Evaluation of Hospital-Setting HCIA Awards

Contract # GS-10F-0086K

Third Annual Report
Final

November 1, 2016

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Abbreviations

ACH	Acute care hospital
ADL	Activities of daily living
CAH	Critical access hospital
CCI	Charlson Comorbidity Index
CMS	Centers for Medicare and Medicaid Services
CVP	Central venous pressure
DD	Difference-in-differences
ED	Emergency department
eICU	Electronic Intensive Care Unit
EMR	Electronic medical record
HCC	Hierarchical Condition Categories
HCIA	Health Care Innovation Awards
ICU	Intensive Care Unit
IRB	Institutional Review Board
IT	Information technology
LOS	Length of stay
LTCH	Long-term care hospital
LTPAC	Long-term post-acute care
MDC	Major diagnostic category
NCE	No Cost Extensions
NP	Nurse Practitioner
PA	Physician Assistant
PAC	Post-acute care
PI	Principal Investigator
RN	Registered nurse
SNF	Skilled nursing facility

Executive Summary

Abt Associates evaluated the 10 Hospital-Setting Health Care Innovation Awards (HCIA), which shared the common feature of taking place, at least in part, in a hospital inpatient or emergency department (ED) setting; two Awards also included nursing homes and post-acute care (PAC) facilities. All 10 Awards focused on high-acuity patients. The initiatives ranged from improving critical care (intensive care unit (ICU) or ED care) to screening for emerging acute conditions in nursing home patients, to team-based inpatient and outpatient services for high-risk patients. Many initiatives relied on information technology (IT) to improve adherence to evidence-based best practices, automate pharmacy and laboratory order sets, or continuously monitor ICU patients. Although each initiative had unique goals and objectives, all shared the goal of improving efficiency and reducing subsequent health care utilization such as rehospitalizations and repeat ED visits. All of the hospital-setting initiatives focused on, but were not limited to, Medicare patients. Please note that throughout this report we refer to programs in the past tense because their HCIA funding and our data collection are complete; most programs, however, continued in some form at their various institutions after HCIA funding ended.

Exhibit 1.1 presents a snapshot view of statistically significant results on Centers for Medicare and Medicaid Service (CMS) core outcome measures for the 10 hospital-setting Awardee programs and, where available, patient survey satisfaction results.

We assessed the evaluability of each Award and described the evaluation challenges in the First Annual Report (https://downloads.cms.gov/files/cmmi/HCIA-HospitalSetting-FirstEvalRpt_4_9_15.pdf).

Our evaluation used mixed methods to explore care improvement/redesign processes, use of IT, staff training and workforce development, and other elements of each initiative. We also measured impacts on utilization, Medicare spending, and patient satisfaction with care. This third and final Annual Report is based on the following information sources:

- Follow-up interviews with the 10 Awardees about program sustainability.
- Patient surveys for five of the 10 Awards (Christus Health Systems, Emory University, Mayo Clinic, Methodist Hospital Research Institute Delirium Program, and Methodist Hospital Research Institute Sepsis Program).
- Regression-based difference-in-differences (DD) analysis of core outcome measures (i.e., hospital admissions, 30-day post-discharge hospital readmissions, 30-day post-discharge ED visits, and total Medicare episode spending), for eight Awardees, based on Medicare claims and patient registries supplied by the Awardees, by quarter and pooled over all intervention quarters.
- Regression-based comparison of core outcome measures (inpatient admissions, ED visits, and total Medicare spending) between intervention and control groups from one Awardee with a randomized controlled trial, based on Medicare claims and patient registries supplied by the Awardees, by quarter and pooled over all intervention quarters.
- For one program, trend analysis of the intervention group only, during the intervention period, because no baseline or comparison group could be estimated using Medicare claims.

Exhibit 1.1 Snapshot of Significant Findings on Core Measure and Patient Survey

Awardee	Project Focus	Program Effectiveness ED	Program Effectiveness Hospital Admission	Program Effectiveness Readmission	Program Effectiveness Cost	Survey Patient Satisfaction
Christus - Acute Care	Screen hospital/nursing home patients to identify early signs of congestive heart failure & sepsis.	NS	-	NS	NS	↑
Christus - LTPAC	Screen hospital/nursing home patients to identify early signs of congestive heart failure & sepsis.	↑	NS	-	↑	-
Dartmouth	Improve severe sepsis care in EDs and ICUs by implementing standardized care bundles.	NS	-	NS	NS	-
Emory	Train/deploy critical care NPs and PAs, supported by an eICU, to address intensivist shortage.	NS	-	↓	↓	↑
Henry Ford	Support patient mobility during hospitalizations, especially in ICUs, to reduce HACs.	-	-	-	-	-
Mayo Clinic	Enhanced IT and presentation/ prioritization of clinical information to improve critical care.	NS	-	NS	NS	↑
Methodist Delirium Screening	Screen older patients to detect risk of delirium and implement preventive interventions.	NS	-	NS	↑	NS
Methodist Delirium – At Risk	Screen older patients to detect risk of delirium and implement preventive interventions.	NS	-	NS	↑	-
Methodist Sepsis Screening – Acute Care	Screen hospital and nursing home patients for early sepsis recognition and timely treatment.	NS	-	NS	NS	-
Methodist Sepsis – Sepsis Confirmed	Screen hospital and nursing home patients for early sepsis recognition and timely treatment.	NS	-	NS	NS	NS
Methodist Sepsis Screening – LTPAC	Screen hospital and nursing home patients for early sepsis recognition and timely treatment.	NS	↑	-	NS	-
Mt. Sinai	Geriatric ED care with evidence-based clinical protocols, decision support, and structural improvements	NS	NS	-	NS	-
St. Luke's	Remote eICU monitoring to improve intensive care/ standardize practices.	NS	-	NS	NS	-
University of Chicago	Integrated team-based care across hospital-campus settings.	↑	NS	-	NS	-

Evaluation Methods

Qualitative Data

We conducted detailed in-person case studies with each of the 10 Awardees in early 2014, including individual interviews, focus groups, and review of documents and Awardee reports to the Centers for Medicare and Medicaid Services (CMS). We conducted follow-up interviews (in most cases by phone) in early 2015, just before the HCIA funding period ended, to understand the mature programs; and reviewed new Awardee documents (e.g., their quarterly self-reports) throughout the evaluation period. Data from both rounds of the case studies were coded in NVivo, a qualitative data software program. The coding scheme aligned with the topics addressed during case studies, and were tailored to match Awardee-specific, or interviewee role-specific, topics and probes. We conducted final interviews with Awardee program leads approximately six months after the three-year HCIA funding period ended regarding the sustainability of the programs.

Claims Analyses

For each Awardee and all quantitative outcome measures, we estimated a single average effect of the program, pooling episodes across all quarters.[1] We also calculated DD estimates for each calendar quarter after the start of the intervention. The pooled analysis increased the sample size, which improved the chance of detecting statistically significant program effects. However, pooled analyses may not provide the full picture of the program's trajectory, if results improved over time. Estimates at the calendar-quarter level were generally too underpowered to detect statistically significant results, but provide additional information regarding trends in outcomes that were not visible in the pooled estimates.

Patient Surveys

A self-administered survey was mailed to selected patients. Telephone follow-up calls were made to non-respondents. It was fielded between April 7 and August 10, 2015 with patients from five of the 10 Awardees that had a sufficient sample size, and for which we could specify a valid comparison group using Medicare claims data. For most respondents, the event of interest had taken place three to six months prior to the date they received the survey.

Limitations

The claims analyses showing no program impact are conservative for two reasons: 1) small sample sizes were generally insufficient to ensure detection of a significant result; and 2) limitations in our ability to specify the intended intervention patients and create matched comparison groups may bias results towards zero, more for some programs than for others. Therefore, a lack of a significant estimate should not be interpreted as confidence that a program did not produce any change in utilization or Medicare spending.

The patient survey was a one-time post-intervention survey, without a baseline comparison. It did not control for baseline differences in patient experiences, or environmental factors that might have differentially affected the intervention and comparison facilities and their patients.

[1] The exception is Henry Ford, where patient selection was based on clinical criteria that cannot be observed in claims data, making it impossible to develop a baseline or comparison group.

Additional Policy-Relevant Findings

Several findings from the hospital-setting Awardee programs may help to inform the design of future health care programs or innovative initiatives. These policy-relevant findings are briefly summarized below and discussed in greater detail in individual sections later in this report.

- **Shortage of critical care physicians.** There is a nationwide shortage of critical care physicians, particularly in rural areas; even in large academic medical centers, intensivist physicians are generally not present in the ICU at night or on weekends. As the number of ICU beds continues to increase, this shortage will become more acute. Two of the hospital-setting HCIA programs (Emory and St. Luke's) aimed to address this shortage of intensivist physicians by extending the reach of those that are present through the use of innovative technology. Both programs implemented eICUs to remotely monitor ICU patients on a 24/7 basis to detect negative trends or departures from clinical guidelines, and both offered off-shift (remote) oversight by critical care physicians. Both programs also supported staff in smaller community hospitals that have no intensivist physician, with the goal of allowing more rural critical care patients to be treated locally. In addition to the eICU, the Emory program trained NPs and PAs to perform many routine ICU procedures and supervise teams of nurses when no physician was present in the ICU. We found that the Emory program was associated with a decrease in inpatient LOS, and also with reduced Medicare episode spending, achieved largely through less need for institutional PAC. We cannot tease apart the effects of the training program from those of the eICU and therefore attribute these positive impacts to the combined components of the Emory program. The St. Luke's program was unfortunately too small to measure impacts with statistical precision.
- **Screening can identify need for post-acute services.** To facilitate early detection and treatment of specific conditions in hospitalized patients, the two Methodist programs developed and implemented standardized screening protocols. The Methodist Sepsis program was designed to identify and treat patients for sepsis before it progresses, while the Methodist Delirium program was intended to monitor and intercept patients at risk for delirium. Requiring trained clinicians to carefully adhere to a standardized screening checklist and screen patients on every shift not only helped to identify patients at risk for the target condition, but may also have helped to identify other emerging health conditions and needs. While total episode Medicare spending increased slightly for the delirium program, this was largely due to an increase in the percentage of patients discharged to home with home health care, indicating that some additional need for home services was identified through the careful screening program. Among both screened patients and patients with a diagnosis of Sepsis in their claims, the Methodist Sepsis program was associated with an increased median of Medicare spending but no increase in mean spending. This suggests that increases in spending were primarily driven by "typical" patients rather than extremely high or low cost patients. Higher costs may have been attributable to shifting discharge patterns. Screened patients were less likely to be discharged home, while both screened patients and those diagnosed with sepsis were more likely to be discharged to "other" institutional PAC settings (e.g., hospice, federal hospital, etc.).
- **Addressing staff turnover in training programs.** Two programs, Christus and Methodist Delirium, partnered with nursing homes to implement components of their programs. In both programs, staff training was ineffective when offered only at the start of the initiative, because nursing homes have a high staff turnover rate. A program that relies on training must offer continuous training for new staff in these settings. For example, during our final follow-up interview with Christus staff in spring 2015,

they shared their concern that none of the nurse aides trained through their program remained at their participating nursing homes by the end of the program.

- **Information technology integration challenges.** Technology challenges arose in many programs, and in some cases delayed implementation at the main site or at partner sites. During follow-up interviews conducted in spring 2015, nine of the 10 programs reported that some aspect of IT was challenging for spreading their innovation to new sites or sustaining it over time. For programs with an important IT component, challenges included having dedicated IT support staff, and integrating the technology innovation into an existing (vendor) electronic medical records (EMR) systems. IT challenges were extreme for multi-site programs, especially when hospitals and their partners did not share an EMR. Overcoming these challenges took longer, in some cases, than the three-year HCIA funding period.

1. Introduction

CMS contracted with Abt Associates to conduct mixed-methods evaluations of the 10 Hospital-Setting HCIAs. The hospital-setting innovations focused on high-acuity patients, and ranged from improving critical (ICU) and ED care, to screening for emerging acute conditions in hospital and nursing home patients, to team-based inpatient and outpatient services for high-risk patients. Many innovations relied on IT to improve adherence to evidence-based best practices, revise pharmacy and laboratory automated order sets, or continuously monitor ICU patients. Although each innovation had unique goals, objectives, and patient populations, all shared the common goal of improving efficiency and reducing follow-up health care utilization such as rehospitalizations and repeat ED visits. All of the hospital-setting innovations focused on Medicare patients, and most included those with other forms of insurance as well.

The mixed-methods evaluations were designed to explore the core research domains as defined by CMS: implementation effectiveness; program effectiveness; workforce issues; contextual factors; impact of the innovations on better care, better health, and lower costs to CMS; and lessons learned for sustainability and spread. Qualitative data were analyzed to understand the care improvement/ redesign processes, use of IT, staff training, and other elements of each initiative. Secondary claims data and surveys were used to measure Medicare utilization and spending, and patient satisfaction with care.

The First Annual Evaluation Report [2]described the 10 innovations and cross-cutting results from in-depth case studies conducted with each, as well as early results from secondary data analyses. The Second Annual Evaluation Report[3] presented results from follow-up case studies and more robust analysis of secondary data through the second full year of the awards. Appendices to both earlier reports described quantitative methods in detail (First and Second Annual Report Appendix A) and detailed Awardee-specific qualitative and quantitative results (First and Second Annual Report Appendix B). Information from these prior reports is repeated here in summary form only.

This Third Annual Evaluation Report contains a summary of each Awardee's qualitative and quantitative results, through the end of the three-year funding period (June 2015), and a synthesis of all findings to date. This report does not contain cross-Awardee results; rather it presents a detailed understanding of the impact of each award and lessons learned from each that are relevant for considerations of sustainability and spread. This report is based on the following data sources:

- Follow-up telephone interviews with key informants from each of the 10 Awardees to collect perspectives on program sustainability and spread after HCIA funding ended.
- Results of core quantitative impact measures based on analysis of Medicare claims and patient registries supplied by the Awardees, using regression-based DD analysis for nine of the 10 Awardees, by quarter and pooled over all intervention quarters.
- For one program, trend analysis of the intervention group only, during the intervention period, because no baseline or comparison group could be estimated using Medicare claims.

[2] https://downloads.cms.gov/files/cmmi/HCIA-HospitalSetting-FirstEvalRpt_4_9_15.pdf

[3] https://downloads.cms.gov/files/cmmi/hcia-hospitalsetting-secondevalrpt.pdf

- Analysis of data gathered via a one-time survey conducted with intervention patients served by five Awardees (i.e., Christus, Emory, Mayo Clinic, Methodist Delirium, and Methodist Sepsis) and matched comparison patients served by non-participating facilities. The surveys were designed to help us understand patient experiences of care. [4]

1.1 Qualitative Methods

Two previous annual reports from this evaluation explained qualitative data collection and analysis, and results of detailed case studies. This third annual report contains information from one additional round of telephone interviews with key program staff (e.g., Principal Investigator (PI); Program Manager (PM) to obtain their perceptions on program sustainability and spread following the end of the HCIA funding period. In particular, we were interested in learning about the essential resources to sustain the innovation, and the key barriers and facilitators for spreading or replicating the innovations to additional units or facilities.

To collect additional qualitative data on sustainability and spread, we developed an informal discussion guide (see Appendix A). Sixty-minute telephone interviews were conducted, and data were coded and entered into an Excel spreadsheet. Findings were synthesized for each Awardee and brief summaries were generated. Results of these analyses can be found in the Individual Awardee Sections (see Chapter 3).

1.2 Quantitative Methods

A detailed description of quantitative analysis of secondary data can be found in Technical Appendix B. Appendix B includes a discussion of the methods used to specify intervention and comparison groups, sample size considerations, and the use of a DD approach with multivariate regression to test whether each Awardee intervention achieved its intended objectives.

There are two differences between the Second Annual Report and this Third Annual Report. First although the design and analytic approach are the same as in previous reports, the end dates of Awardee data included in this report vary due to NCEs. Six of the 10 Awardees (Emory, Henry Ford, Methodist Delirium, Methodist Sepsis, Mt. Sinai, and St. Luke's) received NCEs beyond the June 30, 2015 end date, to continue using the last of their HCIA funding. Therefore, analyses presented in this report were conducted through June 2015 for the four Awardees that did not receive NCEs, as well as for Emory and Mt. Sinai because they informed us that their remaining HCIA funds were not used to serve new patients after June 30, 2015. For the remaining four Awardees (Henry Ford, St. Luke's, Methodist Delirium and Methodist Sepsis), analyses in prior reports are extended here by adding one additional quarter of data. An addendum to this Third Annual Report will be submitted to CMS in 2017 and will include analyses through December 31, 2015 for two programs that continued to serve new patients into 2016 (Methodist Delirium and Methodist Sepsis) programs.

Second, we surveyed patients about care experiences and satisfaction with care. Abt's survey group fielded the survey between April 7 and August 10, 2015 with patients from five of the 10 Awardees that had a large enough sample size to support such a survey, and for which we could identify a valid comparison

[4] Surveys were also conducted with clinical staff from six Awardees (Christus, Emory, Mayo Clinic, Methodist Delirium, Methodist Sepsis, and Mt. Sinai), however we have serious concerns about selection bias because the PMs selected participants in a way that was not based on defined criteria, and the survey response rates were very low. For these reasons we do not present clinician survey results in this report.

group using Medicare claims data. This was a one-time post-intervention survey, without a baseline comparison. It does not control for baseline differences in patient experiences, nor does it control for environmental factors that may have differentially affected the intervention and comparison facilities/patients. Survey methods are described briefly below. A synopsis of the Awardee-specific methods and results are presented in the individual awardee sections in Chapter 3. Greater detail on survey methodology and results can be found in the Patient Survey Reports in Appendix C.

2. Individual Awardee Results

In this chapter we present a description and findings for each of the 10 Awardees. Findings include a summary of qualitative data, claims-based analyses, and patient survey results. Each Awardee section concludes with a synthesis of findings.

2.1 Christus Health System

2.1.1 Introduction

Christus Health received an HCIA to implement the Integrated Nurse Training and Mobile Device Harm Reduction (INTM) Program. INTM combined nurse training and supportive mobile device technology to improve the ability of nursing care staff across multiple organizations to recognize early warning signs of congestive heart failure, sepsis, and other high-risk medical conditions, and intervene to mitigate harmful outcomes.

The INTM training was designed to improve nurses' critical thinking skills. Nursing staff—licensed practical nurses, known in Texas as licensed vocational nurses; certified nurse assistants; and registered nurses (RNs) in hospitals and nursing homes—were taught to recognize signs and symptoms of congestive heart failure, sepsis, and other high-risk conditions. Training in all three years occurred in the classroom and simulation laboratory at St. Michael's hospital. This training was expected to help staff recognize early warning signs, begin treatment earlier, avoid preventable conditions/deterioration, and improve outcomes.

Supportive mobile technology was developed to guide hospital and nursing home staff in conducting systematic screening for specific conditions of concern and identifying emerging problems early. Implemented on an iPad, the technology prompted nursing staff to describe symptoms in detail, thus helping them organize their thoughts and succinctly relay detailed information to physicians. In addition, the mobile technology was designed to help nursing home staff evaluate the need to send a resident[5] to the hospital. Identifying emerging problems meant that a resident might be able to remain in the nursing home and be treated there, rather than being sent to a hospital ED. Even if an ED visit or hospitalization was necessary, earlier identification of symptomology might reduce severity and hospital LOS.

The program encompassed the Christus ARK-LA-TEX (Arkansas, Louisiana, and Texas) service region, which spans a 75 mile radius around Texarkana, Texas.

2.1.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information to better understand resources necessary to sustain the programs after HCIA funding ended, and barriers and facilitators for replicating the program in other units or facilities. These new findings regarding sustainability are presented below as well.

[5] Note that in this report an individual who resides in a nursing home is referred to as a resident. An individual who is admitted to the hospital (including a nursing home resident) is referred to as a patient.

Implementation Effectiveness: Training

It is important to distinguish between the training program, which focused on recognizing emerging serious medical conditions, and use of the iPad technology. There was infrequent use of the iPad software program, but all nursing staff we interviewed had participated in the training, and their perceptions of the impact of the combined program generally focused on the positive impact of the training.

- The training was considered by program staff, as well as nurse-trainees, to be the most important component of the INTM program. Trainees consistently reported a lasting impact of the training, for which they credited the dynamic teaching style of the principle investigator (PI).
- The training component remained consistent over the course of the program. Small revisions to the training materials were made (e.g., adding more content to the PowerPoint slides) but the high-level training model and content were the same over the three-year Award period.
- The training plan did not consider the high rate of staff turnover endemic to the nursing home industry. After initially training all staff in the participating hospital and nursing homes, program training was integrated into the orientation for newly hired hospital nursing staff, but no systematic training process was in place to keep up with the high turnover rate in the partner nursing homes.

Implementation Effectiveness: iPad Technology

- The Christus PI anticipated that nurses would be eager to use the iPad in both hospital and nursing home settings, but this was not the case for several reasons:
  - Nurse managers initially kept the iPads in locked locations because they were worried about theft. Subsequently the iPads were made more available (i.e., not under lock and key), but use of the devices remained low.
  - New graduates and nurse aides used the iPad most often. Experienced RNs, who tended to be more confident in their patient assessment skills, felt that the use of the iPad checklist was a redundant exercise. None of the ICU nurses used the iPad.
  - At the hospital, low iPad use also may have been affected by the presence of the rapid response team. Nurse managers reported that the rapid response team was "an easier resource to use [than the iPad] because they are only a phone call away."
- Although the iPad had originally been intended as a checklist to be used at the bedside to identify early warning signs of high-risk conditions, over time the program team transformed it into a "teaching tool" to retrospectively educate staff about how adverse events might have been handled differently. Nurse managers recreated recent patient scenarios using the iPad, and then discussed with nursing staff what they might have done differently, and how the patient's condition might not have deteriorated, had they used the iPad checklist.

Workforce

Existing clinical staff (i.e., nurses, PAs, NPs) were trained to identify emerging signs of sepsis and other acute conditions, and to use the iPad checklist technology. With the exception of one new program staff position, no new staff were hired to implement either component of the INTM program.

- Although the goal was met of initially training 1,500 nursing staff, the program budgeted less money for training in the second and third years of the Award, and an additional Foundation grant they received covered only training for hospital staff. This resulted in few training opportunities for newly hired nursing staff.

- Among nursing staff, there was inevitable turnover in both the hospital and nursing homes, and it was challenging to keep up with INTM training, especially in nursing homes which had a reported 35 percent annual turnover rate.
- Ongoing training was offered in the hospital setting, but not in the nursing homes. Sending newly hired nursing home staff to these hospital-based training sessions required covering their shifts in the nursing homes (overtime, etc.) and there was no funding support to do so. By the end of the three-year program, few of the originally trained nursing staff in nursing homes remained.

Sustainability and Spread

The INTM program received internal funding from a hospital foundation to continue the four-hour training for all new hospital nurses, during their orientation. The iPad technology, however, was discontinued as a clinical tool because it failed to receive IRB approval. (The Christus Health System's IRB did not believe that the team was able to prove the safety of the software except as a research tool.)

- Neither component of INTM is currently active at any of 12 partner nursing homes.
- The training program is being continued in the hospital inpatient setting.
- The third-party software company that was hired to build the checklist tool and adapt it for use on iPads continues to support the device to a limited extent, but as of March 2016 there is little use in the Christus hospital or partner nursing homes.

During our March 2016 follow-up interviews, the program PI advised that he would be working half-time position in the simulation center to help keep the training and technology alive, while also trying to secure additional funding.

2.1.3 Summary of Quantitative Findings

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total Medicare episode spending). Christus Health did not receive an NCE beyond June 30, 2015, and we present here estimated changes in utilization and Medicare spending updated through June 30, 2015, the entire three year intervention period. For Christus patients whose exposure to the screening program began in a nursing facility (i.e., skilled nursing facility (SNF) or long-term care hospital (LTCH)), we specify total spending as:

- Total Medicare spending for 60 days including the index admission and all spending for 60 days after admission. Index admission was defined as an admission for a patient eligible for the screening innovation, in either an intervention or comparison hospital.
- Admission (transfers) from SNF or LTCH to ACHs.
- Thirty-day post-admission (all cause) visits to an ACH ED following an index admission.

For Christus patients whose program intervention began in an ACH we specify the core measures as:

- Total Medicare episode spending for 60 days including the index admission and all spending for 60 days after discharge.
- Thirty-day (all cause) readmissions to an ACH following an index admission.

- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

Beyond the core measures, the Christus Health program aimed to reduce LOS and to avoid complications through adherence to best practice guidelines and results are therefore presented for the following additional measures:

- Inpatient LOS
- Discharge destination for inpatient discharges

Please see Technical Appendix B for a description of how each outcome measure was specified, our methods for the DD regression analyses, and how we selected a comparison group. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending.

All regression models included controls for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, Charlson Comorbidity Index (CCI) and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from a SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, major diagnostic category (MDC), provider fixed effects, and indicators for the quarter in which the episode occurred.[6] The regression model also included an indicator for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare claims; patients were not included if they were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay). This report is based on final action claims that reflected processing as of six months for Medicare spending—any adjustments processed more than six months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

Below we separately summarize results for patients who first encountered the program in an ACH, and those who first encountered the program in a LTPAC facility.

Summary of Core Measures—Acute Care Hospital Patients

Exhibit 2.1A summarizes the effect of the Christus Hospital intervention on total Medicare 60-day spending, 30-day inpatient readmissions, and 30-day ED visits per episode, pooled across all quarters. [7,8]

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[6] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

[7] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[8] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

It also presents the total impact of the program on spending aggregated across all episodes occurring during the intervention period. There were no large or statistically significant changes in the three core measures attributable to the intervention, and the aggregate effect on spending was also insignificant.

Exhibit 2.1A: Core Measures Summary—Acute Care Hospital Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-1.31	(-5.52, 2.90)
Per episode: (N = 8,370)		
Total 60-day spending	-156.34	(-659.38, 346.70)
Thirty-day inpatient readmissions	0.23	(-1.15, 1.62)
Thirty-day ED visits	1.36	(-0.32, 3.03)

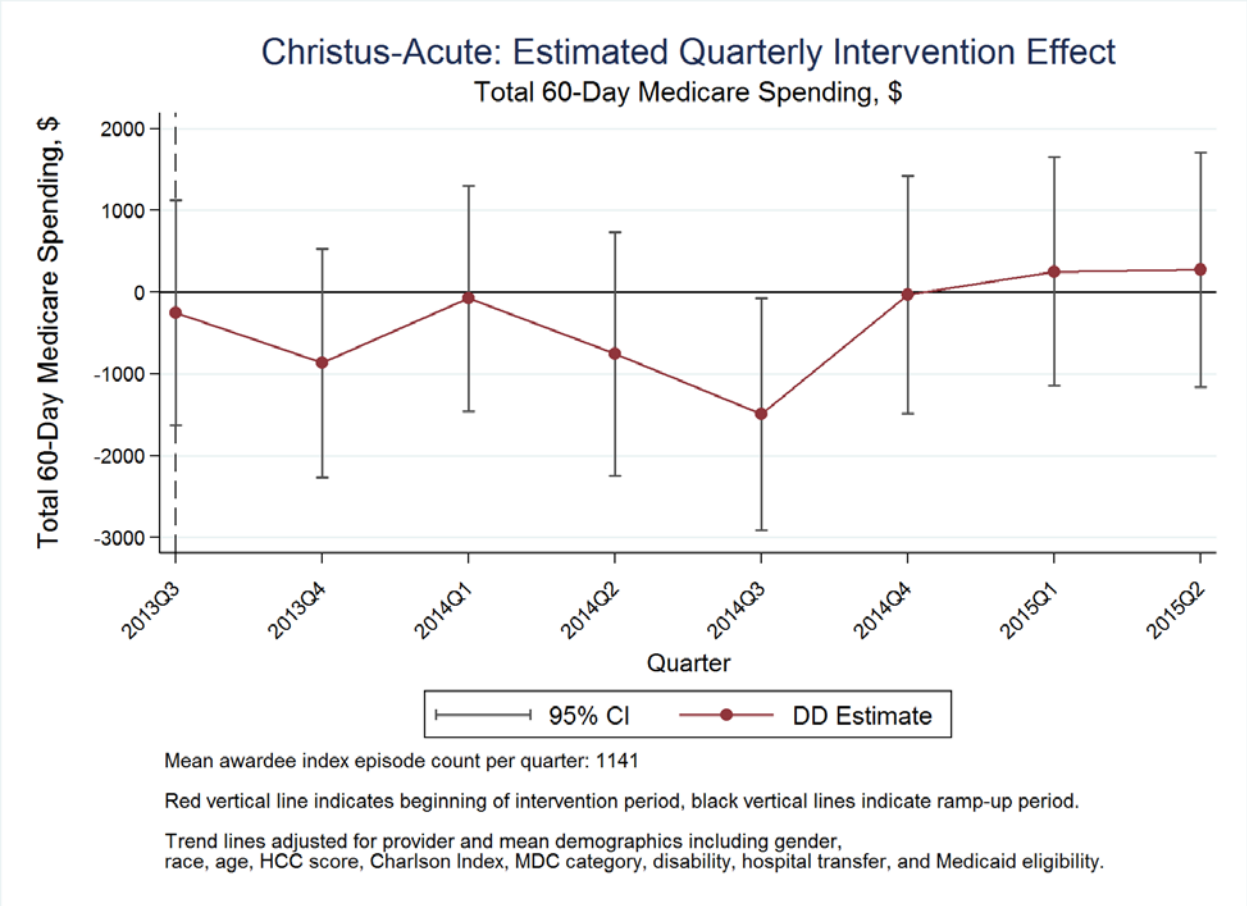
The estimated change in outcomes spans the entire intervention period from 2013Q3 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.1B shows total Medicare spending over a 60-day episode, by quarter. We found no consistent trend in spending associated with the Christus intervention. Exhibit 2.1C shows a statistically insignificant reduction in median Medicare episode spending relative to the comparison group.

Exhibit 2.1B: Medicare Episode Spending—Acute Care Hospital Patients



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.1C: DD Estimated Effect of Intervention on Median Total 60-day Medicare Spending

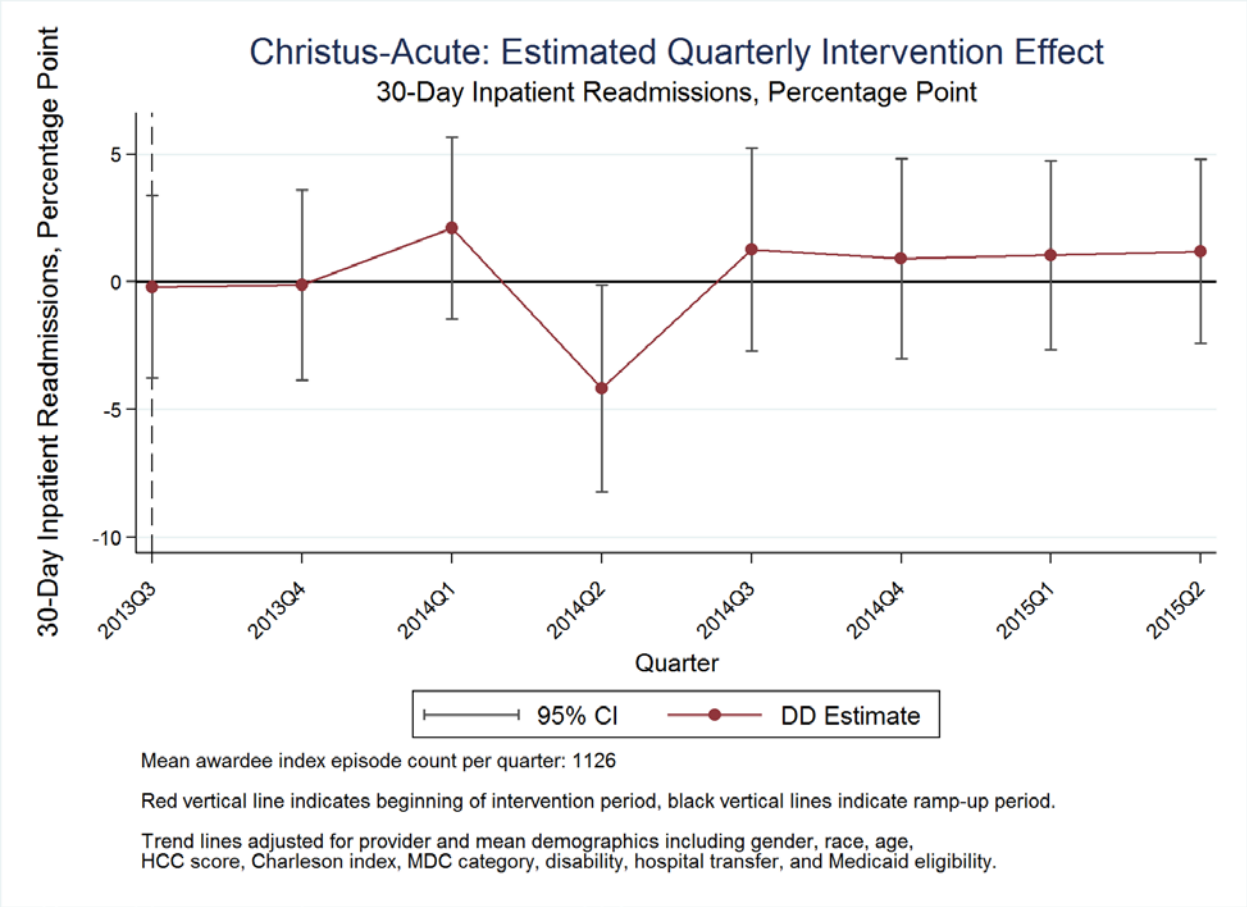
Christus Health—Acute		
Intervention Effect	Estimate	-41.88
	Standard error	(146.08)
	Sample size	[35,880]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

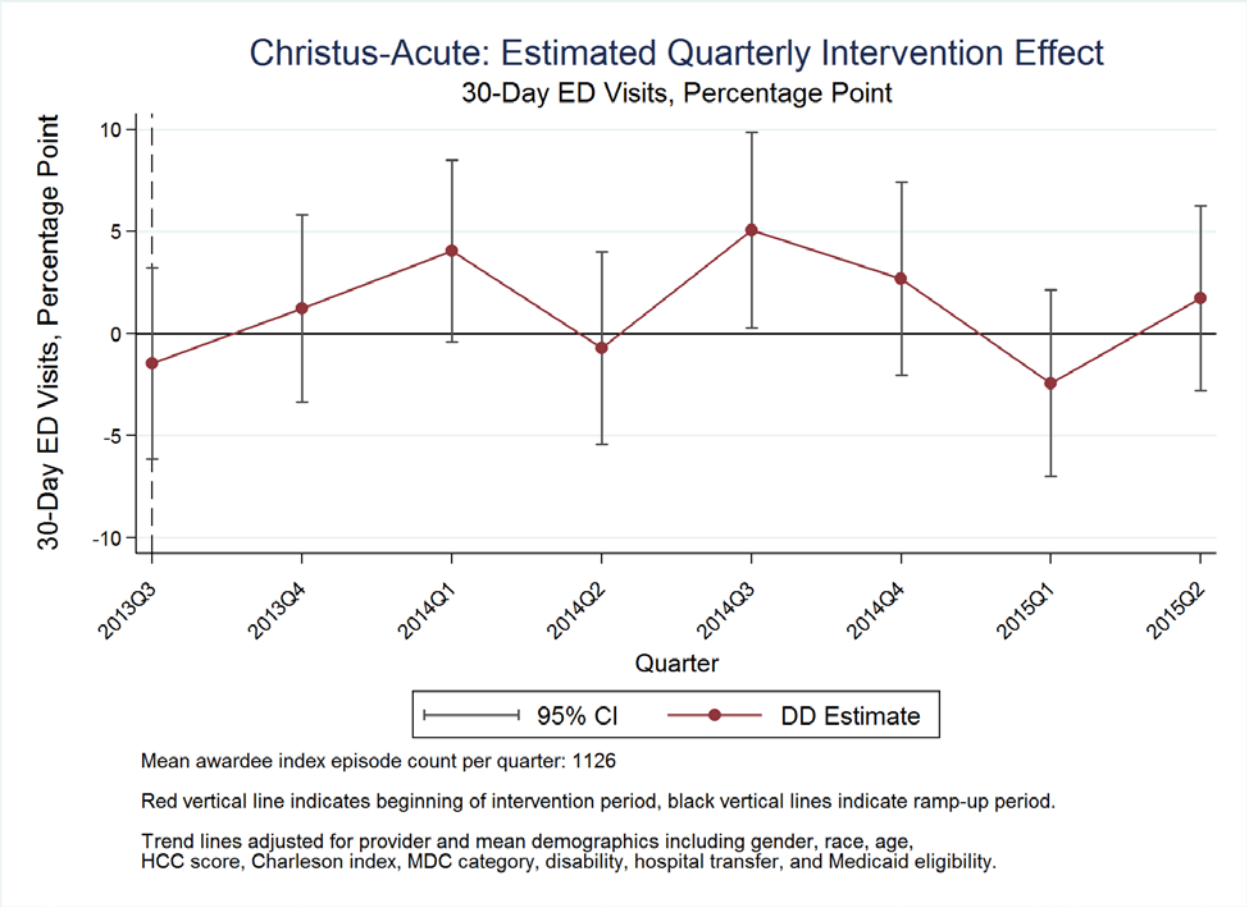
Exhibit 2.1D shows the percentage of hospital discharges followed within 30 days by a readmission, with no consistent trend during the intervention quarters. Exhibit 2.1E shows the change in 30-day post-discharge ED visits, and, again, there was no consistent trend.

Exhibit 2.1D: Readmissions—Acute Care Hospital Patients



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.1E: 30-Day Post-Discharge ED Visits—Acute Care Hospital Patients

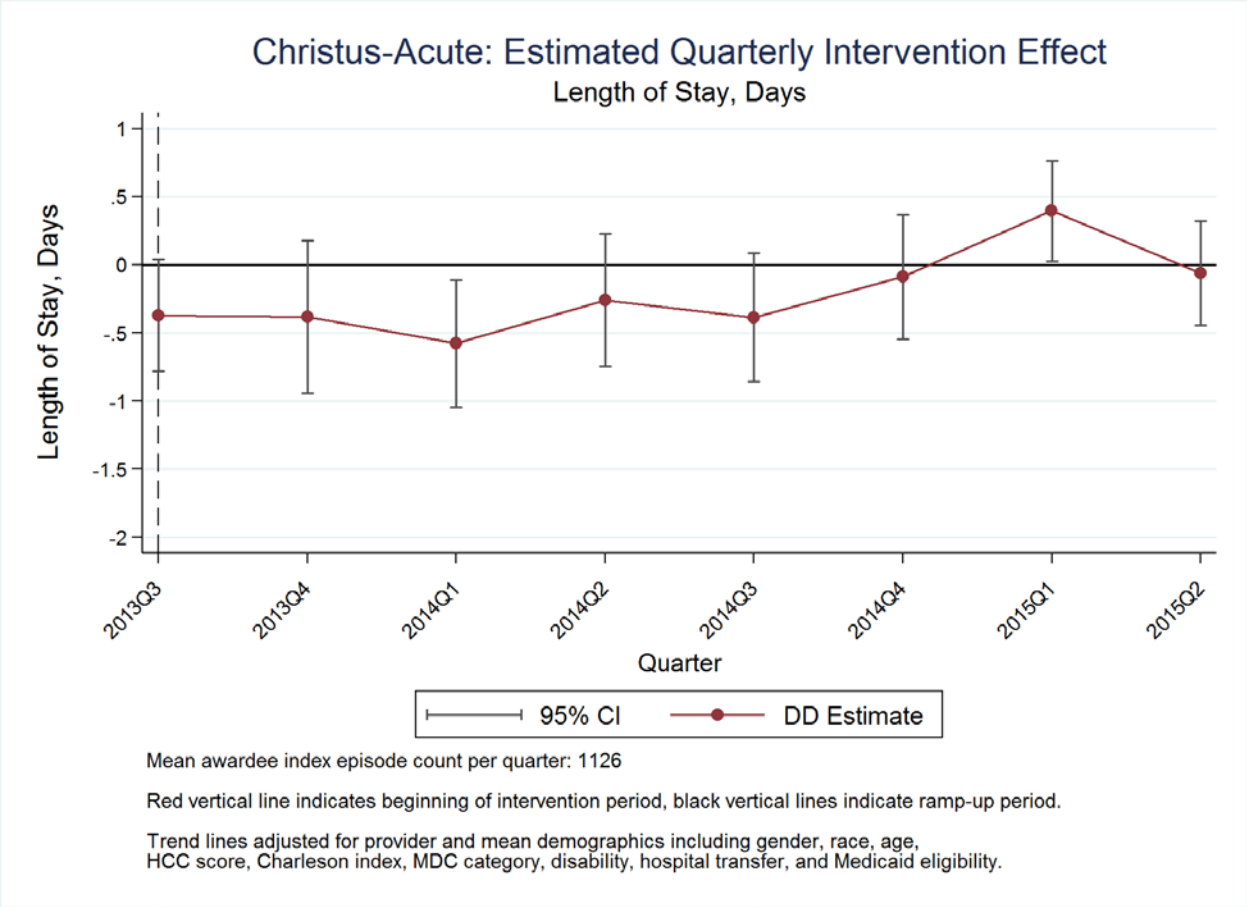


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS—Acute Care Hospital Patients

We examined LOS for the acute care patients in the Christus program to understand whether the careful screening contributed to earlier recognition of emerging problems and yielded lower LOS. Exhibit 2.1F below shows the estimated quarterly change in inpatient LOS for the Christus intervention relative to the comparison group. All quarters until the first quarter of 2015 showed a reduction in inpatient LOS relative to the comparison group, although only one quarterly estimate was statistically significant. Exhibit 2.1G pools all quarters and indicates that the intervention was associated with a significant LOS reduction of 0.2 days ($p<0.10$).

Exhibit 2.1F: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.1G: Pooled DD Estimated Effect of Intervention on Mean Inpatient LOS

Christus Health—Acute		
Intervention Effect	Estimate	-0.18*
	Standard error	(0.09)
	Sample size	[35,345]

*p<0.1 **p<0.05 ***p<0.01 Source: Abt Associates, July 2015.

Discharge Destination—Acute Care Hospital Patients

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization (for ACH patients only). Exhibit 2.1H below indicates that the proportion of inpatients discharged to home health care decreased by a statistically significant 3.1 percentage points overall intervention quarters ($p<0.01$) relative to the comparison group. This decrease was largely offset by a 1.8 percentage point increase in discharges to "other" PAC locations such as hospice, federal hospitals, and psychiatric hospitals ($p<0.01$). This trend began in mid-2014, and influenced the pooled estimates.

Exhibit 2.1H: DD Estimated Change in Episode Discharge Destination—Acute Care Hospital Patients

	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	Overall
Home									
DD	5.43**	0.27	0.50	1.97	1.87	3.88	-2.00	-2.74	0.85
SE	2.53	2.51	2.53	2.49	2.61	2.48	2.41	2.42	1.07
Home Health									
DD	-2.33	0.49	-1.06	-4.93***	-3.68**	-5.99***	-1.85	-4.07**	-3.08***
SE	1.79	2.08	1.93	1.48	1.77	1.41	1.90	1.56	0.80
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home									
DD	-1.08	-1.17	0.72	0.63	-0.08	-1.25	-0.08	2.94	0.39
SE	2.31	2.31	2.33	2.39	2.47	2.36	2.30	2.42	1.01
Other									
DD	-2.01**	0.41	-0.16	2.34	1.89	3.35**	3.94**	3.87**	1.83***
SE	0.90	1.32	1.22	1.62	1.69	1.87	1.73	1.82	0.64

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Summary of Core Measures—LTPAC Patients

Exhibit 2.1I summarizes the average effect of the Christus intervention on LTPAC patients for total 60-day Medicare spending, 30-day inpatient admissions, and 30-day ED visits per episode, pooled across all quarters.[9,10] It also presents the aggregate effect of the program on total spending across all episodes that occurred during the intervention period. The intervention was associated with $1,362 in additional spending per episode of care relative to the comparison group, for a total estimated cost of $2.20 million ($p<0.01$). This was primarily driven by a 3.73 percentage point increase in the rate of 30-day ED visits ($p<0.10$).

[9] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[10] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values.

Exhibit 2.1I: Core Measures Summary—LTPAC Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	2.20***	(0.73, 3.67)
Per episode: (N = 1,615)		
Total 60-day spending	1362.03***	(451.63, 2272.44)
Thirty-day inpatient readmissions	1.87	(-1.73, 5.47)
Thirty-day ED visits	3.73*	(0.00, 7.46)

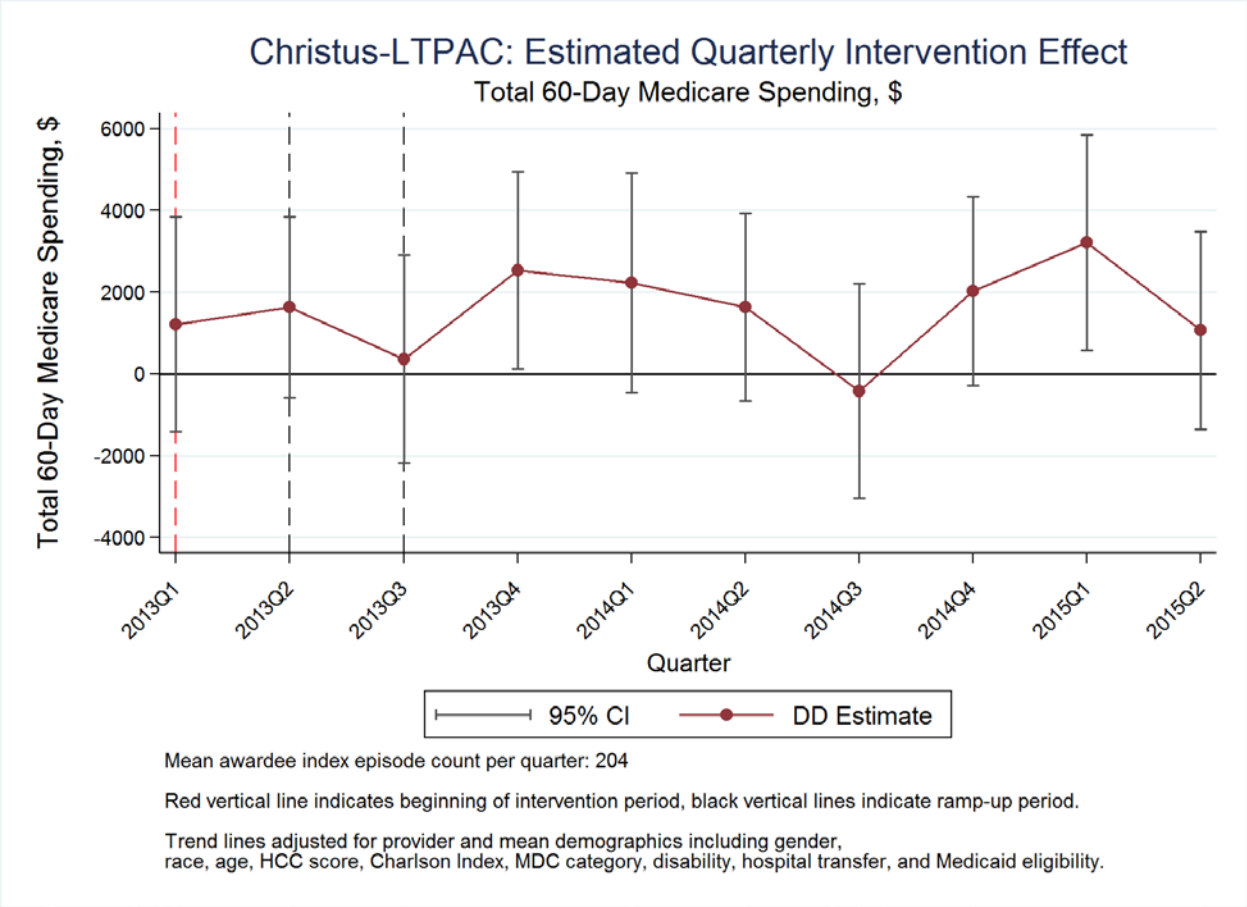
The estimated change in outcomes spans the entire intervention period from 2013Q1 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.1J shows the change in Medicare spending by quarter, relative to change in the comparison group, for patients who first encountered the screening program in LTPAC facilities. With the exception of one quarter, the Christus LTPAC intervention was associated with an increase in average Medicare spending. Exhibit 2.1K shows that median Medicare spending also increased, relative to the comparison group, although this difference was not statistically significant.

Exhibit 2.1J: Medicare Episode Spending—LTPAC Patients



Source: Abt Associates analysis of Registry and Medicare Claims, completed in July 2016.

Exhibit 2.1K: DD Estimated Effect of Intervention on Median Total 60-day Medicare Spending—LTPAC Patients

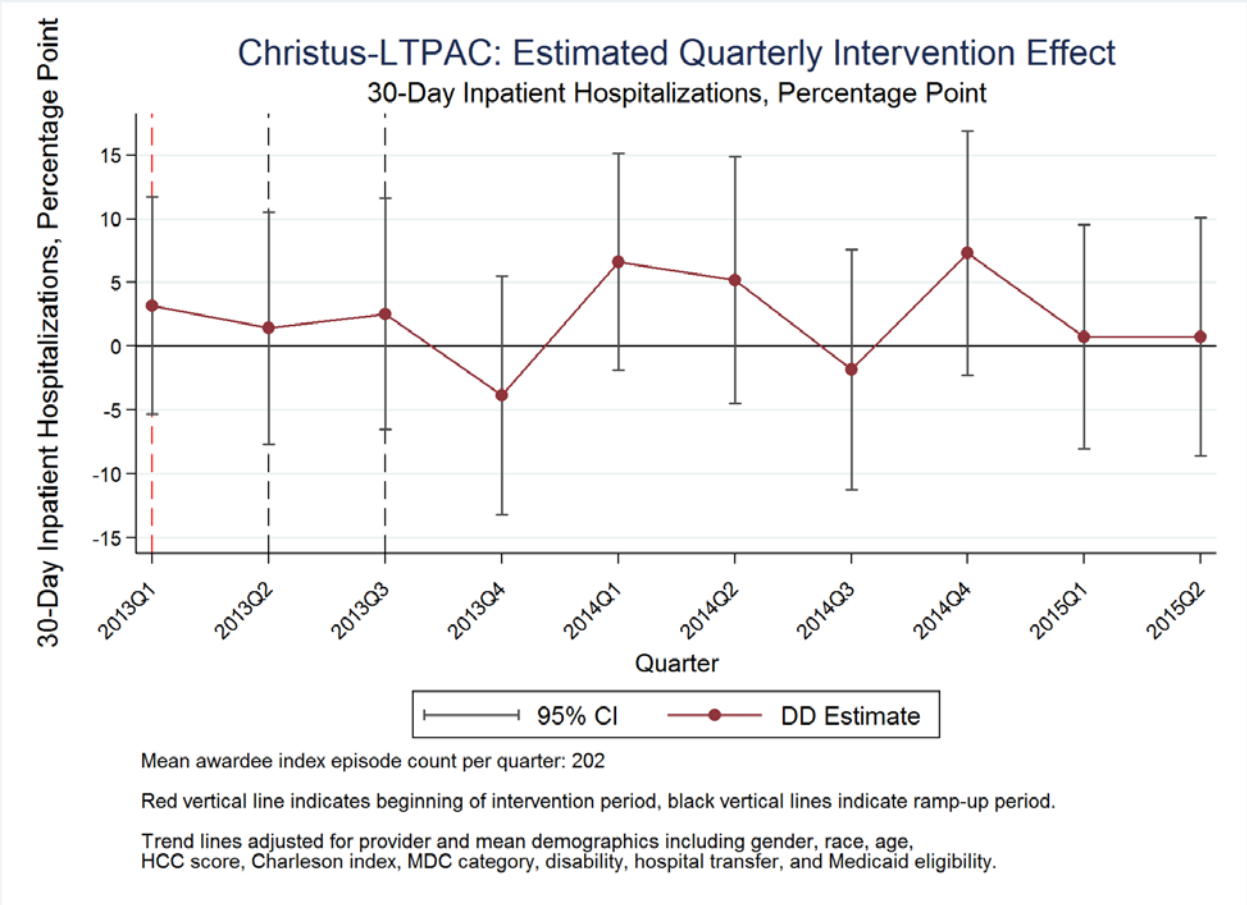
Christus Health—LTPAC		
Intervention Effect	Estimate	894.61
(Median regression)	Standard error	(632.53)
	Sample size	[7,772]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

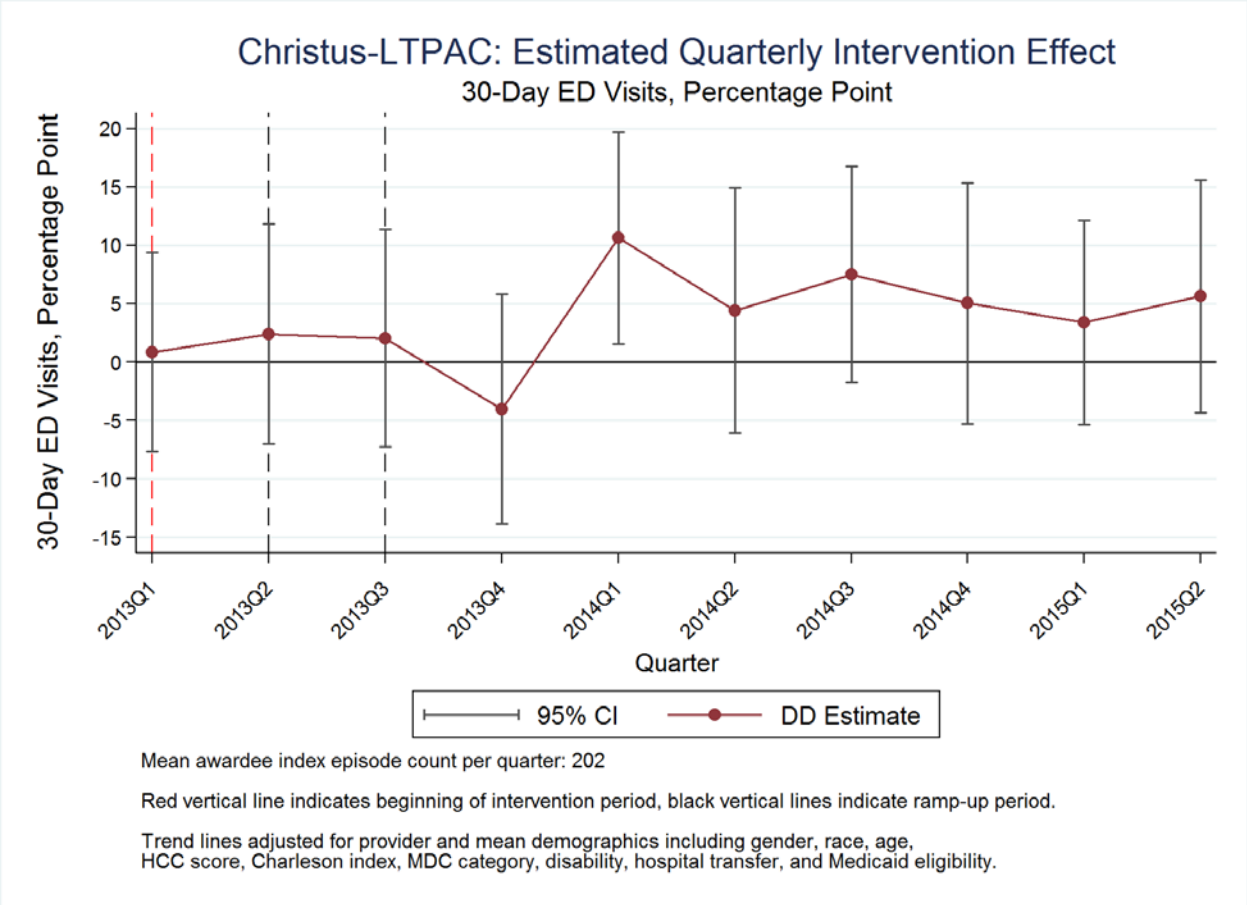
Exhibits 2.1L and 2.1M reflect only the patients who first received the program intervention while in an LTPAC facility, and show admissions (transfers) from that facility to a hospital, and visits from the LTPAC facility to a hospital ED. The quarterly trends indicate a consistent increase in ED visits in the 30 days after admission to a LTPAC setting relative to the comparison group, but the increase was statistically insignificant in most quarters. Admissions from LTPAC to a hospital follow a similar trend but fewer of the quarterly estimates are positive, particularly in the last year of the program, consistent with the lack of overall effect reported in Exhibit 2.1I above.

Exhibit 2.1L: Hospital Admissions—LTPAC Patients Only



Source: Abt Associates analysis of Registry and Medicare Claims, completed in July 2016.

Exhibit 2.1M: 30-Day Post-Admission ED Visits—LTPAC Patients



Source: Abt Associates analysis of Registry and Medicare Claims, completed in July 2016.

Conclusions

- The ACH component of the Christus intervention was associated with a decrease in LOS of approximately 0.2 days ($p<0.1$), relative to the comparison group. This did not yield savings to Medicare because inpatient prospective payment does not vary by LOS.
- The LTPAC component of the Christus program was associated with an increase of $1,362 in average Medicare spending per episode ($p < 0.05$) relative to the comparison group. One contributor to higher episode costs appears to be increased transfers of patients to hospital EDs. The LTPAC component of the Christus program was associated with a 3.7 percentage point increase in the rate of ED visits within 30 days of LTPAC admission ($p<0.10$), possibly indicating that the screening effort was identifying medical conditions that cause LTPAC staff to transfer patients to the ED.

Patient Survey—Acute Care Hospital Patients Only

To address questions related to quality of care and patient satisfaction, a sample of beneficiaries who were treated in the Christus St. Michael's hospital (not in partner nursing homes) were surveyed. A sample of patients treated in comparison hospitals was surveyed as well. Most received the survey within 3-6 months after their hospital discharge and the survey was conducted by mail with phone follow-up with non-respondents. The survey included questions in the following five domains:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

After the removal of decedents, surveys were mailed to 1,438 beneficiaries (intervention and comparison groups combined). Of these beneficiaries, 806 completed at least one survey question, representing an overall response rate of 56 percent (58 percent and 55 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer those items), we replaced the missing values for age and gender using information from Medicare administrative data. Exhibit 2.1N presents the demographics of beneficiaries selected for the survey sample, and the actual respondents. For a detailed description of the Christus patient survey methodology and results, please refer to the Christus Patient Survey Report in Appendix C.

Exhibit 2.1N: Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	135	19%	137	19%	71	18%	53%	48	12%	35%
65-74	256	36%	256	35%	164	41%	64%	155	39%	61%
75-84	199	28%	221	30%	118	29%	59%	133	33%	60%
85+	112	16%	122	17%	51	13%	46%	66	16%	54%
Race										
White	553	79%	576	78%	326	81%	59%	332	83%	58%
Nonwhite	148	21%	158	21%	78	19%	53%	69	17%	44%
Unknown	1	0%	2	0%	0	0%	0%	1	0%	50%
Gender										
Male	307	44%	326	44%	182	45%	59%	184	46%	56%
Female	395	56%	410	56%	222	55%	56%	218	54%	53%
Total	702		736		404		58%	402		55%

Source: Abt Associates HCIA Patient Survey.

Patient Survey Results—Acute Care Hospital Patients Only

There were few statistically significant differences between intervention and comparison survey respondents relating to health outcomes, health-related quality of life, and satisfaction with care/care experiences. The majority in both groups reported that their physical and mental health were good, and most needed little or no help with activities of daily living (ADL). Fewer respondents in the intervention group than the comparison group felt that their health was excellent.

Intervention respondents were significantly more likely to be satisfied with the care they received ($p \leq .05$) and their recovery post-discharge ($p \leq .05$), than were their comparison peers. These survey results indicate generally positive results for patients served by Christus, compared with results for similar patients who received care at comparison hospitals, although without a baseline survey we cannot rule out unobservable differences between the two groups. The survey findings are generally more positive than those from our claims-based analyses, which found only a small decrease in LOS (approximately 0.2 days) in the acute care component.

2.1.4 Synthesis of Findings

The following is a synthesis of findings from all available sources:

- There was an increase in total Medicare 60-Day episode spending relative to the comparison group among patients who first encountered the intervention in LTPAC facilities, which was likely due to an increase in ED visits.
- Among patients who encountered the intervention in the hospital inpatient setting, there was a slight decrease in the average LOS relative to the comparison group. It is possible that the training element of the INTM program was helping bedside nursing staff identify and treat emerging problems sooner, thus shortening hospital stays.
- Fewer patients were being discharged from the hospital with home health care, although more were being discharged to a destination of "other," which includes other facilities (e.g., hospice, general hospital, and intermediate care facility) or outpatient care.[11] Because these care settings may be more costly than home health care, being discharged to a destination of "other" may explain the increase in total Medicare 60-day episode spending.

It is unlikely that the INTM iPad technology had any impact on patient outcomes, given its light use in the hospital and in the nursing homes. We can cautiously attribute some improvement (shorter LOS) in inpatient care to the training component of the INTM, though we did not measure this directly. This assumption is supported by qualitative interviews with staff. Survey findings indicate that hospital inpatients were more satisfied than their comparison peers with the care received, and their recovery post-discharge. The increase in Medicare episode spending may be due to a slight change in discharge destination, although we cannot attribute these changes directly to either component of the program intervention.

[11] We did not run analyses for each of the "other" categories because the number of discharges in each category was too small.

2.2 High Value Healthcare Collaborative

2.2.1 Introduction

The High Value Healthcare Collaborative (HVHC) is a consortium of 19 health care delivery systems and The Dartmouth Institute for Health Policy and Clinical Practice. The HVHC received an HCIA Award led by The Trustees of Dartmouth College to implement a bundle of services related to the care of sepsis patients and 13 HVHC member health care systems around the country participated.

The overall goal of this program was to use process improvement strategies to implement specific clinical services by three and six hours after an initial sepsis diagnosis, as defined by the Surviving Sepsis Campaign and National Quality Forum guidelines for the care of severe sepsis and septic shock. Over three years, the HVHC members aimed to improve optimal adherence to sepsis care bundles (guidelines) by five percent, reduce the burden of chronic morbidity from sepsis-associated chronic organ dysfunction, and achieve a five percent relative reduction in the percentage of patients with sepsis requiring long-term acute care or sub-acute nursing care after an incident episode of severe sepsis. These improvements were anticipated to save Medicare $12.24 million across the HVHC participating health systems and hospitals.

The Dartmouth HVHC Sepsis Improvement program focused on the implementation of three-hour and six-hour treatment bundles for sepsis. Patients were screened and received the initial three-hour care bundle if they had clinically suspected infection and two or more indicators of Systemic Inflammatory Response Syndrome, *and* had hypotension, defined as systolic blood pressure 90mmHG or decrease of ≥40mmHG from baseline or Elevated Serum Lactate, defined as ≥ 4mmol/L. Laboratory work was to be completed before the six-hour care bundle, and any non-septic patients were removed from the intervention prior to receiving the six-hour care bundle of services. Briefly, the three-hour care bundle for suspected sepsis includes the following steps: measuring lactate level, obtaining blood cultures before administering antibiotics, administering broad spectrum antibiotics, and aggressive fluid resuscitation. The six-hour care bundle for confirmed septic shock includes the following steps: administering second line antibiotics as indicated, administering vasopressors for hypotension that does not respond to initial fluid resuscitation, monitoring central venous pressure and oxygen saturation, and repeated lactate measurement.

2.2.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team visited three of the health systems participating in the initiative and collected information to better understand resources necessary to sustain the programs after HCIA funding ended, and barriers and facilitators for replicating the program in other units or facilities. These new findings regarding sustainability are presented below as well.

Implementation Effectiveness

Staff in all three hospitals we visited reported that the sepsis care bundles were implemented in the EDs and ICUs, with plans to expand to other hospital units. ED and ICU staff reported that the sepsis care bundles were easy to understand and implement and required minimal instruction. The care bundles were much less complex and labor-intensive than a previous widespread sepsis protocol, and workflows for clinicians were more straightforward and required less decision-making at each step. These were important reasons for the rapid adoption and enthusiasm for the care bundles that we observed among

clinical staff in participating EDs and ICUs. Clinical educators in each hospital also reported that the care bundles were easier to teach to new nurses and rotating medical residents than the previous sepsis protocol.

Clinicians emphasized that identifying patients earlier in the sepsis pathway is essential for improving outcomes and saving lives. Staff in EDs and ICUs were trained to investigate sepsis for any patient meeting clinical criteria, and begin fluid and antibiotic administration while waiting for definitive laboratory confirmation of sepsis (patients subsequently determined not to have sepsis were removed from the six-hour sepsis care pathway).

The three-hour and six-hour sepsis care bundles were implemented consistently at participating hospitals, and deliberate care process redesign was undertaken in each (e.g., Lean Six Sigma, or a related process). Many small improvements identified through these care redesign efforts together contributed to more rapid identification and aggressive treatment of suspected sepsis.

Physicians in participating EDs and ICUs raised concerns about some of the clinical requirements in the six-hour care bundle, and did not implement these consistently, including the following:

- Many physicians expressed concern about placing a central catheter to measure central venous pressure (CVP) when there is no other indication for a central line; the catheterization risks (e.g., central line-associated blood stream infection) may outweigh the need for precise CVP measurement. In addition, new technology permits alternative non-invasive methods for measuring CVP.
- Some physicians were uncomfortable ordering the levels of fluid indicated in the protocol for certain subsets of patients. In particular, aggressive fluid resuscitation for cardiac ICU patients could at times be unsafe, and clinical judgment is required.
- Nursing staff advised that gauging the correct fluid for obese patients is difficult, as the care bundle calculation method is weight-based and may yield an unsafe recommendation for fluid administration for obese patients.

A variety of adjustments to care delivery processes were made to trim minutes from workflows and achieve the three-hour and six-hour targets. For example, most hospitals use automated dispensing systems for decentralized medication distribution, but these were not always conveniently available in the three hospitals' EDs (especially for antibiotics that require refrigeration) and nurses reported time lost while waiting for the pharmacy to deliver antibiotics to the ED. All three determined that having a medication-dispensing machine in the ED stocked with commonly needed antibiotics for sepsis, and refrigerated antibiotics in convenient locations, was essential to reducing antibiotic delivery times. All three made changes to their laboratory processing as well, marking samples for suspected sepsis patients—especially lactate levels—as STAT for immediate laboratory processing.

The Dartmouth HVHC program staff developed an electronic tool for capturing (and submitting) data, which evolved during the course of their program; it itemized each step in the three-hour and six-hour care bundles, with times when each step took place for a patient. This tool was developed to be used in real time at the bedside. Implementing this tool had both challenges and successes:

- Busy ED and ICU staff often did not have time to complete data entry while hurrying to provide time-sensitive care to high-risk patients; instead, they filled it out retrospectively, usually at the end of their shift (sometimes at the end of a week). At some participating hospitals, clinicians tried to collect data on paper forms in real time and then transfer these data to the electronic tool. At other sites data (e.g.,

time stamps) were retrieved from the EMR for one patient at a time, and used to complete data entry in the electronic tool. Everyone involved in collecting, entering, and verifying data agreed that this was a laborious process, and that the tool was not used in real time to track adherence to the care bundle timelines.

- The tool was also available in paper form and nurses in all three hospitals we visited agreed that the paper form was useful for communicating the urgency of starting patients on the sepsis care pathway. Nurses used the paper checklist to educate and improve communication with attending physicians, and encourage adherence to the care bundles. We also observed nurses using the paper form to improve handoffs of patients between the ED and ICU, to prevent any confusion about fluid and antibiotic administration.

Workforce

Other than dedicated labor for collecting and reporting data to Dartmouth HVHC program staff, participating hospitals we visited hired no new staff, and none were dedicated solely to the sepsis program.

All three hospitals described additional workforce development activities including: e-learning modules for ED and ICU staff, annual sepsis competency days for nurses in the EDs and ICUs, mandatory staff meetings where sepsis process measures and results were regularly discussed, and spread of e-learning modules beyond the ED and ICU to other hospital units that may transfer septic patients to the ICU.

Some participating hospitals received transfer patients from small outlying hospitals. The transferring hospitals often did not begin elements of the three-hour and six-hour care bundles, reducing the ability of the receiving hospital to impact the trajectory of care (or patient mortality). Outreach to emergency medical service providers and outlying hospitals was initiated in rural states in particular, to encourage external providers to begin sepsis care (e.g., fluid resuscitation) before transferring patients. For example, a sepsis training module was designed by a participating physician and included in EMS training in his state.

Sustainability and Spread

In the three hospitals we visited, aggressive sepsis detection and treatment have become the "new normal." Sepsis protocol training is incorporated as part of on-boarding for all staff working in the ED. The EMR supports the care bundle protocol, and all ED and ICU staff now have a heightened awareness of emerging sepsis. Staff described this as a culture change. Additional funding is not required to sustain these changes.

Expansion of the sepsis care bundles to other hospital units, beyond the ED and ICU, was planned in the three hospitals we visited, but had not yet been implemented by the end of the HCIA funding period. The goal will be to detect sepsis in patients who are admitted to the hospital for other problems, using rapid response teams in other hospital units, and starting the care bundles as rapidly as possible, wherever a patient is in the hospital.

2.2.3 Summary of Quantitative Findings

Note that patient survey findings are not reported for the Dartmouth HVHC program because no survey was administered. The HVHC members spanned 19 health systems; drawing a few patients from each and a few from relevant comparison hospitals in each state would not have illuminated differences in patient experiences attributable to this program. In addition, other hospitals nationwide, including at least some

of our comparison hospitals, are also implementing the Surviving Sepsis campaign. Thus we were not convinced that a "clean" comparison group could be created.

Core Measures

The four core measures that CMS specified for the HCIA evaluations included three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total Medicare episode spending). The admission measure was not relevant for the Dartmouth HVHC program, because patients had already been admitted (or were in the ED awaiting admission) when they received the sepsis care bundle intervention. Dartmouth HVHC did not receive a NCE and we present here estimated changes in utilization and Medicare spending updated through June 30, 2015, the entire intervention period, specified as follows:

- Total Medicare spending for 60 days including the index admission and all Medicare spending for 60 days after discharge. Index admission was defined as an admission for a sepsis patient, in either an intervention or comparison hospital.
- Thirty-day (all cause) readmissions to an ACH following an index admission.
- Thirty-day post-discharge (all cause) visits to a hospital ED following an index admission.

The Dartmouth HVHC program also aimed to avoid complications through faster treatment and adherence to best practice sepsis treatment guidelines. We therefore present results for the following additional measures:

- LOS
- Discharge destination

Please see Technical Appendix B for a description of how each outcome measure was specified, our methods for the DD regression analyses, and how we selected a comparison group. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending.

All regression models included controls for: patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred.[12] The regression model also included an indicator for individuals with missing HCC scores.

[12] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

The analyses in this report are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report is based on final action claims that reflected processing as of six months for Medicare spending—any adjustments processed more than six months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

Implementation of the sepsis program did not take place on the same day in all participating hospitals. The red vertical line in the graphs below indicates the start of the intervention period in the first hospital, and the black vertical lines indicate the timing of implementation for subsequent groups of hospitals. Estimated changes in the Medicare spending measure were based on 10 quarters of post-implementation data.

Summary of Core Measures

Exhibit 2.2A summarizes the effect of the Dartmouth HVHC intervention on average total 60-day Medicare spending, 30-day inpatient readmissions, and 30-day ED visits per episode, pooled across all quarters. [13,14] It also presents the aggregate effect on spending across all episodes that occurred during the intervention period. There were no large or statistically significant changes in the three core measures attributable to the intervention, and the aggregate change in spending attributable to the program was insignificant as well.

Exhibit 2.2A: Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-3.10	(-10.61, 4.41)
Per episode: (N = 17,348)		
Total 60-day spending	-178.83	(-611.69, 254.04)
Thirty-day inpatient readmissions	0.01	(-0.92, 0.93)
Thirty-day ED visits	-0.83	(-1.82, 0.15)

The estimated change in outcomes spans the entire intervention period from 2013Q1 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.2B shows quarterly trends in total 60-day episode Medicare spending, which included the inpatient stay and all claims in the following 60 days. There were no consistent trends indicating changes in episode spending, and none of the quarterly estimates were statistically significant. Exhibit 2.2C shows the estimated change in median Medicare spending pooled over the full program, indicating the program had no effect on spending for the median patient relative to the comparison group.

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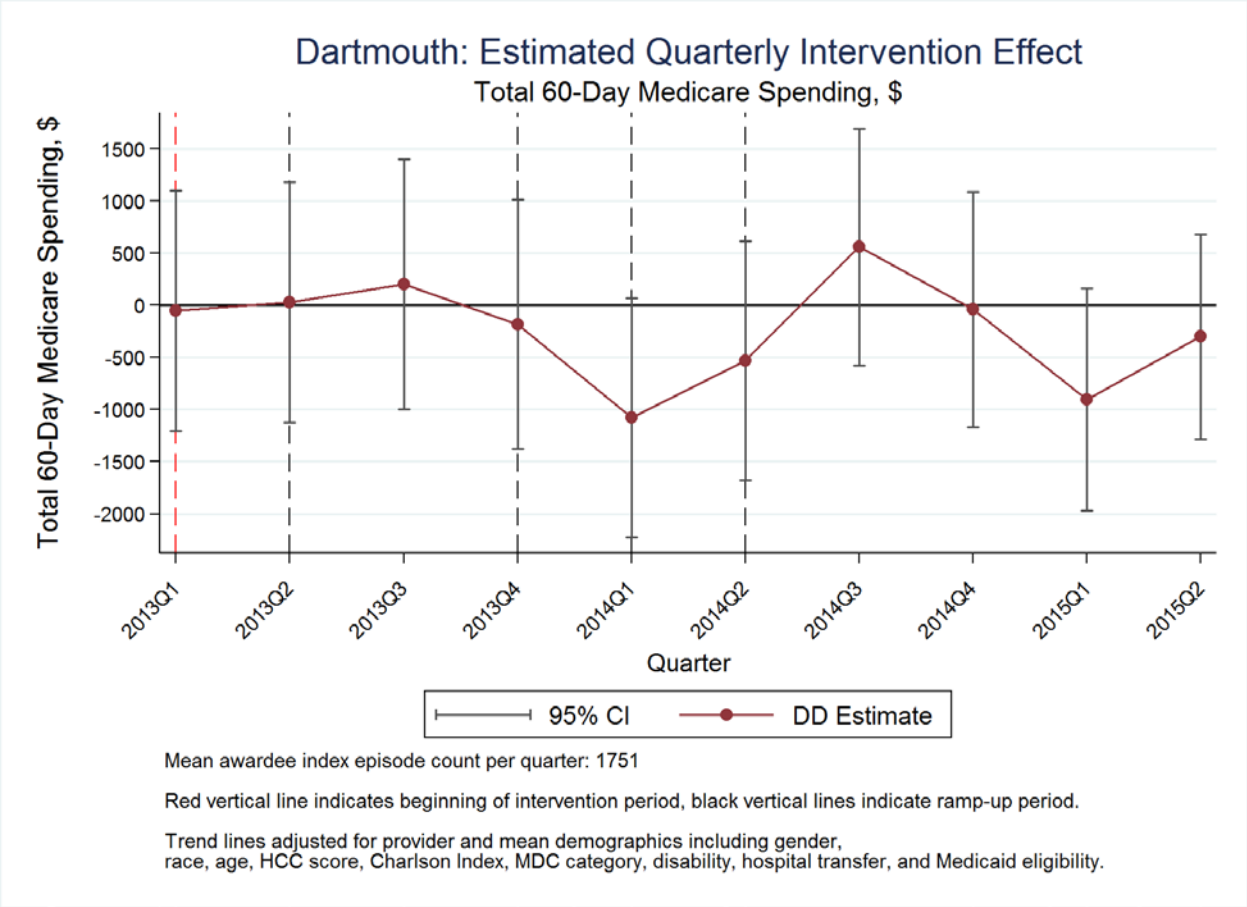
[13] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[14] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

Exhibit 2.2B: Medicare Episode Spending



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.2C: DD Estimated Effect of Intervention on Median Total 60-day Medicare Costs

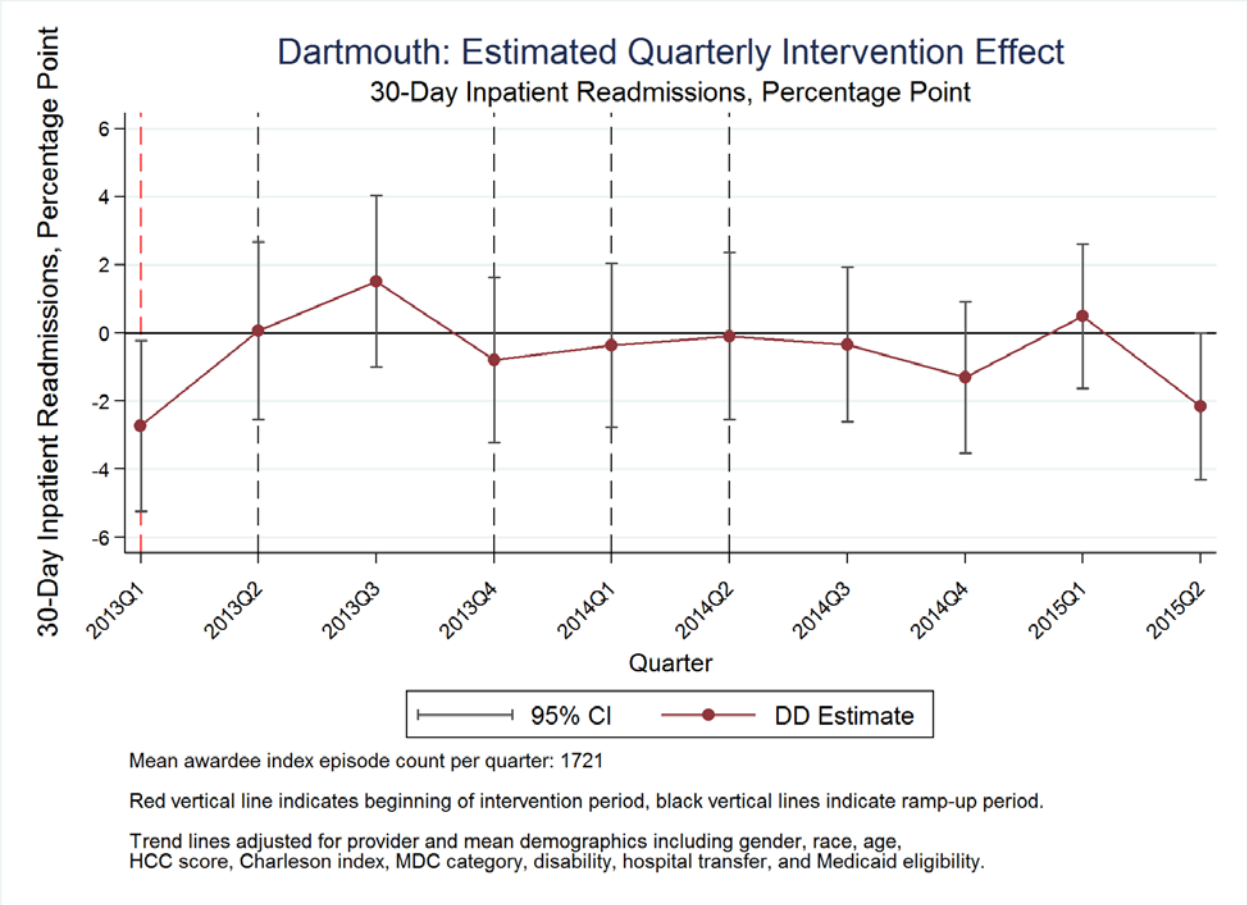
Dartmouth		
Intervention effect ($)	Estimate	27.83
(Median regression)	Standard error	(211.71)
	Sample size	[125,697]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

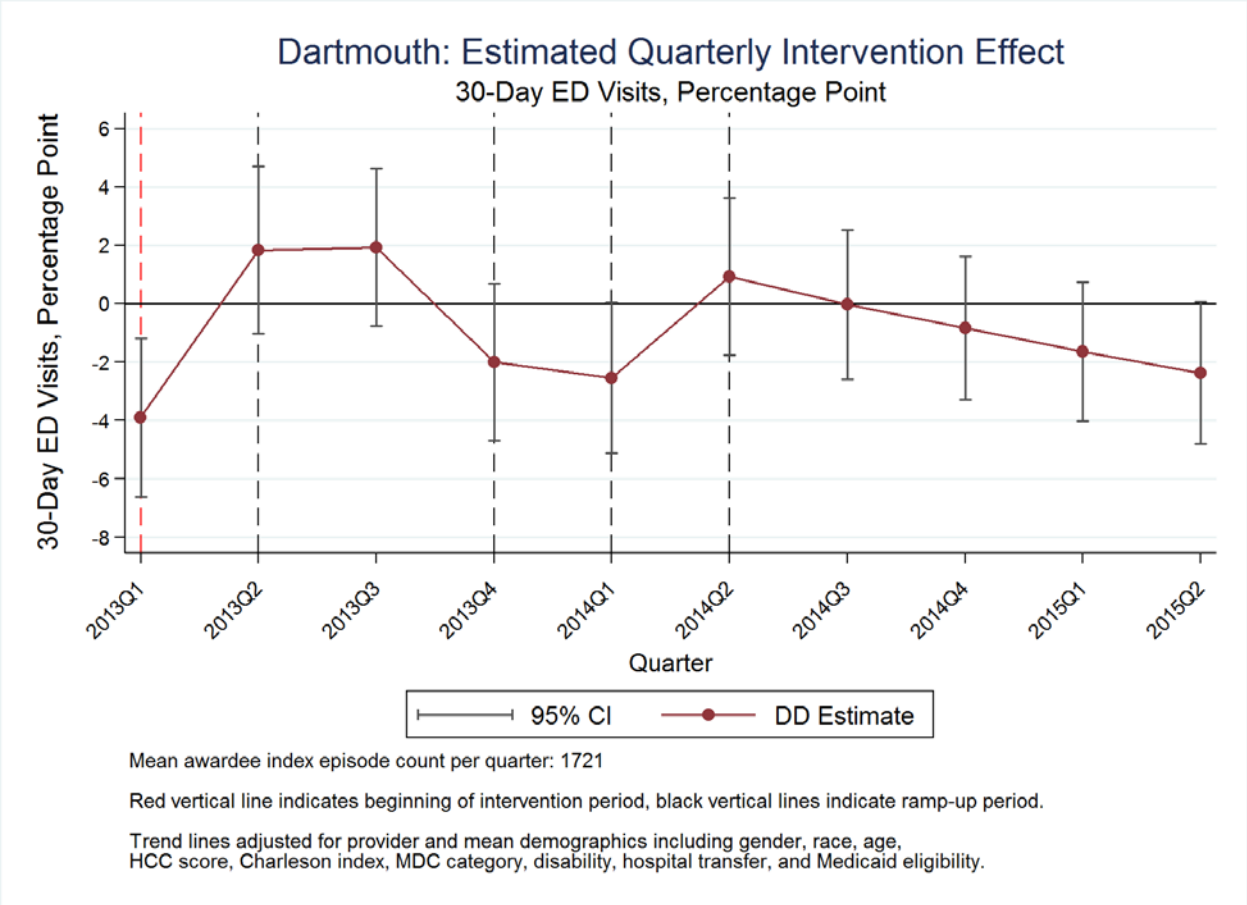
The Dartmouth Institute HVHC improvement program aimed to reduce Medicare spending by reducing complications, readmissions, return ED visits, and the need for PAC. Exhibit 2.2D (hospital discharges followed within 30 days by a readmission) shows no association between the intervention and inpatient readmissions. Exhibit 2.2E (discharges followed within 30 days by an ED visit) shows some evidence that the rate of ED visits may have been declining relative to the comparison group, particularly in the final year of the program. However none of the quarterly estimates were statistically significant.

Exhibit 2.2D: Readmissions



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.2E: 30-Day Post-discharge ED Visits

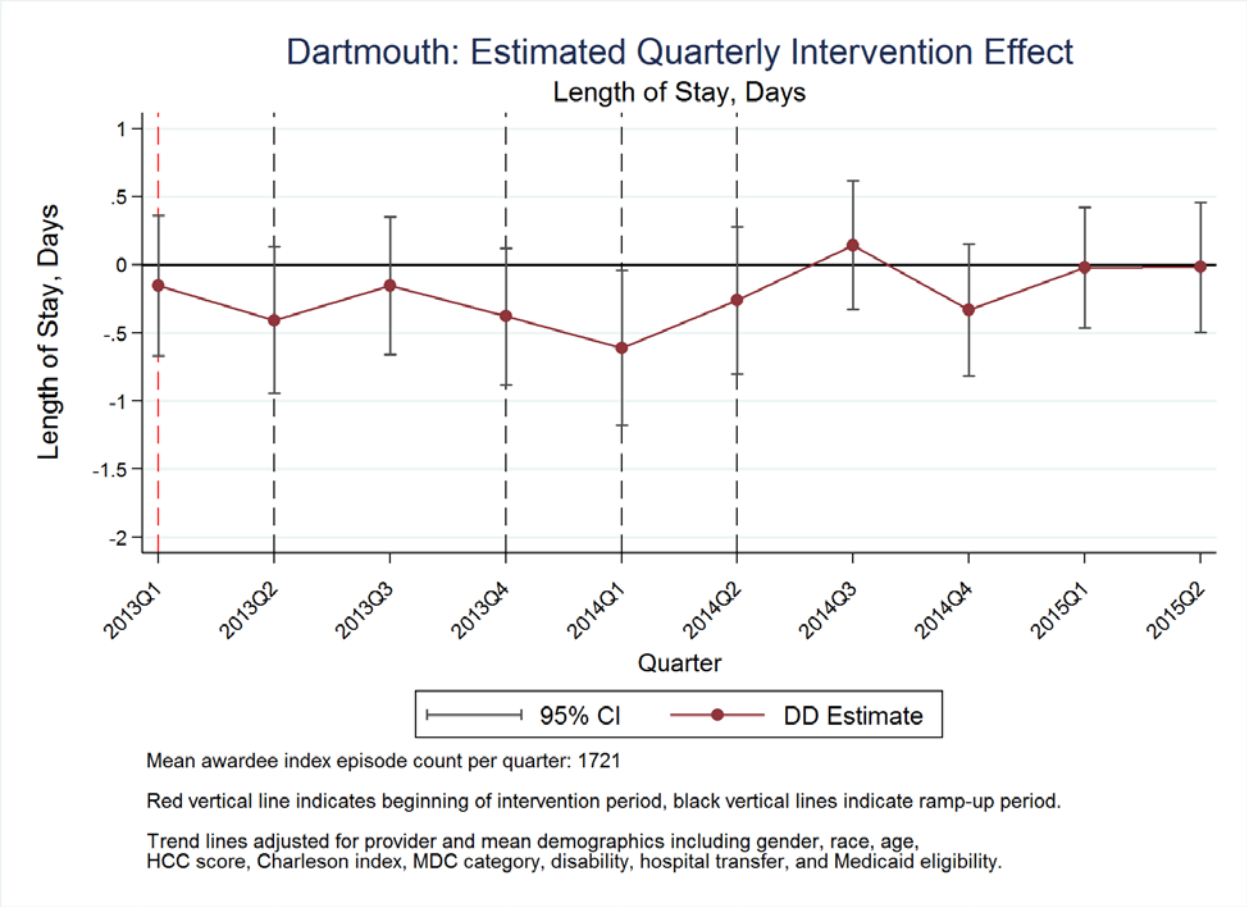


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS

Important goals of the Dartmouth HVHC program included early recognition of sepsis and improved adherence to evidence-based best practices, which in turn were expected to reduce LOS. Exhibit 2.2F shows that LOS was slightly lower for patients in Awardee facilities relative to those in comparison facilities; however, only one quarterly estimate was statistically significant, and overall, the pooled estimate (Exhibit 2.2G) of the relationship between the intervention and LOS was statistically insignificant.

Exhibit 2.2F: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.2G: DD Estimated Effect of Intervention on Inpatient LOS

Dartmouth		
Intervention effect	Estimate	-0.10
	Standard error	(0.12)
	Sample size	[123,509]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Discharge Destination

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.2H below indicates that since the start of the intervention there was no sustained and statistically significant relationship between the intervention and change in the rate of discharge to any of the four types of post-acute destinations.

Exhibit 2.2H: DD Estimated Change in Episode Discharge Destination

	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	Overall
Home											
DD	0.44	-0.86	1.57	0.70	0.95	0.13	-0.78	0.28	-0.99	1.58	-0.09
SE	1.47	1.40	1.46	1.37	1.37	1.34	1.33	1.26	1.20	1.24	0.62
Home Health											
DD	-0.90	-1.31	-1.59	-1.54	-0.02	-0.66	0.54	-0.84	-0.74	-1.60	-0.54
SE	1.25	1.21	1.21	1.15	1.22	1.17	1.22	1.09	1.06	1.06	0.54
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home											
DD	-0.08	-0.51	-1.13	-1.05	-1.68	-0.23	1.06	0.67	1.19	0.61	0.53
SE	1.55	1.60	1.57	1.52	1.46	1.51	1.50	1.41	1.35	1.39	0.67
Other											
DD	0.55	2.69**	1.14	1.89*	0.75	0.77	-0.82	-0.11	0.54	-0.60	0.10
SE	0.95	1.19	1.03	1.07	0.96	0.99	0.86	0.85	0.89	0.86	0.42

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Conclusions

- There were no statistically significant differences between the intervention and comparison groups in changing rates of 30-day readmissions, 30-day ED visits, inpatient LOS, discharge destination, or total 60-day episode spending.
- Trends suggest that the rate of ED visits within 30 days after discharge may have declined in Dartmouth's HVHC partner hospitals during the program intervention period, relative to the comparison group. Point estimates were consistently negative (and became more strongly negative) in the four quarters after the program was fully implemented in all participating hospitals. However, none of the quarterly estimates were statistically significant.

2.2.4 Synthesis of Findings

A synthesis of findings from all available sources indicates the following:

Although this program was well received by clinicians and appeared to be firmly embedded in the workflows and IT systems of participating EDs and ICUs, this analysis shows no impact of the program on most quantitative metrics (LOS, readmissions, post-discharge ED visits, total Medicare episode spending).

The null findings from this program are likely due to the fact that many hospitals now have sepsis programs under way (modeled, as was this HVHC program, on the Surviving Sepsis Campaign) reflecting the widespread recognition of sepsis as a leading cause of inpatient morbidity and mortality. For example, we asked ED directors in three of our comparison group hospitals about sepsis control and learned that they have also adopted the three-hour and six-hour care bundles. In addition, some of the Dartmouth HVHC participants had sepsis control programs prior to HCIA award, as was likely also true of some comparison hospitals (we did not systematically investigate the current or prior sepsis programs in comparison hospitals). The Dartmouth HVHC sepsis program would have needed to exceed prior

programs, and also exceed those in comparison hospitals, in order to be detected as significant in our DD analyses.

Although no significant changes in the core measures were revealed, implementing the sepsis care bundles as a collaborative, offered opportunities to share insights and improvements throughout the leaning network, such as EMR enhancements. It also brought to light the variation in data collection, abstraction, and measurement.

2.3 Emory University

2.3.1 Introduction

The Emory Rapid Development and Deployment of Non-Physician Providers in Critical Care program aimed to improve patient care and more efficiently use resources to address the critical care physician shortage in the state of Georgia. The program included two components: 1) a critical care residency training program for affiliate providers, and 2) an eICU program to monitor critical care patients 24/7 and provide intensivist physician oversight and support on the night and weekend shifts, when physicians are not consistently present in ICUs. The eICU intervention began in the spring of 2014 in several critical care units in Emory University Hospital, Emory University Hospital Midtown, and St. Joseph's hospital, all in Atlanta. It was expanded to two smaller community hospitals—East Georgia Regional Medical Center and Emory Johns Creek Hospital—in late 2014.

The Emory program staff expected that the addition of critical care trained affiliate providers, continuous monitoring of ICU patients and access to intensivist physicians at night and on weekends via the eICU, would improve quality of care, shorten ICU LOS, and possibly reduce overall hospital LOS. They also expected that patients would be discharged from the hospital in a better state of recovery due to this program and require less intense PAC, potentially reducing Medicare spending. Most importantly, their goal was to bring clinicians with critical care training to ICUs, particularly in those facilities that had no intensivist physicians (or perhaps no physicians at all) working in the ICU at night and on weekends. Eligible patients included all who were cared for in one of the Emory program ICUs.

2.3.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain their program after HCIA funding ended, and barriers and facilitators to replicating the program in other hospitals. These new findings regarding Sustainability are presented below.

Implementation Effectiveness

Affiliate Provider Training Program

- The affiliate provider training program was at capacity almost at inception, attracting many applicants (30 applicants for two openings in 2016); other academic medical centers have requested curriculum materials and guidance to inaugurate their own programs modeled on Emory's.
- The affiliate provider residents rotated through many of the ICUs at Emory; when they graduated from the residency program most were hired as full-time staff for Emory ICUs. They were viewed by intensivist physicians as competent and trustworthy, and they were well acquainted with the Attending ICU physicians and nurses, and familiar with Emory treatment protocols.

- Graduates of the program praised the hands-on skills gained in the program, beyond any they had learned in traditional NP or PA training programs or in non-ICU work settings.

eICU

- Overall, the implementation of the eICU progressed as expected in the Emory-affiliated major medical centers. There were considerable technology challenges: interfacing each hospital's pharmacy, laboratory and EMR into the eICU was challenging, and the effort to bring the smaller outlying hospitals online had the added complexity of incomplete IT systems (e.g., East Georgia Regional Medical Center did not have an EMR in the ICU).
- The eICU staff remotely monitored patients in participating ICUs via telemetry, and alerted clinicians at the bedside when they noticed any potentially problematic changes in patient vital signs that exceeded clinical guidelines. This monitoring was credited with numerous "saves" when problems were brought to the attention of bedside staff that might otherwise have gone undetected, endangering patient safety.
- The timeliness of intensivist-directed care during the night (rather than waiting for ICU physicians to return in the morning) was reported by ICU staff as the most important benefit of the eICU. Rapid attention to patient needs was the most important improvement credited to the eICU by physicians who worked there and by bedside ICU physicians and nurses.

Workforce

- Training NPs and PAs to perform common ICU procedures and lead ICU teams eased the burden on intensivist physicians (especially at night). The affiliate providers required support during shifts when no physicians were present in the ICU (e.g., nights and weekends), which was the main purpose of the eICU. The eICU staff included nurses 24/7 for this monitoring function, and intensivist physicians on night and weekend shifts. The nurses generally worked full-time in the eICU, and most did not also work ICU (bedside) shifts. However, the intensivist physicians worked both eICU and ordinary day shifts, in rotation.
- To staff the eICU, roughly half of the new nursing positions were filled by Emory ICU nurses who had previously been bedside nurses, and half were filled by hiring from outside the system. This created some vacancies in ICUs when bedside nurses transferred to eICU work.
- More importantly, the physicians working in the eICU also had day shift responsibilities (they shared and rotated ICU night and weekend shifts). It was difficult to find intensivist physicians willing to work both day and night shifts, and those that did felt increasing burnout by the third program year. Further expansion of the program will not be possible without additional physicians covering eICU shifts.
- Because community hospitals have so few clinical staff present at night and on weekends, and do not typically have affiliate providers, they required more attention from the eICU to manage lower-acuity issues. eICU physicians found that a great deal of their time at night was spent attending to minor issues at the two community hospitals that could have been handled by an affiliate provider, if one had been present. In addition, procedures and tests that eICU physicians ordered at night were not possible at these less-resourced outlying hospitals (e.g., the laboratory and radiology departments were closed at night), and despite the orders placed by eICU physicians, care was sometimes delayed until morning.

Sustainability and Spread

Emory received an NCE, but HCIA funds were depleted during the summer of 2015. Both components of the Rapid Development and Deployment of Non-Physician Providers in Critical Care program are being subsidized by Emory University Health System, at least for the time being. There are three reasons the health system is supporting these programs:

1) As noted, there are not enough intensivist physicians to meet ICU needs, and Emory recognizes that training NPs and PAs to cover ICUs, particularly on after-hours shifts, is one way to address this shortage. These affiliate providers need support, however, during shifts when no physicians are present in the ICU. One solution is to hire physicians who work only nights/weekends in the eICU and have no day shift responsibilities, but few physicians desire such work schedules. Another solution Emory is testing is whether it is possible to locate an eICU clinical team with the right technology in Australia, where its daytime is Georgia's night. Emory has found staff willing to test this approach for several months, and will be measuring whether care is as safe and effective from afar, and whether personal and physiological stress are reduced for physicians (and their eICU nursing team) no longer working both day and night shifts.

2) The Emory ICUs are at capacity and beyond, and frequently turn away even extremely critical patients (e.g., those on extracorporeal membrane oxygenation) when the ICUs are full. One way to prioritize ICU beds for the most critically ill patients is to support outlying hospitals in caring for patients with lesser needs, reducing patient transfers to Emory.

3) Due to capacity limitations, critical patients often spend extended periods in the ED awaiting an ICU bed, and Emory has therefore introduced eICU carts in the ED. eICU nurses and physicians can monitor such patients remotely, even before they are admitted to the ICU.

Although these reasons for supporting the initiatives are compelling for the health system, mechanisms to cover program costs are also necessary. The affiliate provider training program was able to temporarily offer tuition-free training and salary support during training, using HCIA funds. Going forward, Emory intends to implement a model wherein a hospital that wishes to send one of its affiliate providers for training will pay that individual's salary while the person is in the training program, as well as a tuition fee. If the individual works within the Emory Health System, and will return to an Emory ICU after training (as is true of most trainees), the person's salary and tuition would be covered by Emory. If individuals from other Georgia hospitals apply, Emory will not be able to cover tuition or offer salary support while they are in training. There is still some tension about recouping the investment in affiliate providers whose training is subsidized by Emory, but who decide to leave the Emory health system after training.

Perhaps the most substantial financial challenges for the eICU are the salary cost of eICU nurses and physicians, and the costs of hardware and software maintenance and support. Today, insurers (including Medicare) do not reimburse for eICU consults or technology. Today, insurers (including Medicare) do not reimburse for eICU consults or technology, even though they may be the ones to benefit from the efficiencies realized by these interventions. This imbalance of ongoing salary and technology costs borne by Emory, and benefits accruing to payers, may not be sustainable.

2.3.3 Summary of Quantitative Findings

Core Measures

The four core quantitative measures that CMS specified for the HCIA evaluations are admissions, readmissions, ED visits, and total episode spending. The admission measure is not relevant for the Emory program because patients had already been admitted when they received the intervention. The results presented below are for the following core measures:

- Total Medicare spending for 60 days including the index admission and all Medicare spending for 60 days after discharge.
- Thirty-day (all cause) readmissions to an ACH following an "index" admission. Index admission was defined as an admission to an ICU, in either an intervention or comparison hospital.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

The Emory program also aimed to reduce LOS, and by improving adherence to best practice guidelines reduce the intensity of services required after hospital discharge. We therefore present results for the following additional measures:

- Inpatient LOS
- Discharge destination

Please refer to Technical Appendix B for a description of how each outcome measure is specified and our methods for the conducting DD regression analyses for total Medicare episode spending, 30-day hospital readmissions and ED visits, LOS, and discharge destination. Although Emory received an NCE, its program staff advised that HCIA funds were not used to serve new patients beyond June 30, 2015, and we therefore present estimated changes in utilization (readmissions, ED visits) and spending through June 30, 2015.

Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare cost.[15] All regression models controlled for patient age and squared age, gender, race, HCC score in year of treatment, squared HCC score, eligibility for Medicaid at any time during the observation period, CCI, squared CCI, whether the patient was transferred from anther hospital, whether the patient was transferred to the index hospital from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability,

[15] The only exception is discharge destination, where quarterly estimates are reported in table form due to the multitude of possible outcomes.

MDC for the index stay, provider fixed effects, and indicators for the quarter in which the episode occurred.[16] An indicator was also included for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare fee-for-service claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report used final action claims that reflected processing as of six months for Medicare spending—any adjustments processed more than six months after a claim was submitted were excluded, and partial claims (i.e., those that were mid-processing) were included.[17] We believe this approach is an accurate way to capture Medicare spending.

Summary of Core Measures

Exhibit 2.3A summarizes the effect of the Emory eICU program on average total 60-day Medicare spending, 30-day and 60-day inpatient readmissions, and 30-day ED visits per episode, pooled across all quarters. [18] It also presents the estimated effect of the program on Medicare spending aggregated across all episodes that occurred during the intervention period. The program was associated with a $1,486 reduction in average Medicare spending per 60-day episode relative to the comparison group, yielding an estimated savings of $4.6 million over the course of the intervention ($p<0.01$). This may have been driven, in part, by a 2.14 percentage point reduction in the relative rate of 60-day inpatient readmissions. [19]

Exhibit 2.3A Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-4.60***	(-6.93, -2.26)
Per episode: (N = 3,093)		
Total 60-day spending	-1,486.27***	(-2,240.74, -731.79)
Thirty-day inpatient readmissions	-0.89	(-2.76, 0.99)
Sixty-day inpatient readmissions	-2.14*	(-4.24, -0.04)
Thirty-day ED visits	0.21	(-1.87, 2.30)

[16] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention.)

[17] Due to the different run-out times (three months for utilization measures, six months for episode spending) the analytic sample sizes vary slightly between utilization and spending outcomes.

[18] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[19] As a robustness check we also estimated changes in 60-day ED visits. The direction and magnitude of the effect was similar to the 30-day value, and statistically insignificant.

The estimated change in outcomes spans the entire intervention period from 2014Q2 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Due to the large estimated change in spending, and the relatively few participating hospitals, we were able to estimate hospital-level changes in average Medicare episode spending for the three urban medical centers participating in the program. We find that most of the reductions in Medicare spending were attributable to the Emory University Hospital and Emory University Midtown Hospital, as shown in Exhibit 2.3.B.

Exhibit 2.3B Hospital-Level Changes in Total 60-day Medicare Spending

Outcome	Estimate	90% CI
Aggregated results: Total spending (in millions)		
Emory University Hospital	-1.94***	(-2.95, -0.93)
Emory University Midtown Hospital	-1.98**	(-3.11, -0.84)
St. Joseph's Hospital	-0.02	(-1.36, 1.33)
Per episode: Total 60-day spending		
Emory University Hospital (N = 824)	-2359.28***	(-3578.47, -1140.09)
Emory University Midtown Hospital (N = 1,093)	-1811.21**	(-2845.54, -776.88)
St. Joseph's Hospital (N = 1,176)	-15.74	(-1156.76, 1125.28)

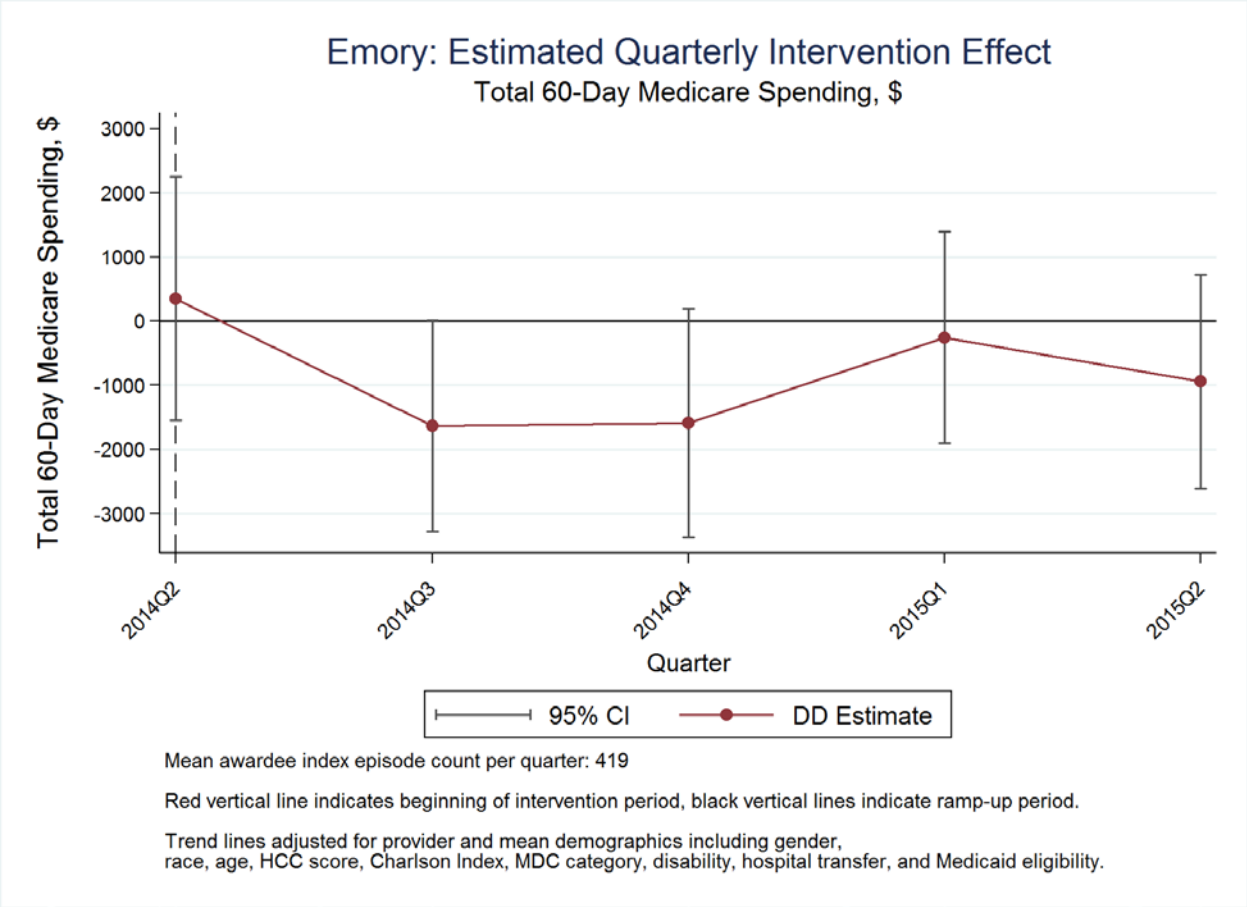
The estimated change in outcomes spans the entire intervention period from 2014Q2 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.3C shows the estimated quarterly change in spending per episode pooled across all hospitals. We estimated four consecutive quarters of decreased episode spending relative to the comparison group, although only one quarterly estimate was statistically significant. Exhibit 2.3D shows the estimated change in median Medicare spending pooled across all quarters. The estimate is small and insignificant, suggesting that most of the savings were realized among more serious (and therefore more expensive) ICU patients in the sample.

Exhibit 2.3C: Total Medicare Spending per Inpatient



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.3D: DD Estimated Effect of Intervention on Median Total 60-Day Medicare Costs

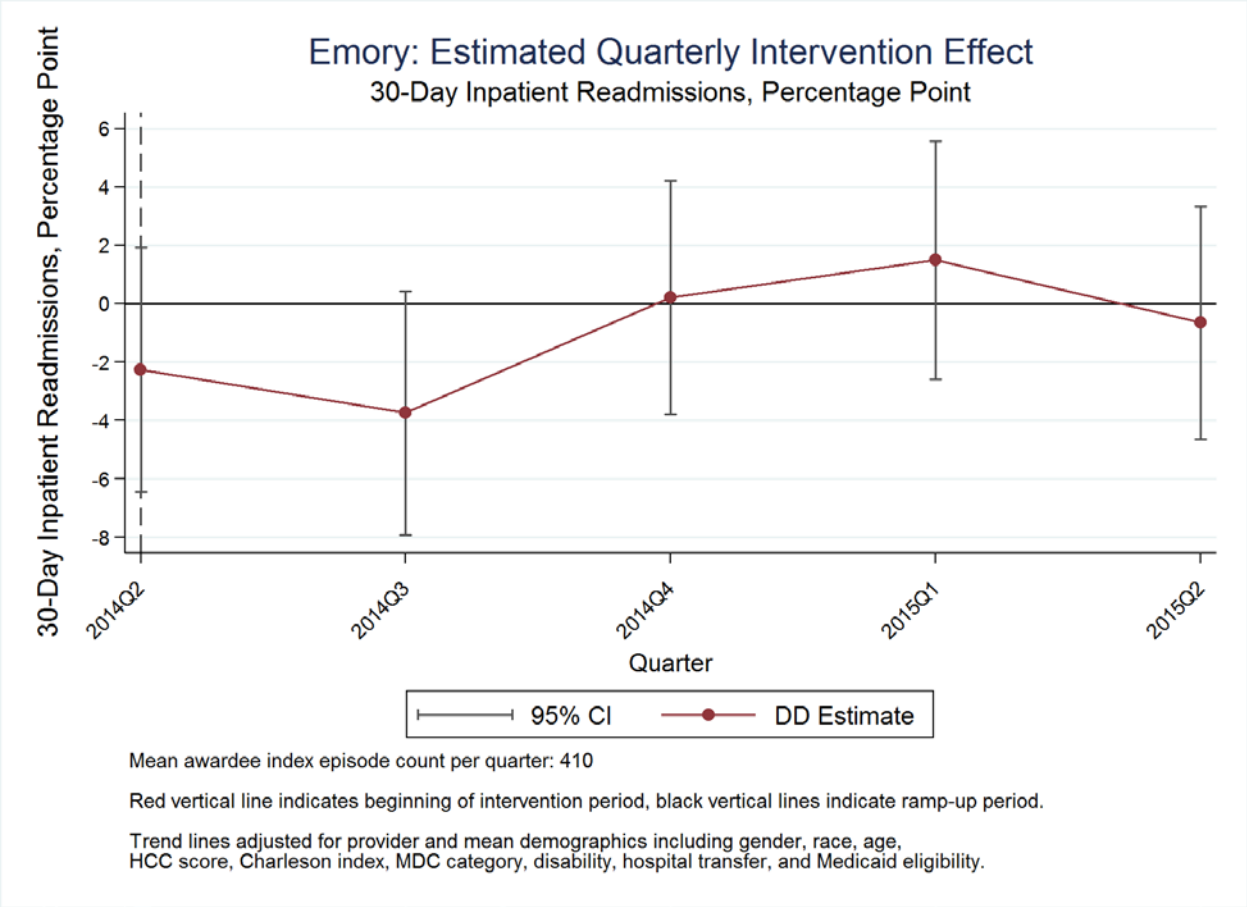
Emory University Hospital		
Intervention effect ($)	Estimate	-119.90
(Median regression)	Standard error	(201.51)
	Sample Size	[30,360]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.3E shows quarterly estimated changes in hospital discharges followed within 30 days by a readmission, and we found no consistent relationship between the intervention and changes in readmission rates.

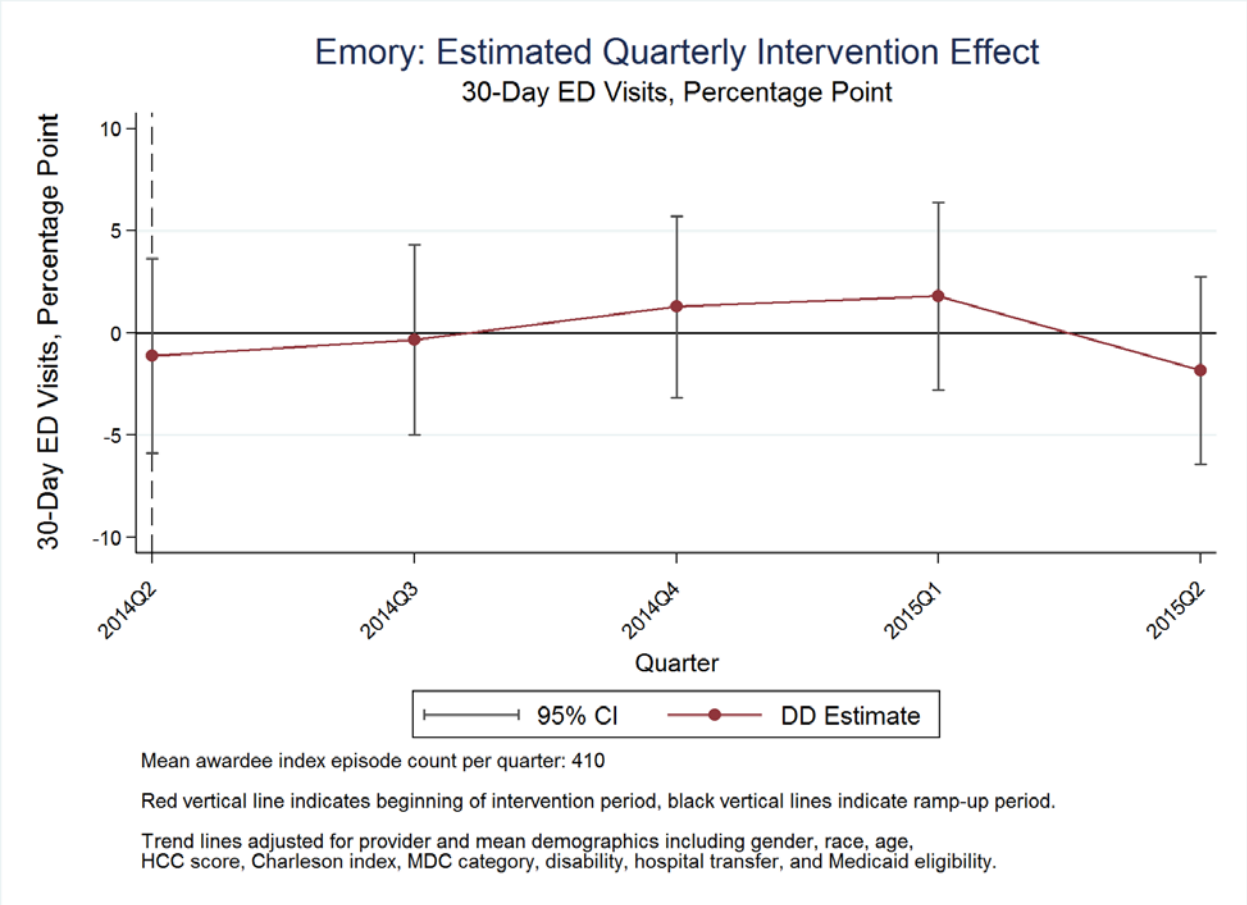
Exhibit 2.3E: Readmissions



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.3F shows discharges followed within 30 days by an ED visit. No quarterly estimate was statistically significant.

Exhibit 2.3F: Thirty-Day Post-Discharge ED Visits

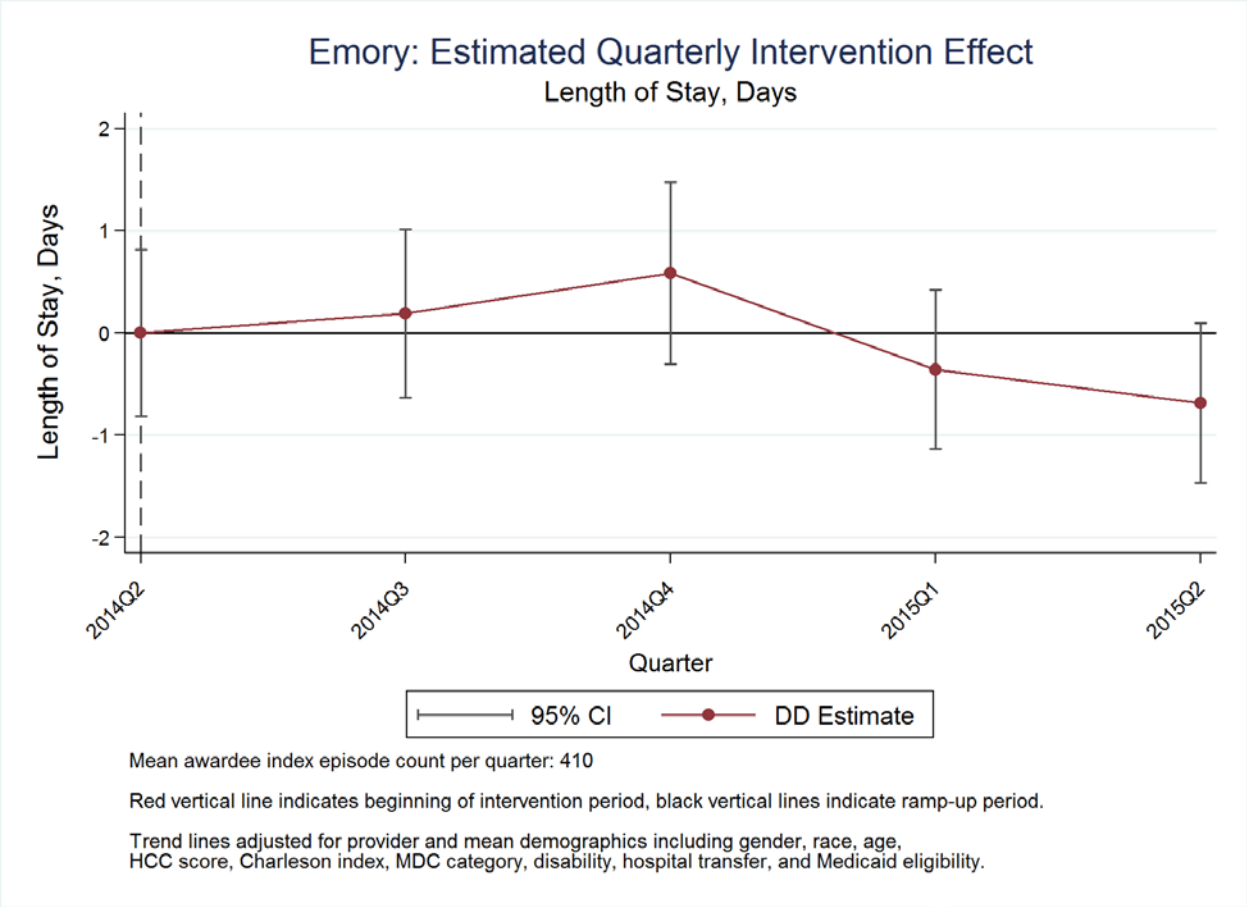


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS

Important goals of the Emory program were to improve the timeliness of care delivery in the ICU, and reduce complications, which together should contribute to shorter LOS for the index admission (ICU LOS cannot be measured using claims data). Exhibit 2.3G shows no consistent correlation between the intervention and change in LOS relative to the comparison group during the first quarters of the intervention, but later quarters suggest a decrease in LOS. This improvement over time is obscured in the pooled estimate in Exhibit 2.3H, which was essentially zero and statistically insignificant.

Exhibit 2.3G: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.3H: DD Estimated Effect of Intervention on Mean Inpatient LOS

Emory University Hospital		
Intervention effect	Estimate	-0.08
	Standard error	(0.22)
	Sample size	[29,666]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Discharge Destination

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.3I presents the DD estimates for discharge destination. We found that discharges to LTPAC facilities (SNF, inpatient rehabilitation facility (IRF), LTCH) decreased by roughly 6.9 percentage points (p<0.01) among patients discharged from intervention hospitals as compared with those discharged from comparison hospitals, while discharges to home health care increased by roughly 4.5 percentage points (p<0.01). There was also a 1.7 percentage point increase in discharges to other care settings (p<0.1).

Exhibit 2.3I: DD Estimated Change in Episode Discharge Destination

	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	Overall
Home						
DD	-3.74	-0.55	-2.01	-2.15	6.25**	0.19
SE	2.60	2.48	2.47	2.39	2.55	1.31
Home Health						
DD	7.97***	4.93**	4.48*	7.01***	0.96	4.85***
SE	2.63	2.47	2.44	2.41	2.29	1.25
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home						
DD	-5.11***	-5.69***	-0.09	-4.49***	-17.18***	-6.90***
SE	1.75	1.76	2.02	1.73	0.93	0.94
Other						
DD	0.88	1.31	-2.39**	-0.37	9.97***	1.86**
SE	1.62	1.75	1.21	1.51	2.12	0.87

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Conclusions

- Emory University's combined training and eICU program was associated with a decrease of roughly $1,486 in average Medicare spending per episode (p<0.01) relative to the comparison group. Most of these savings were attributable to the Emory University flagship hospital and the Emory Midtown hospital, which per episode reduced spending by $2359 (p<0.01) and $1811 respectively (p<0.05). There was no reduction in average Medicare spending at St. Joseph's hospital.
- There were no significant differences in the rate of 30-day ED visits or inpatient readmissions. However, the program was associated with a 2.1 percentage point decrease in the rate of 60-day inpatient readmissions (p<0.10) relative to the comparison group. Medicare pays for home health care in 60-day increments, and more of Emory's patients were discharged with home health care, which may have contributed to this reduction in 60-day readmissions.
- The relative rate of discharges to home health care increased by 4.9 percentage points, while discharges to SNF and LTCHs declined by 6.9 percentage points (p<0.01), indicating that Emory was discharging patients with less need for institutional lower PAC. This change in discharge destination might have contributed to the average observed decrease in Medicare episode spending.
- Although the pooled point estimate and quarterly estimates were statistically insignificant, we found some evidence of an emerging trend in inpatient LOS. LOS at Emory hospitals trended downward in the two most recent quarters relative to the comparison hospitals. Although this demonstrated change in LOS does not reduce Medicare spending (because payments are based on diagnosis-related group not LOS), it may signal a positive development for participating hospitals and their patients.

The combined Emory programs might have had the most impact in ways that are difficult to measure, such as avoiding care delays at night, improving adherence to standardized clinical guidelines, reducing physician burn-out, and enriching communication and critical care knowledge of entire care teams. These

improvements may also have contributed to other outcomes, such as reduced LOS in the ICU, even if they cannot be measured directly using data available to evaluators.

Summary of Survey Results

To assess patient satisfaction and quality of care, a sample of beneficiaries who were treated in Emory's participating ICUs was surveyed. A sample of comparison patients cared for in the ICUs of other Atlanta medical centers were also surveyed. Most received the survey within 3-6 months after their hospital discharge and the survey was conducted by mail with phone follow-up with non-respondents. The survey included questions in the following five domains:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

After the removal of decedents, surveys were mailed to 1,448 beneficiaries (intervention and comparison groups combined). Of these, 751 completed at least one survey question, representing an overall response rate of 52 percent (55 percent and 49 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer those questions), we replaced the missing values for age and gender using information from that individual's Medicare administrative data. Exhibit 2.3I presents the demographics of beneficiaries selected for the survey sample, and the actual respondents. For a detailed description of the Emory patient survey methodology and results, please refer to the Emory Patient Survey Report in Appendix C.

Exhibit 2.3I: Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Home										
Under 65	192	26%	178	25%	79	20%	41%	66	19%	37%
65-74	275	38%	266	37%	161	40%	59%	137	39%	52%
75-84	190	26%	192	27%	114	28%	60%	110	32%	57%
85+	76	10%	79	11%	48	12%	63%	36	10%	46%
Race										
White	465	63%	516	72%	299	74%	64%	272	78%	53%
Nonwhite	258	35%	193	27%	99	25%	38%	73	21%	38%
Unknown	10	1%	6	1%	4	1%	40%	4	1%	67%
Gender										
Male	395	54%	382	53%	216	54%	55%	185	53%	48%
Female	338	46%	333	47%	186	46%	55%	164	47%	49%
Total	733	-	715	-	402	-	55%	349	-	49%

Source: Abt Associates HCIA Patient Survey.

Patient Survey Results

There were few statistically significant differences between intervention and comparison survey respondents. The majority in both groups reported that their physical and mental health were good, and most needed little help accomplishing ADL. Intervention respondents reported less limitation in activities such as climbing flights of stairs and bathing or dressing than did comparison respondents. Findings from multivariate logistic regression models similarly indicate that being in the intervention group was associated with having less limitation in bathing or dressing. Intervention respondents were more likely than their comparison peers to be satisfied with the care they received in the hospital. Respondents in both groups seemed uncertain regarding their health outlook for the future. Outcomes for Emory program survey respondents were generally more favorable than for their counterparts in the comparison group.

2.3.4 Synthesis of Findings

A synthesis of findings from all available sources indicates the following:

- The two program components together helped to relieve the shortage of intensivist physicians by improving affiliate provider training and increasing the number of patients that one intensivist could cover using eICU technology.
- The eICU supported affiliate providers, especially on night and weekend shifts. The eICU was less effective when the outlying ICU did not have an affiliate provider present at the bedside to carry out orders (e.g., procedures) placed by eICU physicians, or when other resources (e.g., radiology, laboratory) were not available at the outlying hospital during nights and weekends.

- The programs did not impact 30-day readmission rates, but 60-day readmission rates declined for the intervention group relative to the comparison group.
- The two program components combined decreased Medicare total episode spending and use of post-acute institutional care relative to the comparison group; the use of post-acute home health care increased.
- More patients were discharged with home health care (which typically lasts 60 days) and this may have helped to significantly reduce the 60-day readmission rate, relative to the comparison group.
- We estimated significant reductions in average Medicare spending due to reductions at the Emory University and Emory Midtown locations. Evidence from the median spending regressions suggests that most of the savings for the program as a whole occurred among the more expensive patients.

Despite mainly insignificant intervention effects on patient-reported satisfaction and quality, outcomes for Emory program survey respondents were generally more favorable than for their counterparts in the comparison group. We conclude that the more timely critical care provided by these combined programs improved patient outcomes and reduced costs to Medicare. Inpatient LOS was reduced and patients were discharged in a better state of health, requiring less use of post-acute institutional care. Earlier discharge to home did not result in returns to the hospital or returns to the ED, and did not impact patient satisfaction with care.

2.4 Henry Ford Health System

2.4.1 Introduction

Henry Ford Hospital received an HCIA award to implement a program they called Mobility, the Sixth Vital Sign. The mobility program aimed to reduce the rate of hospital-acquired pressure ulcers, decrease the rate of ventilator-acquired pneumonia, reduce deconditioning during hospitalization, reduce Medicare spending, and increase patient satisfaction. Patients who were at risk for developing pressure ulcers while hospitalized were the main target of the intervention, which was implemented in several units of the Henry Ford Hospital, an 800-bed tertiary care hospital. Although initially implemented on many adult medicine hospital units, the program evolved over time and by late 2014 the focus was exclusively on ICU patients, because ICU patients—many of whom are ventilated—were viewed as having more to gain from mobility assistance.

Nurses assessed each patient's risk of developing pressure ulcers using the Braden Scale for Predicting Pressure Sore Risk®. Nurses then assessed mobility levels for each patient to determine appropriate mobility interventions. The program employed trained patient mobility aides (PMAs) to help patients in mobility interventions, and skin/mobility nurses to provide guidance on appropriate dressings and treatment to reduce skin shear and friction, common causes of pressure ulcers.

2.4.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain the program after HCIA funding ended. These new findings regarding sustainability are presented below.

Implementation Effectiveness

There was widespread agreement among clinicians at Henry Ford Hospital that the mobility program resulted in better care for patients. The program, and especially the presence of PMAs in the ICUs, enhanced patient care in the following ways:

- Facilitated patient movement, which staff had struggled to do previously while attending to competing clinical demands. The presence of PMAs freed nurses and aides to focus on their routine tasks.
- Provided nursing aides with additional support when moving patients, a task that often requires two people.
- Improved patient satisfaction by having more staff, and more staff time, involved in their care.
- Enhanced engagement of patient and caregiver by empowering them to take an active role in the recovery process.
- Created the expectation that patients should be mobile while in the hospital to speed recovery.

The culture of attention to skin care at Henry Ford ICUs changed as a result of the program. Checking patients every morning, conducting Braden assessments, directing PMAs to work with patients who could benefit from enhanced mobility, and enhancing movement even for some ventilated patients, were among the improvements described by ICU teams.

Nurses in the ICUs believed that there were fewer pressure ulcers among patients, as well as other positive health benefits of the mobility program. Several clinicians noted that ICU patients, particularly those on ventilators and those who were bedbound when admitted to the hospital, benefitted most from the mobility program.

Workforce

Program leaders created the PMA job category expressly for this mobility program; this position did not previously exist in the Henry Ford Health System, and new staff were hired for these positions. Most of the PMAs hired for the program had worked previously as certified nursing assistants (CNAs) in other hospitals or nursing homes. Regardless of previous training, they were required to participate in an abbreviated CNA training along with the PMA training.

The mobility program focused initially on one ICU and several adult medicine units in the hospital, but was discontinued on the adult medicine units. Two other ICUs and a step-down unit implemented the program in the second and third years of the HCIA-funded period. The number of PMAs fluctuated during the course of the Award due to unexpected departures and subsequent hires to meet the needs of an expanding program.

Rehabilitation specialists who had previously worked in the Henry Ford physical therapy department transferred to the mobility program when new positions were funded by the Award. However, most were not content with this assignment because they felt that they were not practicing to the full potential of their certification. They eventually transferred back to the physical therapy department, where they assumed consultative and training roles in the program.

Skin care specialist nurses were hired to fill positions funded by the Award. In early 2014 three skin care specialist nurses worked for the program; a year later the program employed six skin care specialist

nurses. Both the PMAs and skin care specialist nurses worked Monday through Friday, eight hours each day.

Sustainability and Spread

Henry Ford program staff had funds remaining at the end of the initial three-year HCIA period, and received a six-month NCE (through December 31, 2015). Resources were depleted before the end of that period and the program ended in September 2015.

Program leadership submitted plans to the Henry Ford Health System's budget committee to continue the mobility program in a modified form after the end of HCIA funding, but the budget committee rejected the proposal.

While the original mobility initiative was discontinued, mobility-related activities are now part of standard practice in ICUs at the main Henry Ford Hospital and four other affiliated hospitals in the Henry Ford Health System. Anticipating the end of the mobility program, a participating ICU nurse manager created a nurse-driven mobility protocol that has been integrated into the workflows in the EMR used by all five hospitals in the Henry Ford Health System. A similar protocol for nursing aides was also designed and implemented. The mobility protocols initially developed with HCIA funding prompt nurses and aides to execute mobility-related activities as part of routine care—despite the fact that there are no longer dedicated staff (PMAs, skin care nurses) to assist with these mobility activities. By November 2015, the nurses' and aides' protocols were implemented in nearly all adult medicine, surgery, and ICUs in the five hospitals (labor and delivery, pediatrics, and neonatal ICUs were excluded). In addition, a mobility program directed by the physical therapy department was being pilot-tested in one of the medical ICUs at the main hospital. This program, which involved mobility services furnished by physical therapists, began in July 2015 just as the HCIA-funded program was winding down. Mobility training was integrated into the orientation courses for new nurses and aides. All nurses and aides were required to participate in an online education module, as well as a practical training led by physical therapists. By November 2015, nearly 2,200 nurses—approximately 96 percent of those employed by the health system—were trained to enhance patient mobility, and 94 percent of nurses' aides were trained.

2.4.3 Summary of Quantitative Findings

Note that survey findings are not reported for Henry Ford, because we were not able to create a well-matched comparison group in order to administer a survey (as described below).

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). The admission measure is not relevant for the Henry Ford mobility program because patients had already been admitted when they received the intervention. Henry Ford received a six-month NCE through December 31, 2015, although their HCIA funds were exhausted as of September 30, 2015. We present here estimated changes in utilization and Medicare spending updated through September 30, 2015, one quarter beyond the initial three-year period. The results presented below are for the following core measures:

- Total Medicare spending for 60 days including the index admission and all Medicare spending for 60 days after discharge.

- Thirty-day (all cause) readmissions to an ACH following an "index" admission. Index admission was defined as an admission to the Henry Ford Hospital for a patient listed in the Awardee registry.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

The Henry Ford program also aimed to reduce LOS and avoid complications through earlier mobility. We therefore present results for the following additional measure:

- LOS

The analyses reported below are based on data from Medicare claims. Patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. We used claims data for all periods reflecting final action claims processing as of three months after initial submission for utilization outcomes, and as of six months for Medicare spending. Any adjustments processed more than three (six) months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

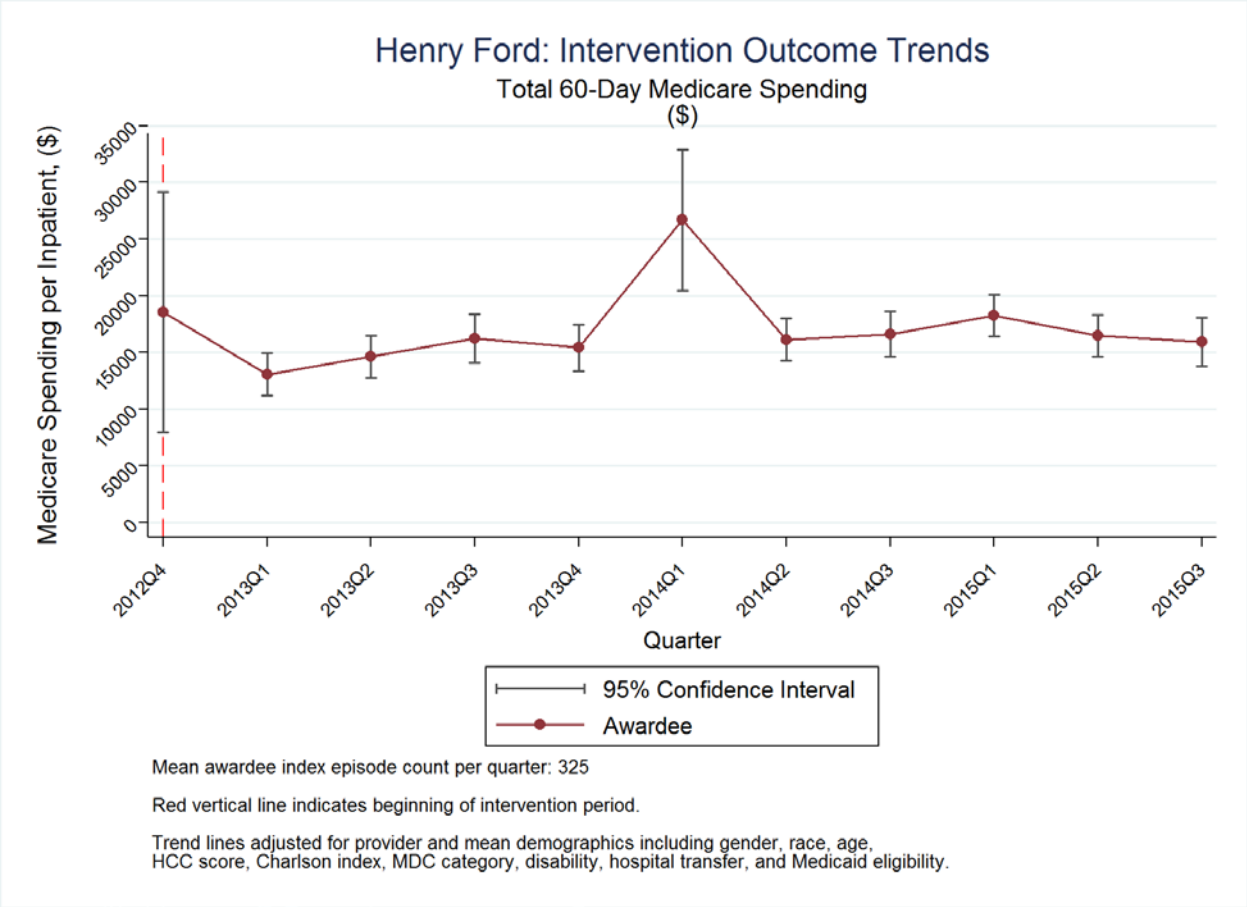
All trend analyses controlled for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during the observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, and MDC. Please see Technical Appendix B for a description of how each outcome measure was specified.

We were unable to create a well-matched comparison group for Henry Ford mobility patients because important selection criteria for patients in the mobility program were not available in claims data (e.g., Braden Score and other clinical factors), and we therefore could not use a DD approach. Results shown are for Henry Ford's intervention patients only. We present risk-adjusted trend lines for patients from the Henry Ford registry for which we could locate Medicare claims; we did not create baseline or comparison groups or conduct tests of statistical significance. In the graphs below, the red dotted vertical line on the far left shows the beginning of the intervention period. The Henry Ford program did not begin on the first day of Q4 2012, so the first quarter of 2013 represents the first full quarter of program implementation. We do not include a core measures summary table for Henry Ford since we are unable to estimate changes in core measures after the start of the intervention. Instead, we present risk-adjusted trend lines for each quarter of the intervention.

Total Cost of Care—Medicare Episode Spending

Exhibit 2.4A (total Medicare 60-day episode spending) includes the inpatient stay and all claims in the following 60 days. Spending was roughly constant in all quarters, except for the first quarter of 2014, when there was a notable increase, but that one quarter appears to be an anomaly.

Exhibit 2.4A: Medicare Episode Spending

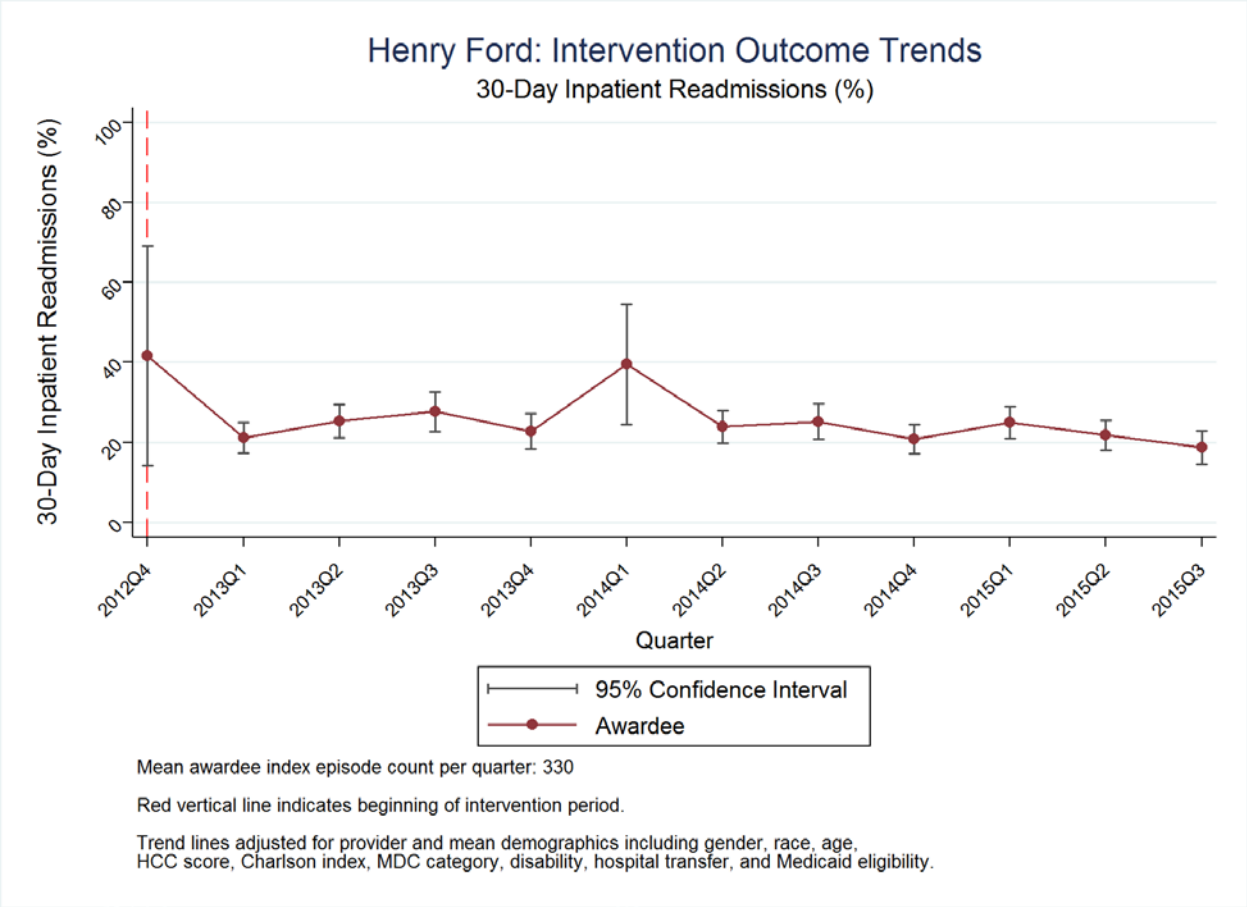


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Readmissions

Exhibit 2.4B (hospital discharges followed within 30 days by a readmission) shows little change in the rate of inpatient readmissions over time. There was a small spike in the readmission rate that may explain the observed spike in episode spending that occurred in Q1 2014 (see Exhibit 2.4A above), but the point estimate was not notably different from any of the other point estimates and was not the beginning of a new trend.

Exhibit 2.4B: Readmissions

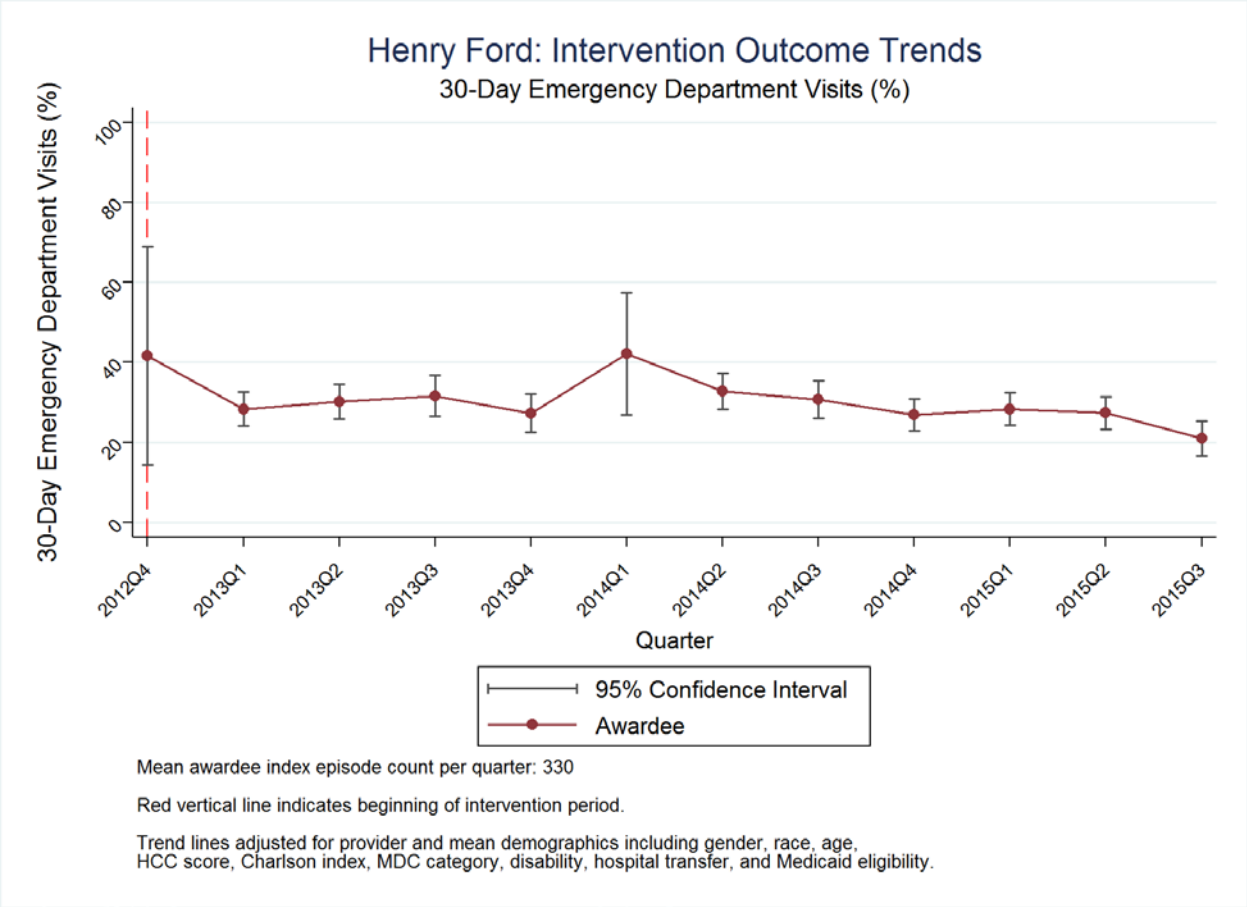


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Thirty-Day Post-Discharge ED Visits

Exhibit 2.4C shows discharges followed within 30 days by an ED visit. After the first incomplete quarter, the rate of ED visits was relatively constant, nearly 30 percent, except for a spike in Q1 2014. We note that this apparent spike was likely due to the very small number of episodes in this quarter (38) compared with all the other quarters (350-450), and conclude that this is a data issue and not a true change in outcomes. Overall, there was little evidence of change in the rate of return ED visits over time.

Exhibit 2.4C: 30-Day Post-Discharge ED Visits

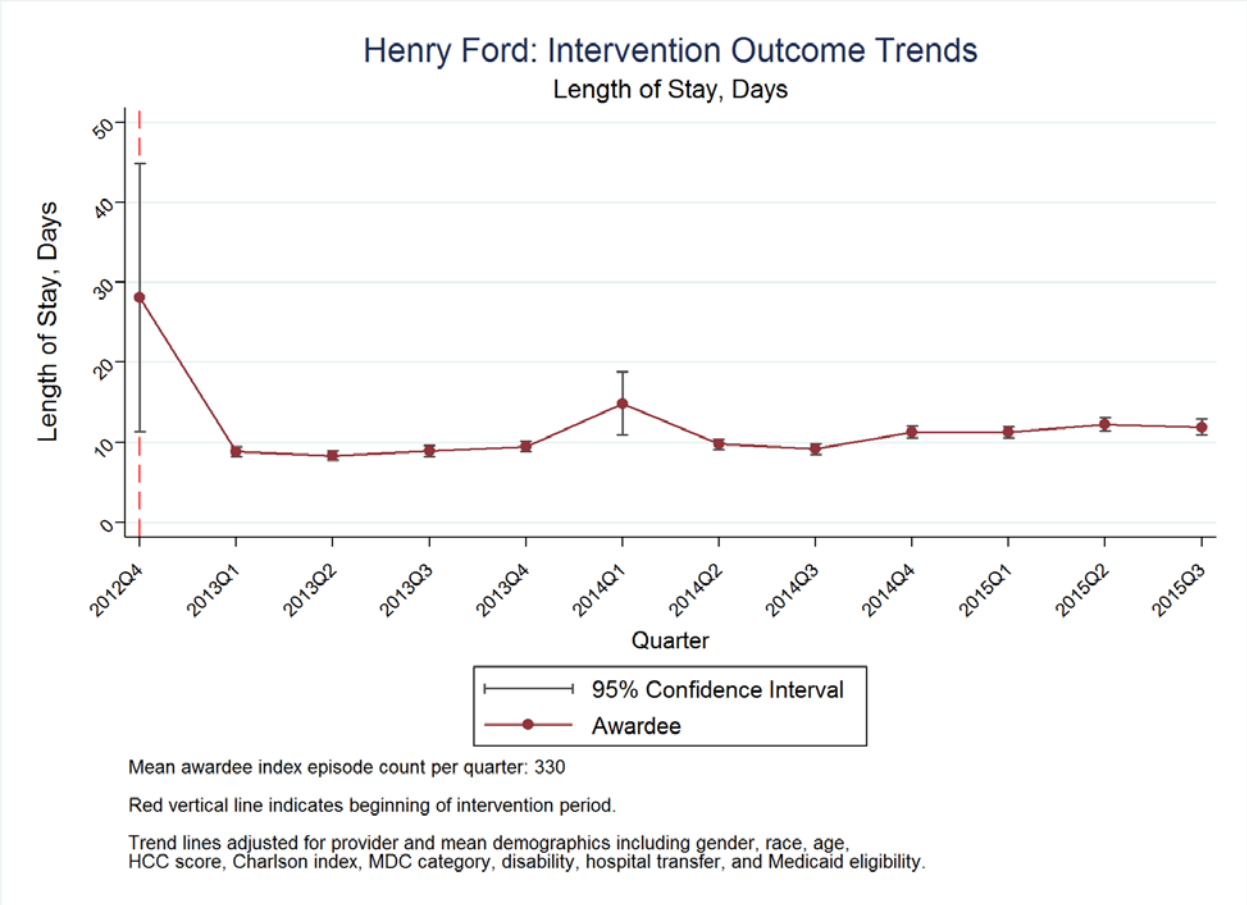


Source: Abt Associates analysis of Registry and Medicare Claims, completed in July 2016.

Index Admission LOS

Important goals of the Henry Ford program were to improve mobility and reduce respiratory and other complications, which together should contribute to shorter LOS during the index admission. After the first incomplete quarter, Exhibit 2.4D shows little change in LOS, except for repeating the pattern of a spike in Q1 2014 that we saw in other measures.

Exhibit 2.4D: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Conclusions

- We see no evidence that the intervention was associated with changes in the rate of inpatient readmissions or ED visits, inpatient LOS, or total Medicare episode spending. However, we caution that without a comparison or baseline group we are unable to determine whether the program was changing patient outcomes.

2.4.4 Synthesis of Findings

A synthesis of findings from all available sources indicates the following:

- Total 60-day Medicare spending, 30-day hospital readmissions, and 30-day ED visits did not change appreciably over the course of the intervention.
- The numbers of ventilator-associated pneumonias and hospital-acquired pressure ulcers among ICU patients were too small to reliably measure trends.
- We identified several resource and staffing-related issues that may have reduced the impact of this program. The intervention was implemented five days per week, eight hours per day; this degree of assistance might not have been sufficient to markedly improve patient outcomes. In addition, the program experienced many staffing challenges, which might have diminished its effectiveness. Finally, retention of patient mobility assistants proved challenging, particularly near the end of the

Award period as program PMAs sought permanent positions that would continue after the Award ended.

- This innovation was not sustained as designed because dedicated staff positions could not be supported with internal resources. However, mobility training and protocols were added to the routine tasks of inpatient nurses and aides throughout the Henry Ford Health System.

2.5 Mayo Clinic

2.5.1 Introduction

The Mayo Clinic received an HCIA to further develop the Patient Centered Cloud-based Electronic System, Ambient Warning and Response Evaluation (hereafter referred to as "AWARE"). AWARE is an electronic interface used in ICUs that displays dynamic, real-time data for all patients in the unit. The layout and presentation of data in AWARE were designed to improve clinicians' ability to prioritize and respond to patients' needs within the unit. AWARE was mapped to myriad other hospital information systems (e.g., laboratory results, vital signs, orders, EMR), and the information assembled for each patient was organized by organ system, with the highest-priority information most prominently displayed. The goals of the AWARE program were to reduce physician cognitive overload and resulting errors, improve communication between nurses at shift hand-offs, and improve patient health outcomes. AWARE was developed with input from ICU physicians and nurses, and applications and interfaces were designed to meet many of their needs. A prototype of this technology was developed and pilot-tested prior to the Award and improved and deployed with HCIA funding.

The program was first implemented at the Mayo Clinic in Rochester, MN (Mayo Rochester) and then expanded to two other Mayo Clinic-owned hospitals (Mayo sites) and three additional hospitals with which the Mayo Clinic has partnerships (non-Mayo sites). Program staff expected that widespread use of AWARE would lead to shorter LOS, reduced need for PAC, and reduced Medicare spending.

2.5.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain its program after HCIA funding ended and barriers and facilitators for replicating the program in other hospitals. These new findings regarding sustainability are presented below.

Implementation Effectiveness

Overall, AWARE was implemented effectively where sufficient technical and leadership resources were present. Mayo Rochester benefited from having the staff who developed the tool located on site to provide technical assistance and resources. Additionally, AWARE adoption was rapid at Mayo Rochester because the inventors and champions of the program were respected intensivist physicians at that institution and advocated for adoption with their physician colleagues. Adoption of AWARE at two other Mayo sites was also high, with ICU staff at all levels using it consistently. These Mayo sites benefited from implementing a version of AWARE that had been pre-tested at Mayo Rochester. Due to the variability in resources (inadequate funding, incompatible IT systems, competing IT demands), AWARE was not implemented as planned at non-Mayo sites: one non-Mayo site was not successful in implementing AWARE during the HCIA funding period, and implementation was significantly delayed at

two others. Eventually AWARE was rolled out on a very small scale and for a short time at one non-Mayo site and implemented more completely at the other.

Implementation Effectiveness—Mayo Rochester

- At Mayo Rochester, AWARE was generally viewed as effective in saving time and presenting the most important and clinically relevant information. AWARE organized information for clinicians about each patient's most pressing needs. For example, AWARE allowed users to click once to see patient data points over time (e.g., fluid balance over the past seven days), which may have helped with prescribing.
- Respiratory therapists at Mayo Rochester viewed AWARE as effective because it allowed them to easily retrieve information pertinent only to respiratory therapy without having to sift through voluminous information not relevant to their role.
- The AWARE program was inconsistently adopted as part of standard care delivery at Mayo Rochester. Some intensivist physicians used it frequently but a few did not, and it was not widely adopted by nursing staff, who viewed it as a physician's tool that did not improve their work or workflow. There were three primary reasons for the inconsistent adoption and use:
  - There was limited training in how to use AWARE. Resident physicians and PAs received training during orientation, but nurses and attending physicians received no training.
  - The use of AWARE was optional and some clinicians—primarily nurses and older physicians—opted not to change their previous care processes and did not learn a new software program. For example, AWARE requires that nurses abandon hand-written progress notes in favor of tracking them in AWARE's electronic whiteboard, a change that was not viewed as useful by nurses.
  - Flaws in the technology, such as medication lists and orders not up-to-date, inhibited adoption. Clinicians could not always rely on medication data being current and had to verify information using the underlying medication ordering software or the EMR.

Implementation Effectiveness—Other Mayo Sites

- The two partner Mayo sites each implemented the program in one or two ICUs, with multiple users and teams adopting the tool in each unit. This focused implementation supported more rapid and widespread adoption of AWARE.
- These Mayo sites benefited from implementing a version of AWARE that had been pre-tested at Mayo Rochester. As a result, the new version of AWARE had fewer software bugs and contained new features suggested by Mayo Rochester users.

Implementation Effectiveness—Non-Mayo Sites

The program was fully implemented in only one non-Mayo site and implemented on a very small scale in another. One non-Mayo site was not able to implement AWARE at all. The challenges to effective implementation in the three non-Mayo partner sites were significant and persistent. In general, non-Mayo sites had fewer resources to support implementation. These gaps included the absence of a physician champion, as well as fewer dedicated program staff.

- The cloud-based system used by non-Mayo sites created implementation challenges because it required local IT staff rather than Mayo Rochester staff to oversee the mapping of EMR data into the AWARE program. Non-Mayo sites lacked important information about IT specifications in advance

of integration. One site reported that AWARE data were not processed properly at the cloud-based level before being integrated into their servers, data formats were not technically compatible, and this required reworking of the technical specifications.

- Competing demands on IT staff at partner sites meant that AWARE implementation sometimes was not prioritized. For example, when one non-Mayo site should have launched AWARE, it was in the process of implementing a new EMR system, and this consumed its IT staff time and resources, delaying AWARE implementation.
- The physician champion at one partner site left that hospital, and no one volunteered to serve in this role.

Workforce

The AWARE program did not necessitate direct hiring or new staff; all the staff, with the exception of a few members of the IT team, worked at Mayo Rochester prior to HCIA funding. IT staff resources at other Mayo and non-Mayo sites were not as robust.

- When the AWARE project was first implemented at Mayo Rochester, there was a dedicated team of informatics specialists. This team was also responsible for overseeing implementation at partner Mayo sites. By late 2014, the staff had been pared back to one dedicated full-time informatics person at Mayo Rochester, because the initial phase of implementation was complete and due to budget constraints.
- The original IT staffing plan was to have a site manager at each of the non-Mayo sites, but this did not come to fruition. Instead, only a consultant from the vendor that developed the cloud-based version of AWARE provided implementation oversight at non-Mayo sites.

Sustainability and Spread

As of April 2015 when we followed-up, AWARE was in use at Mayo Rochester, the Mayo partner sites, and one non-Mayo site. At Mayo Rochester, AWARE was expanded beyond ICUs to include high-risk units such as those devoted to inpatient oncology. However, sustainability of the AWARE program was uncertain due to the development of competing software products.

- The main challenge in sustaining AWARE at the Mayo sites (Rochester and partner Mayo sites) was the impending transition to the Epic EMR system over the next two to three years. It is likely that Epic will develop a similar clinical product, and because it will be within the EMR, it will likely be more efficient than a separate interface like AWARE. However, if the Epic clinical product is suboptimal, AWARE may be retained as the preferred tool.
- The vendor that helped create the cloud-based version of AWARE has turned it into a commercial product, which will be released to select hospitals in 2016. It may be adopted by Mayo sites and one non-Mayo site, to replace their installed versions of AWARE, depending on the cost of the product and its advantages over Epic's application.

2.5.3 Summary of Quantitative Findings

Core Measures

The four core measures that CMS specified for the HCIA evaluations included three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). The admission measure is not relevant for the Mayo AWARE program, because patients had already been

admitted when they received the intervention. Mayo did not receive an NCE beyond June 30, 2015, and we present here estimated changes in utilization and Medicare spending updated through June 30, 2015, the entire intervention period. The results presented below are for the following core measures:

- Total Medicare spending for 60 days including the index admission and all Medicare spending for 60 days after discharge.
- Thirty-day (all cause) readmissions to an ACH following an index admission. Index admission was defined as an admission for a relevant ICU patient, in either an intervention or comparison hospital.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

The Mayo Clinic program also aimed to reduce LOS and avoid complications. We therefore present results for the following additional measures:

- LOS
- Discharge destination

Please see Technical Appendix B for a description of how each outcome measure is specified, our methods for the DD regression analyses, and how we selected a comparison group. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending.

All regression models included controls for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score,[20] eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred. The regression model also included an indicator for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report is based on final action claims that reflected processing as of three months after initial submission for utilization outcomes, and as of six months for Medicare spending. Any adjustments processed more than three (six) months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

[20] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

AWARE was implemented first at Mayo Rochester, then at approximately the same time in the two Mayo partner sites. Some months later, AWARE was implemented at two non-Mayo hospitals (note that the third non-Mayo site did not implement AWARE during the time period of the HCIA award). Although the five hospitals that implemented AWARE during the HCIA funding period are included in our analyses, we only received a patient registry from Mayo Rochester. Lacking data from the other hospitals, we assumed that all five used the same inclusion/exclusion criteria. Inclusion/exclusion criteria developed from the Mayo Rochester registry were applied to the other four participating hospitals, as well as to comparison hospitals. After specifying selection criteria using Mayo Rochester patient registry data, we applied those criteria consistently for all five hospitals (Mayo and non-Mayo sites, henceforth referred to as Mayo program hospitals or ICUs), and all comparison hospitals, in the analysis.

Implementation of AWARE did not take place on the same day in all participating ICUs. In the graphs below, the red dotted vertical line shows the beginning of the intervention period at Mayo Rochester, and the black dotted vertical lines indicate the dates when each of the other participating hospitals began their program implementation. Estimated changes in the Medicare spending measure were based on nine quarters of post-implementation data, through June 30, 2015, the full implementation period.

Summary of Core Measures

Exhibit 2.5A summarizes the average effect of the Mayo Clinic ICU program on total 60-day spending (including the inpatient stay and all claims in the following 60 days), 30-day inpatient readmissions, and 30-day ED visits per episode.[21, 22] It also presents the estimated effect on Medicare spending aggregated across all episodes that occurred in during the intervention period. Although we estimated modest decreases in all three measures, none of the estimates was statistically significant at the 10 percent level or better. The estimated change in aggregate spending was also statistically insignificant.

Exhibit 2.5A Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-4.26	(-10.15, 1.64)
Per episode: (N = 9,629)		
Total 60-day spending	-441.94	(-1053.84, 169.96)
Thirty-day inpatient readmissions	-1.34	(-2.73, 0.05)
Thirty-day ED visits	-1.16	(-2.66, 0.35)

The estimated change in outcomes spans the entire intervention period from 2013Q2 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

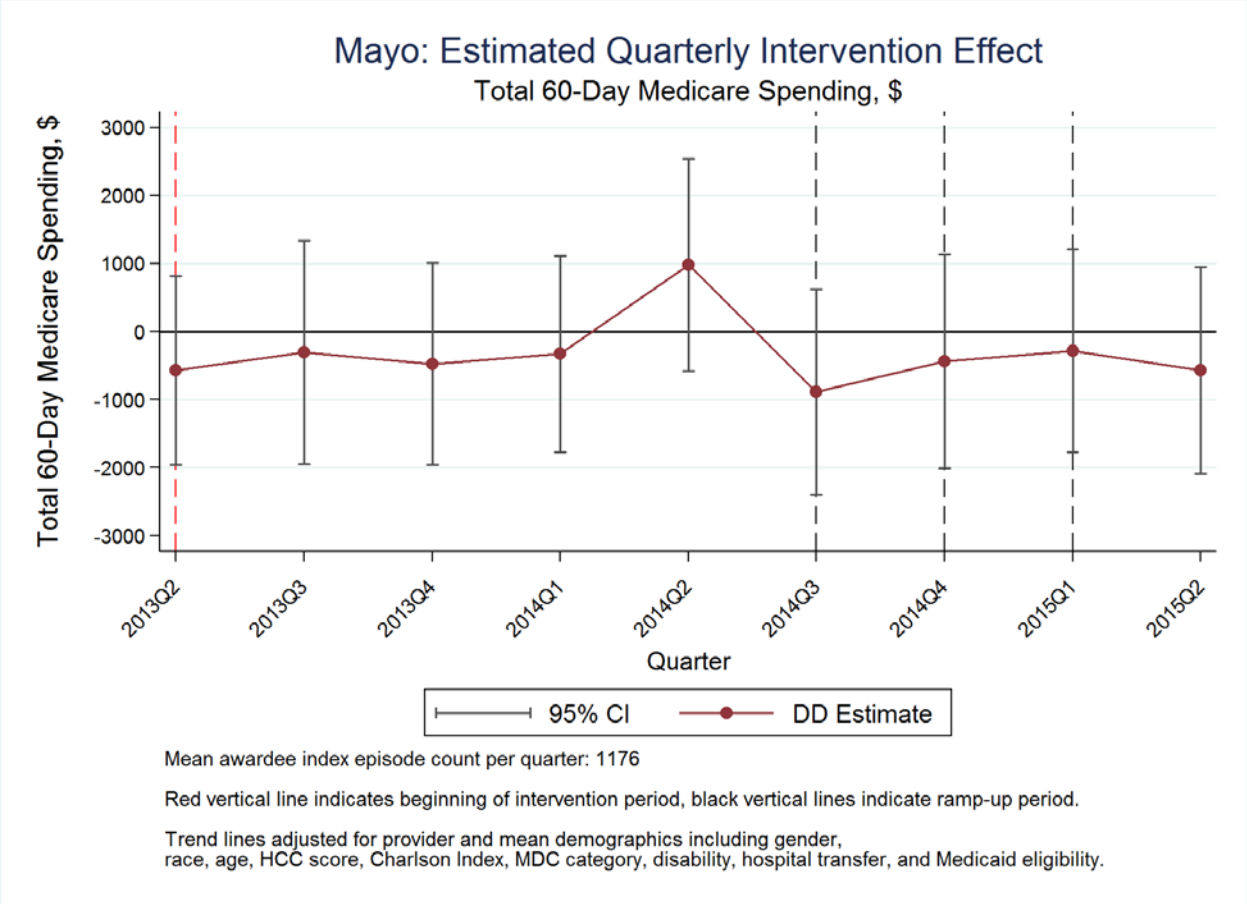
However, Exhibit 2.5B shows that total Medicare spending trended lower in Mayo program hospitals relative to comparison hospitals for all quarters but one since the start of the intervention, though all

[21] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both the intervention and comparison groups.

[22] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

confidence intervals contain 0. The program was also associated with a decrease in median Medicare spending of $1,093 across all quarters (Exhibit 2.5C). Estimated changes in median spending suggest that the program may be more effective at reducing spending among "typical" patients, rather than those with the most or least expensive episodes of care. Combined with the quarterly results and the negative but insignificant pooled estimate in Exhibit 2.5A, this may indicate that the program reduced total Medicare spending, but with a magnitude too small to detect with statistical significance.

Exhibit 2.5B: Medicare Episode Spending



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.5C: DD Estimated Effect of Intervention on Median Total 60-day Medicare Costs

Mayo Clinic		
Intervention effect ($)	Estimate	-1,092.97***
(Median regression)	Standard error	(235.81)
	Sample Size	[75,401]

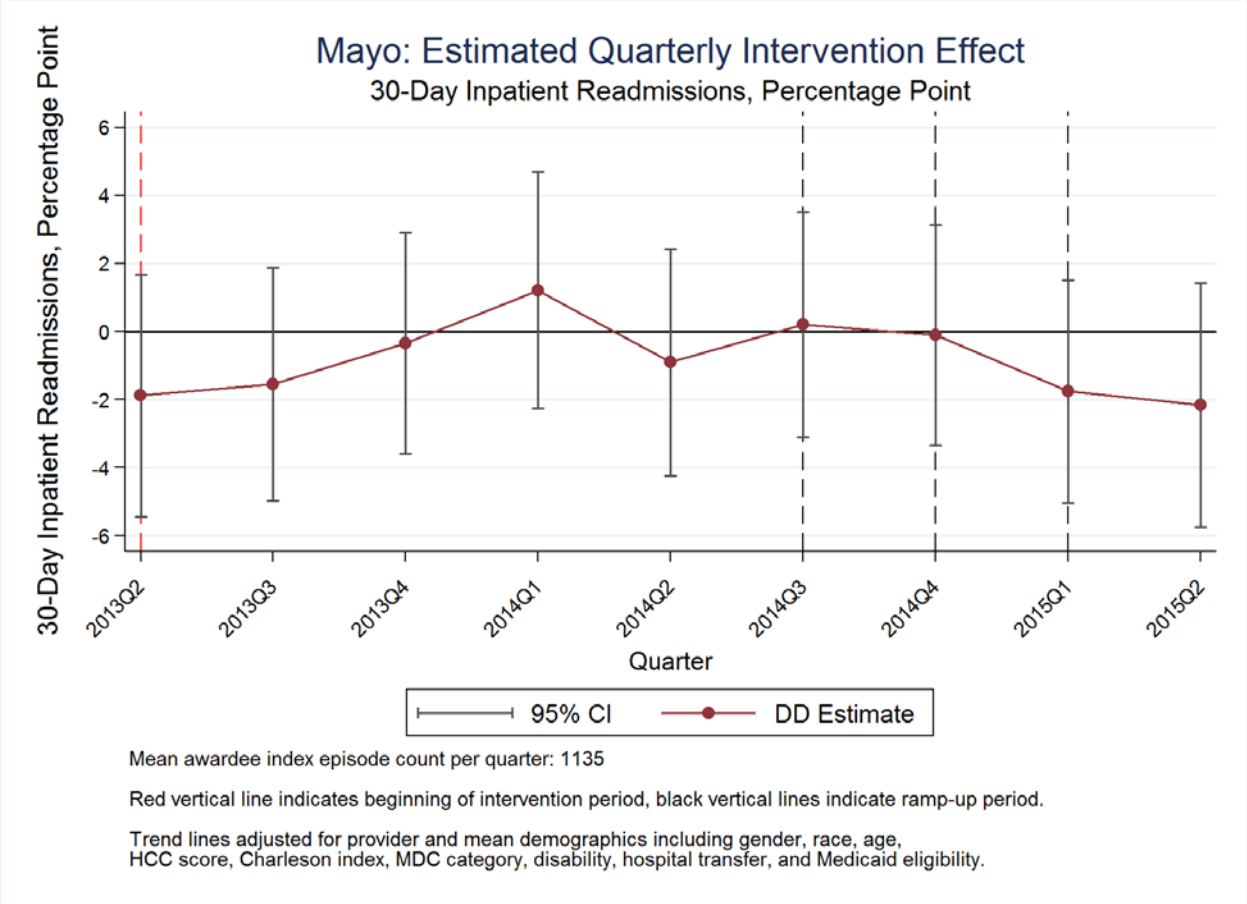
*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.5D below shows hospital discharges followed by a readmission within 30 days. The rate of inpatient readmissions generally declined for patients treated at Mayo program ICUs, relative to the comparison group, although none of the quarterly estimates were statistically significant. Exhibit 2.5E

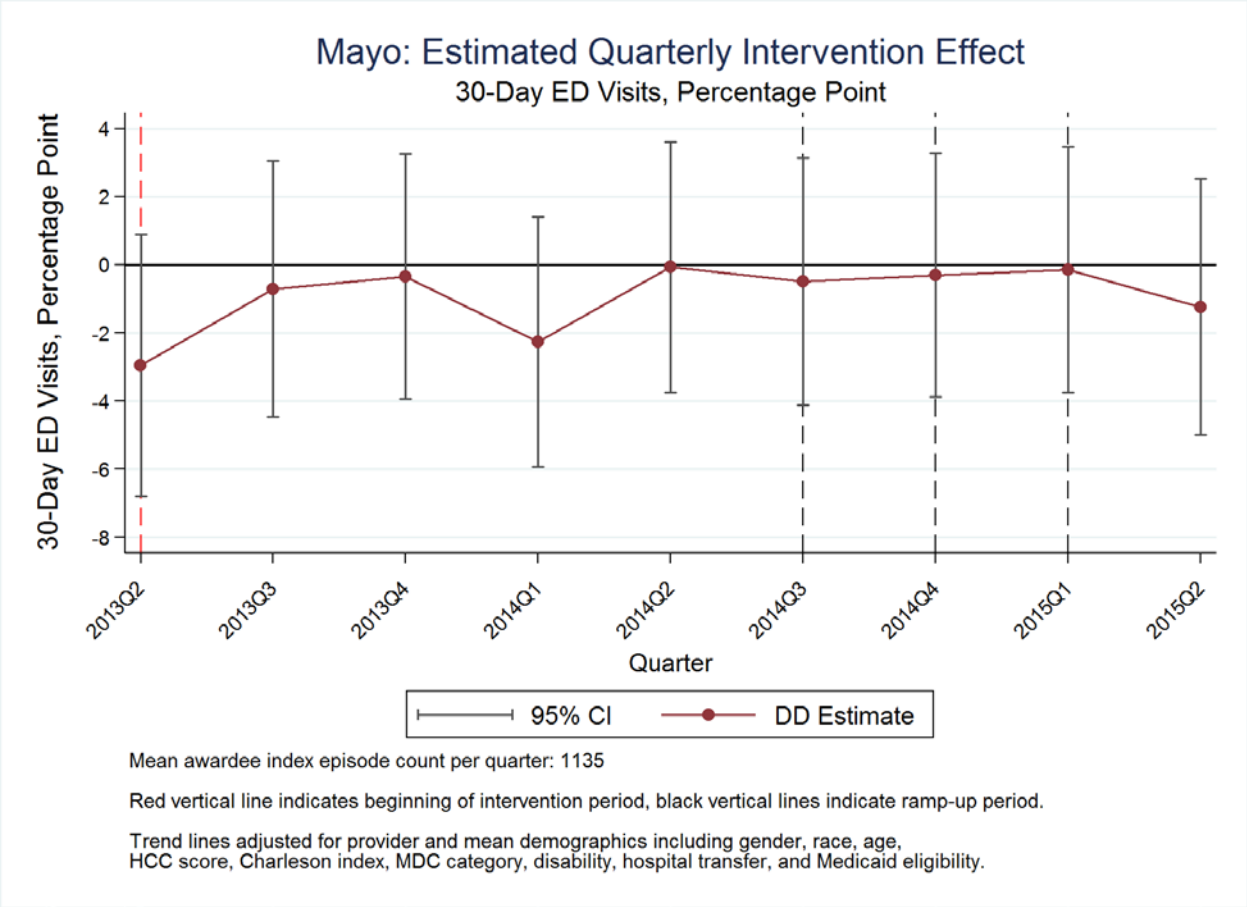
shows discharges followed within 30 days by an ED visit. In general, the rate of ED visits trended downward among patients from Mayo program hospitals, relative to the comparison group, although in no quarter was the change statistically significant. These results are consistent with the negative but insignificant point estimates in Exhibit 2.5A, although we note that most point estimates are close to zero.

Exhibit 2.5D: Readmissions



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.5E: 30-Day Post-Discharge ED Visits

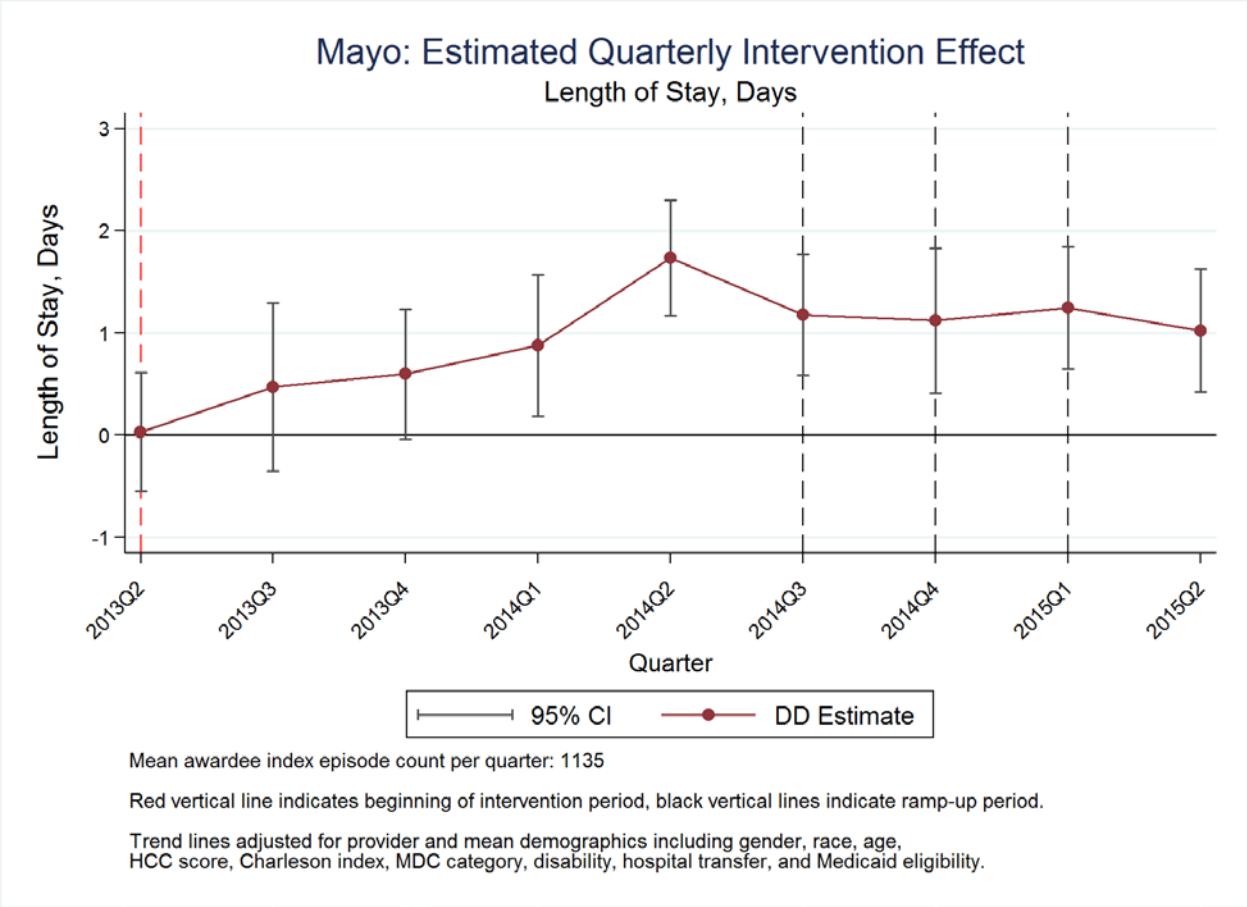


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS

Exhibit 2.5F shows LOS during the index admission. The quarterly point estimates show that LOS at Mayo program hospitals was consistently longer than at the comparison hospitals during the intervention period. Six of the available nine intervention quarters show a statistically significant longer LOS relative to the comparison group. Exhibit 2.5G shows the estimated change in LOS relative to the comparison group, aggregated across all quarters, which was 1.14 days longer on average than at comparison hospitals ($p<0.01$).

Exhibit 2.5F: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.5G: DD Estimated Effect of Intervention on Inpatient LOS

Mayo		
Intervention effect	Estimate	1.15***
	Standard error	(0.18)
	Sample size	[73,281]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Discharge Destination (Acute Care Patients)

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.5H shows that the intervention was associated with a 2.6 (p<0.01) percentage point reduction in discharges home without home health care relative to the comparison group, balanced by a 3.0 (p<0.01) percentage point increase in the rate of discharges to "other" locations (e.g., hospice, federal hospital, psychiatric hospital), relative to the comparison group. Estimates for the change in rate of discharges to other settings were small and insignificant.

Exhibit 2.5H: DD Estimated Change in Episode Discharge Destination

	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	Overall
Home										
DD	-2.35	-0.32	-6.58***	-4.42**	-3.14*	-3.76**	-1.93	-0.17	-1.44	-2.64***
SE	1.96	1.92	1.75	1.84	1.85	1.80	1.83	1.80	1.93	0.92
Home Health										
DD	-0.46	-3.71***	-0.49	0.90	0.00	2.73	0.80	-1.60	0.33	0.49
SE	1.57	1.29	1.58	1.64	1.59	1.81	1.57	1.43	1.67	0.81
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home										
DD	1.29	1.21	4.46***	-0.39	0.74	-1.78	-1.76	-1.65	-2.84	-0.81
SE	2.09	2.05	2.06	1.98	2.02	1.92	1.96	1.94	2.02	1.00
Other										
DD	1.52	2.81*	2.61	3.90***	2.40*	2.82*	2.90*	3.41**	3.95**	2.96***
SE	1.49	1.52	1.51	1.60	1.43	1.56	1.55	1.57	1.72	0.79

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Conclusions

- The Mayo Clinic ICU intervention was not associated with significant improvements in any of the three core measures. However, quarterly estimates indicate that total Medicare spending trended lower among Mayo program participants relative to the comparison group in most quarters since the start of the intervention. Additionally, the intervention was associated with a significant $1,092 decrease in median Medicare spending (p<0.01). The combination of these results suggests that the program achieved modest savings that we were unable to detect with statistical precision.
- The small reduction in total Medicare spending was accompanied by a 1.1 day increase in inpatient LOS (p<0.01), a decrease in the rate of discharge to home with no additional care (2.6 percentage points; p<0.01), and an increase in the rate of discharge to "other" PAC settings (e.g., hospice, federal hospital, psychiatric hospital) (p<0.01).

2.5.4 Summary of Patient Survey Results

In order to address questions related to care quality and patient satisfaction, a sample of beneficiaries who were treated in ICUs using AWARE were surveyed. A sample of patients treated in comparison hospitals also was surveyed. Most received the survey within three to six months after their hospital discharge, and the survey was conducted by mail with phone follow-up with non-respondents. The survey included questions in the following five domains:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

After the removal of decedents, surveys were mailed to 1,419 Mayo beneficiaries (intervention and comparison groups combined). Of these, 869 completed at least one survey question, representing an overall response rate of 61 percent (67 percent and 55 percent for the intervention and comparison groups, respectively). Non-Mayo sites were not included in the patient survey because the delayed implementation resulted in too few patients having experienced the intervention by the time the survey was fielded.

If demographics were missing from a completed survey (respondent did not answer those questions), we replaced the missing values for age and gender using information from that individual's Medicare administrative data. Exhibit 2.5I presents the demographics of beneficiaries selected for the survey sample and the actual respondents. For a detailed description of the Mayo patient survey methodology and results, please refer to the Mayo Clinic Patient Survey Report in Appendix C.

Exhibit 2.5I: Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	105	14%	104	15%	44	9%	42%	36	10%	35%
65-74	301	41%	288	42%	217	44%	72%	165	44%	57%
75-84	223	30%	202	30%	167	34%	75%	118	32%	58%
85+	106	14%	90	13%	68	14%	64%	54	14%	60%
Race										
White	701	95%	541	79%	480	97%	68%	312	84%	58%
Nonwhite	31	4%	136	20%	14	3%	45%	54	14%	40%
Unknown	3	0%	7	1%	2	0%	67%	7	2%	100%
Gender										
Male	416	57%	382	56%	283	57%	68%	209	56%	55%
Female	319	43%	302	44%	213	43%	67%	164	44%	54%
Total	735		684		496		67%	373		55%

Source: Abt Associates HCIA Patient Survey.

Patient Survey Results

There were differences between the intervention and comparison group respondent demographics, possibly indicating that the comparison group was not well matched to the intervention group (see Technical Appendix B for matching techniques). We controlled for observable differences, but have some concern that the two groups might not have been well matched on other unobservable traits. In addition, the absence of baseline survey data limits our ability to control for time-invariant differences. With this in mind, there were many statistically significant differences between intervention and comparison survey respondents.

- The majority in both groups reported that their physical and mental health were good, and most needed little or no help accomplishing ADLs. Intervention respondents reported fewer limitations in ADLs such as moving a table or pushing a vacuum cleaner, bending, walking several blocks, bathing or dressing. Findings from multivariate logistic regression models, which controlled for observable patient demographic and health status factors, also indicate that being in the intervention group was associated with fewer limitations in these activities.
- Intervention respondents were more likely than comparison respondents to be satisfied with the care they received in the hospital and more likely to indicate positive communication with hospital staff.
- While respondents in both groups seemed uncertain regarding their health outlook for the future, those in the intervention group appeared to be more optimistic.

Overall, the survey results were generally positive for patients served by this program compared with their peers in the comparison group.

2.5.5 Synthesis of Findings

A synthesis of findings from all available data indicates the following:

- The claims-based analyses show little impact of AWARE on hospital utilization, LOS, or discharge to PAC. We found a $1,092 reduction in median Medicare episode spending ($p<0.01$) relative to the comparison group. However, the difference in average Medicare spending was not statistically significant, suggesting that the program was better at reducing spending for the "typical" patient than for higher- or lower-cost patients.
- The Mayo program apparently accomplished a reduction in median Medicare episode spending, while also leaving patients with generally better functional status some months after discharge when the survey was administered (acknowledging differences between survey intervention and comparison patients).
- The estimated inpatient LOS for Mayo Rochester patients increased significantly after AWARE was implemented; there was no significant impact on 30-day readmissions, and a slight but insignificant reduction in ED visits during the 30 days following discharge. Nothing in our qualitative data, survey data, or claims data explains this increase in LOS.
- Over time, intervention patients were less likely to be sent directly home without home care, and more likely to be discharged to "other" destinations (e.g., short-term hospitals, intermediate care facilities, hospice, outpatient care) relative to the comparison group. The decline (although not significant) in post-discharge ED visits may be because more patients were discharged with additional services such as home health care, which reduced the need for ED visits in the weeks following discharge.
- Median (but not mean) episode spending declined significantly, even though a larger share of patients received PAC rather than being discharged home without home health care. These findings seem inconsistent. It is possible that people increasingly discharged to PAC fall into the higher end of the cost distribution (i.e., "typical" patients' episodes costs for Medicare declined, bringing down the median, but high-cost patients' episodes got even more expensive, cancelling out at the mean).

2.6 Methodist Hospital Research Institute—Delirium

2.6.1 Introduction

The Houston Methodist Hospital (HMH) System received HCIA funding to implement the Delirium Detection and Prevention across the Continuum program (delirium program) designed to detect and reduce delirium in the HMH and four community hospitals in the Houston Methodist system. The program included a nurse-administered Delirium Screening Tool and an algorithm-based automated calculation of a Delirium Risk Assessment to be used as screening tools twice daily for all patients aged 70 and older, with the exception of those in ICUs.

Patients who were screened to be at risk for delirium received staged interventions depending on their risk level. Intermediate-risk patients received a telephone follow-up call after hospital discharge, while high-risk patients received a nurse's aide home visit after discharge to complete a thorough safety check and medication reconciliation. In addition, volunteers, who were specifically recruited and trained for the delirium program, visited patients in the hospital who had been identified as at risk for delirium, prioritizing those screened as intermediate or high. Volunteers gave patients and family members an educational handout about delirium prevention, offered reading glasses and hearing amplifiers as well as sleeping masks. They also offered reading material and puzzles for cognitive stimulation and provided overall emotional support to patients, particularly those who did not have visiting friends or family. Patient and family education in the hospital emphasized warning signs of delirium; video signs were displayed on a rotating basis to educate patients and providers about the risks of sedating medications and warning signs of delirium. Patient education videos were shown in patient rooms to educate patients and families about best practices in the hospital to improve functional outcomes and avoid delirium.

Beyond the delirium screening and patient-specific interventions, all hospital pharmacy order sets were revised to remove deliriogenic medications, especially when ordered for older patients. Customized order sets and an alerting system identified high risk medication orders and pharmacists worked with prescribers to suggest safer medications.

The delirium program aimed to identify and prevent delirium in hospitalized patients, and reduce LOS, 30-day readmissions, return ED visits, and Medicare spending.

The goals of the delirium program were to:

- ***Monitor and intercept patients at risk*** for medication-induced delirium by establishing a system-wide pharmacy surveillance system to "flag" patients for clinician review who were prescribed deliriogenic medications.
- ***Increase recognition of delirium*** by adopting a standardized assessment tool to screen patients at risk for delirium and educating providers, caregivers, families, and patients about the diagnosis in general.
- ***Enhance care transitions*** for patients at high-risk for delirium as they leave the hospital, by creating new and complementary roles for care providers to monitor and assist patients throughout the transition process from hospital to home.

2.6.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the

Awardee to better understand resources necessary to sustain the program after HCIA funding ended and barriers and facilitators for replicating the program in other hospitals. These new findings regarding sustainability are presented below.

Implementation Effectiveness

Across all levels of the program, staff described the shift in culture that the delirium program had achieved, primarily through increased recognition of the condition across the system.

- ***Reduction of Medication-Related Delirium.*** Both the pharmacist and physician program leads described a dramatic increase in the use of Ramelteon, a melatonin agonist, prescribed as a substitute for sleep medications such as Ambien. Most physicians had never heard of Ramelteon before and now are prescribing it frequently for older patients because it is less deliriogenic.
- ***Education of Patients and Family Members.*** Nurses reported that family members seemed more educated about medications and were exploring alternative medicines and holistic strategies for improving sleep. Caregivers and family members were reportedly better able to recognize subtle differences in patient behavior and to bring this to the nurse's attention.
- ***Better Sleep Cycles in the Hospital.*** Many program participants emphasized that the program led to simple yet important improvements in care such as offering reading glasses and hearing amplifiers to help patients remain cognitively engaged during the day and sleeping aids such as masks to reduce wakefulness at night.
- ***Safer Transitions.*** Participants described safer transitions from hospital to home, better coordination with patients' primary care physicians, improved medication reconciliation, better identification of medication risks in the home setting, and identification of other safety concerns for older patients at home (e.g., rugs that could trip a patient). Program staff reported that patients felt care was more personalized and more supportive than they had received in the past.

Staff reported that the delirium program had a positive impact on the way they did their jobs:

- Nurses developed more personal relationships with patients as a result of their delirium program training and reported an increased sense of empowerment in their interactions with physicians, accountability to the patient and to each other, and pride when they identified a symptom of delirium or a potential risk factor.
- Pharmacists reviewed all deliriogenic medication and sometimes found and corrected other problematic medication issues, improving overall medication safety.

Although the Delirium Program was intended for patients 70 years or older, it improved care for younger patients also. Automated order sets that reduce deliriogenic medications were applied to all patients regardless of age. In addition, bedside nurses used the delirium assessment to assess the cognitive status of patients in their 60s who could benefit from early recognition of delirium, even if other program components (e.g., home visits) were not available for somewhat younger patients due to funding constraints.

Bedside nurses, program staff, and pharmacists noted several examples where targeted patients did not receive the full complement of interventions that were intended.

- Some patients who presented at the hospital on Friday evening or over the weekend for a brief stay might not have received a pharmacy intervention/review before being discharged. Further, pharmacists were challenged in reconciling medications during care transitions, and were concerned that primary care physicians could reintroduce deliriogenic medications. Coordination with hospital discharge planners and community primary care physicians was incomplete for weekend discharges, due to reduced weekend staffing.
- Inaccuracy of patient telephone numbers inhibited follow-up calls to check on discharged patients. Adding an assistant to identify missing or invalid telephone numbers before patient discharge improved this situation.
- Some high-risk patients initially declined the home visit, but after adjusting the script multiple times to soften the way delirium was discussed, program staff noticed an increase in patients agreeing to the home visit.
- Some high-risk patients were discharged from the hospital before a home health aide referral could be made, and therefore did not receive a home visit. Other patients lived too far away for home visits (the home health contract HMH negotiated specified visits to patient homes within a 40 mile radius around each hospital.)

Workforce

It was not necessary to hire new clinical staff to implement the delirium program in the hospital. Monitoring and training activities were implemented by existing hospital staff. Volunteers were reassigned and volunteer coordinator positions were added in each hospital. Home visits were contracted with a local home health agency.

The delirium program used a "train-the-trainer" model that was specific to the staff role. For example:

- The lead pharmacist conducted training for other hospital pharmacists.
- A nurse educator trained bedside nurses and identified a nurse champion on each hospital unit to share program feedback on assessment and screening compliance with their unit staff.
- Volunteers attended a general hospital orientation followed by a two-hour delirium-specific training class. A volunteer supervisor was identified to provide mentoring to other volunteers.
- Care Navigator Nurses who called intermediate-risk patients after discharge (and also those at higher risk who declined a home visit) received formal hospital training as well as "learn-by-doing" training under the tutelage of experienced care navigators.
- Home health aides were trained in two cohorts. The first group received a very intensive 40-hour training that focused on how to record information, didactic lectures about delirium, role-playing exercises and extensive clinical content. The second cohort received a shorter training (24 hours) that focused on building proficiency in communicating with and reassuring patients, addressing what can be managed in the home, performing data collection activities, and documenting information using an iPad.

Sustainability and Spread

With some modifications, the delirium program continues at HMH as well as the four participating community hospitals:

- Two of the community hospitals have seen significant leadership turnover, and new leaders are less engaged with the program. The other three locations, including HMH, have a high level of engagement from hospital leadership, as well as the cooperation of internal quality improvement departments.
- Across the five hospitals, work continues to enhance the pharmacy component of the program.
- The home visit component of the delirium program ended in June of 2015 due to funding constraints, and was replaced with a follow-up phone call to patients at risk for delirium after discharge from the hospital. To supplement the phone call, patients needing additional support were connected to community resources through referrals to Senior Specialists at the United Way and to the Houston Alliance to Address Dementia. These services included Meals on Wheels, assistance with application for benefits, caregiver support services, and transportation services.
- Although volunteer coordinators worked in every hospital during the program years, these positions were eliminated when HCIA funding was depleted. However, program staff continue to train and supervise new volunteers in each hospital.

Challenges related to sustaining the delirium program were identified by program staff and include:

- The workflow at each hospital was revised to integrate data use agreements and secure email systems for referrals to community support providers.
- Program leaders continue to educate staff about the delirium program to prevent it from being eclipsed by other priorities for busy hospital staff.

2.6.3 Summary of Quantitative Findings

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). Methodist Delirium received a one-year NCE beyond June 30, 2015, and we present here estimated changes in utilization and Medicare spending updated through September 30, 2015, one quarter beyond the three-year HCIA intervention period. We first present results for all patients screened by the program and then for those patients who screened positive and received subsequent interventions (the treated population). The results presented below are for the following core measures:

- Total Medicare episode spending for 60 days, including the index admission and all Medicare spending for 60 days after discharge. Index admission was defined as an admission for a patient eligible for the screening innovation, in either an intervention or comparison hospital.
- Thirty-day (all cause) readmissions to an ACH following an index admission.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

We also present results for the following additional measures:

- Inpatient LOS
- Discharge destination

Please see Technical Appendix B for a description of how each outcome measure was specified, our methods for the DD regression analyses, and how we selected a comparison group for total Medicare

episode spending, 30-day hospital readmissions and ED visits, LOS, and discharge destination. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending.

All regression models controlled for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred.[23] The regression model also included an indicator for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report is based on final action claims that reflected processing as of three months after initial submission for utilization outcomes and as of six months for Medicare spending. Any adjustments processed more than three (six) months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included.[24] We believe this approach is an accurate way to capture Medicare spending.

Implementation did not take place on the same day in all participating hospitals. In the graphs below, the red dotted vertical line shows the beginning of the intervention period, and the black dotted vertical lines indicate the quarters when various participating hospitals began their program implementation. We present graphs first for the Methodist-Delirium screened population (all patients 70 years or older, with some exclusions), then for the Methodist Delirium prevention intervention sub-population (patients screened as being at intermediate or high-risk). Estimated changes reported below were based on 11 quarters of post-implementation data.

Summary of Core Measures

Exhibit 2.6A summarizes the average effect of the Methodist Delirium screening program on total 60-day Medicare spending (including the inpatient stay and all claims in the following 60 days), 30-day inpatient readmissions, and 30-day ED visits per episode. [25,26] The exhibit also presents the estimated effect of the

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[23] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

[24] Due to the different run out times the analytic sample sizes will vary slightly between utilization and cost outcomes.

[25] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[26] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

program on spending aggregated across all episodes that occurred during the intervention period. Exhibit 2.6B summarizes the same measures for patients who were identified as intermediate or high-risk for delirium and received additional intervention. Both the screening program and the delirium interventions were associated with significantly higher total Medicare spending per episode relative to the comparison group—increases of $302 ($p<0.10$) and $491 ($p<0.05$), respectively. Neither of these increases was accompanied by a large or significant change in the relative rate of post-discharge inpatient readmissions or ED visits.

Exhibit 2.6A Core Measures Summary—Screened Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	7.73*	(1.16, 14.30)
Per episode: (N = 25,637)		
Total 60-day spending	301.60*	(45.34, 557.87)
Thirty-day inpatient readmissions	0.36	(-0.21, 0.93)
Thirty-day ED Visits	-0.26	(-0.88, 0.36)

The estimated change in outcomes spans the entire intervention period from 2012Q4 through 2015Q3.

Exhibit 2.6B Core Measures Summary—Treated Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	8.77**	(2.32, 15.21)
Per episode: (N = 17,870)		
Total 60-day spending	490.50**	(129.75, 851.26)
Thirty-day inpatient readmissions	0.31	(-0.47, 1.09)
Thirty-day ED Visits	-0.70	(-1.54, 0.15)

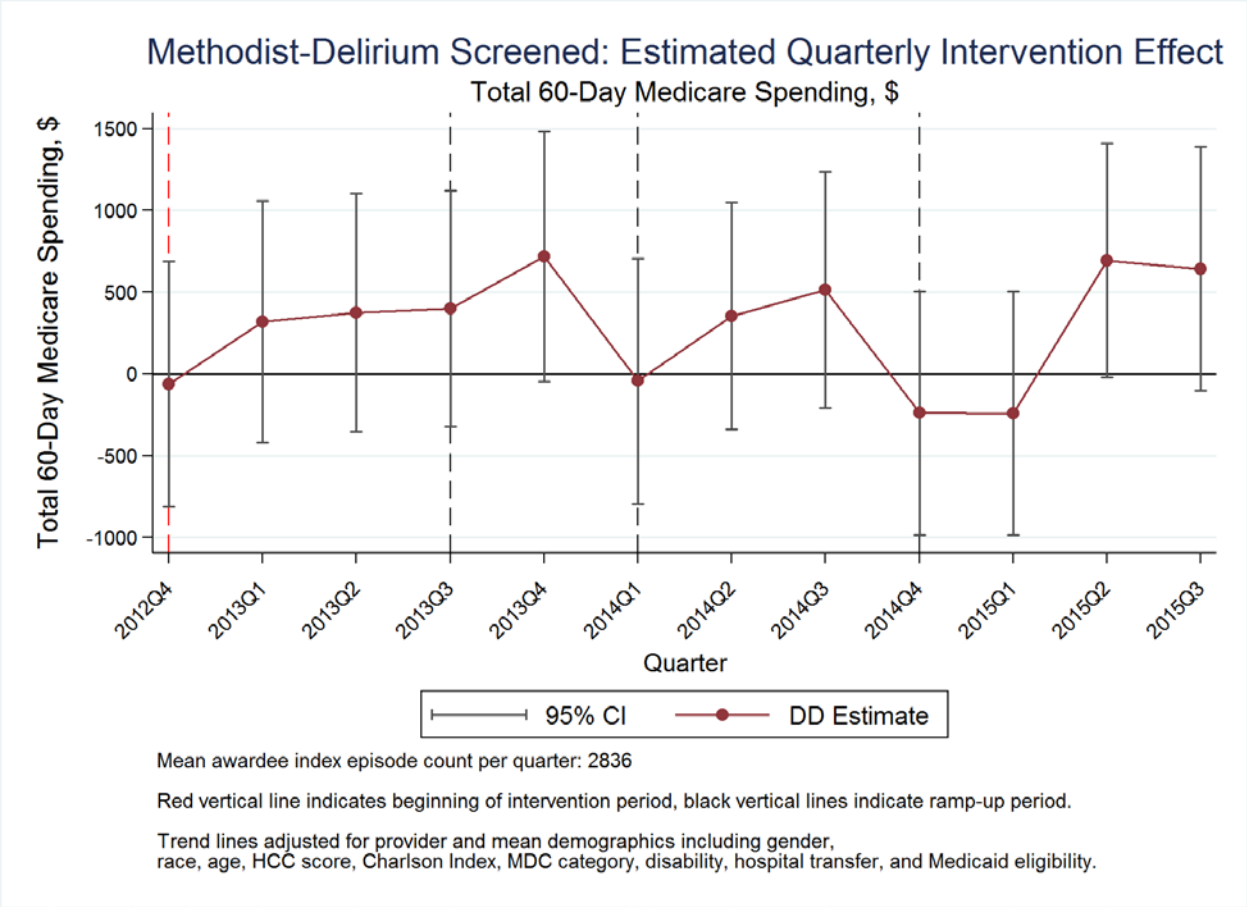
The estimated change in outcomes spans the entire intervention period from 2012Q4 through 2015Q3.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

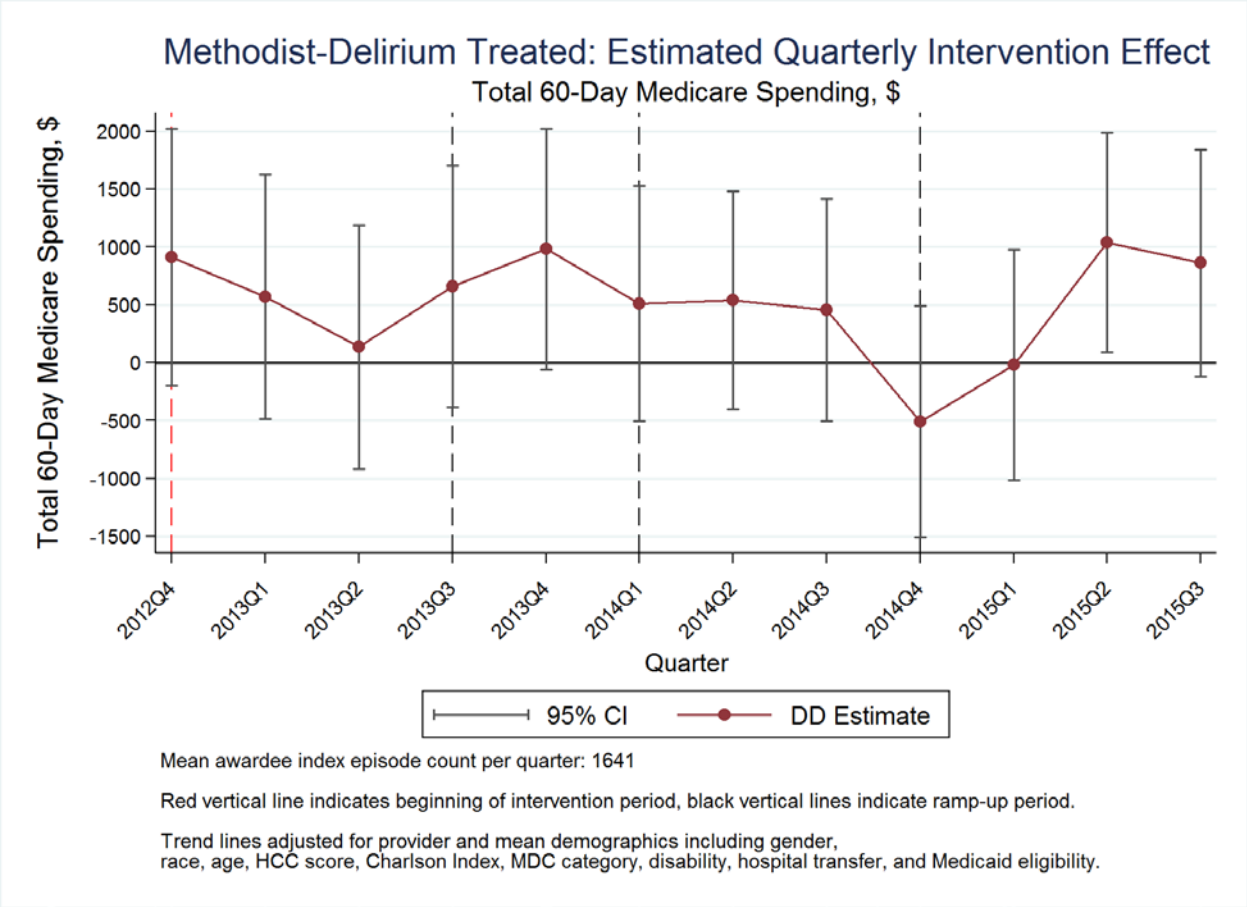
Quarterly estimated changes in total Medicare spending are presented in Exhibits 2.6C and 2.6D. In most quarters since the start of the intervention, average Medicare episode spending increased more among patients screened and treated by intervention hospitals than among those in comparison hospitals, although none of the quarterly point estimates are statistically significant. Estimated changes in median Medicare spending pooled across all quarters (Exhibits 2.6E) are only slightly smaller than the estimated changes in mean Medicare spending ($185 for screened patients and $413 for treated patients: $p<0.01$). This suggests that increases in Medicare spending, though modest, are occurring across the entire patient distribution and not restricted to the sickest (i.e., most costly) patients.

Exhibit 2.6C: Medicare Episode Spending—Screened Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6D: Medicare Episode Spending—Treated Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6E: DD Estimated Effect of Intervention on Median Total 60-Day Medicare Costs

Methodist Delirium: Screened		
Intervention effect ($)	Estimate	117.01*
(Median regression)	Standard error	(69.18)
	Sample size	[218,752]

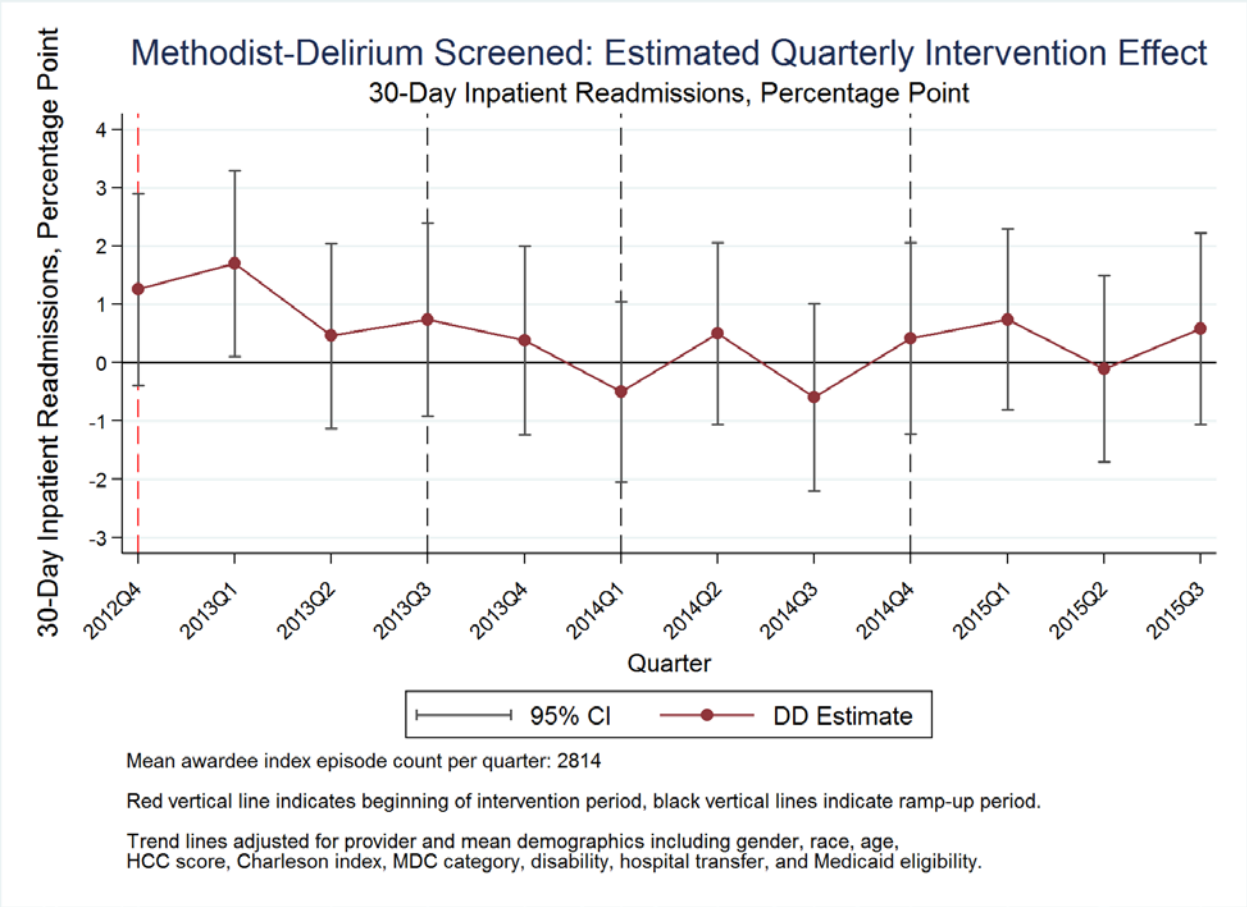
Methodist Delirium: Treated Subpopulation		
Intervention effect ($)	Estimate	403.79***
(Median regression)	Standard error	(127.42)
	Sample size	[107,500]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

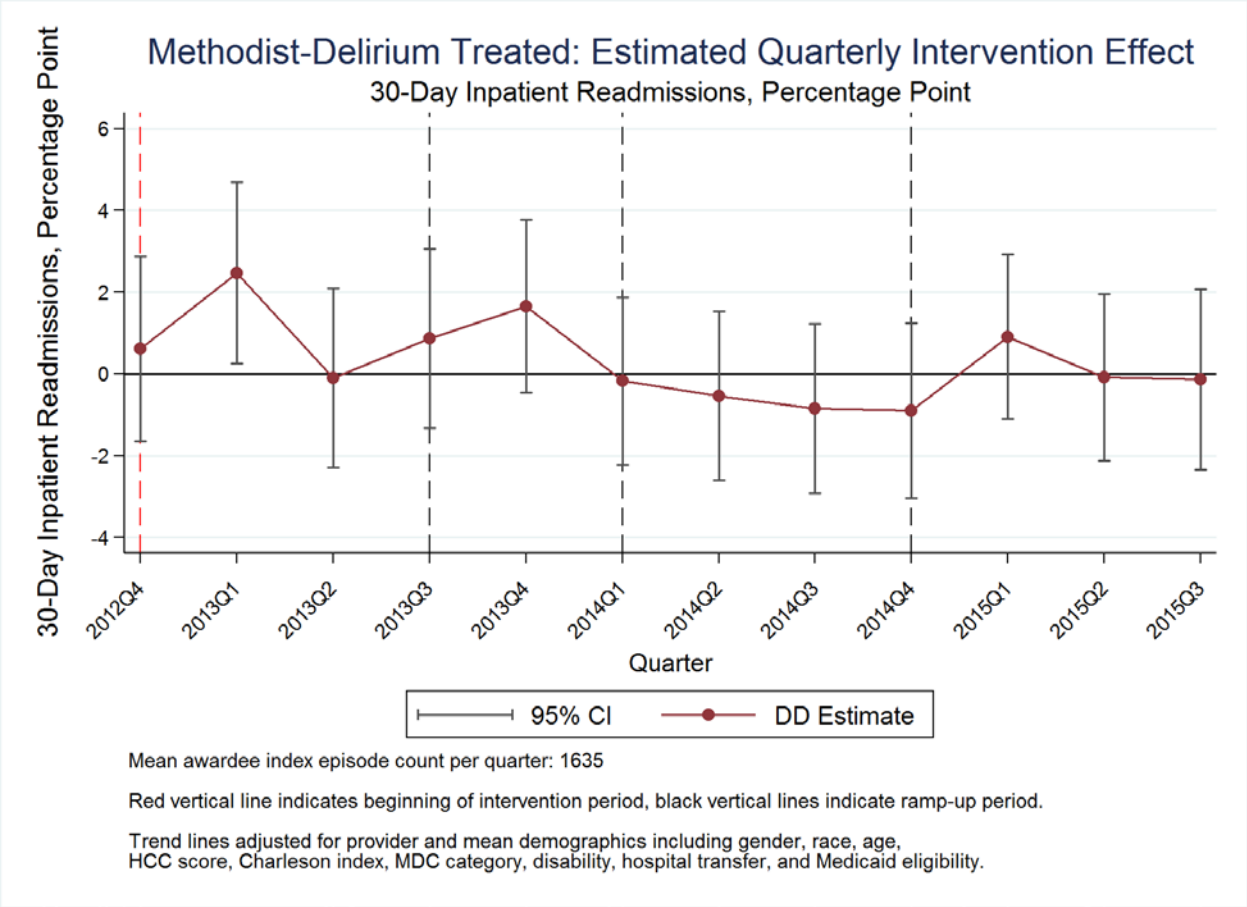
Exhibits 2.6F and 2.6G show hospital discharges followed within 30 days by a readmission. There was no consistent relationship between the intervention and readmission rates among either the screened population or the treated subpopulation. Likewise, there does not appear to be any trend in the rate of ED visits among either the screened or treated populations (Exhibits 2.6H, 2.6I).

Exhibit 2.6F: Readmissions—Screened Patient Population



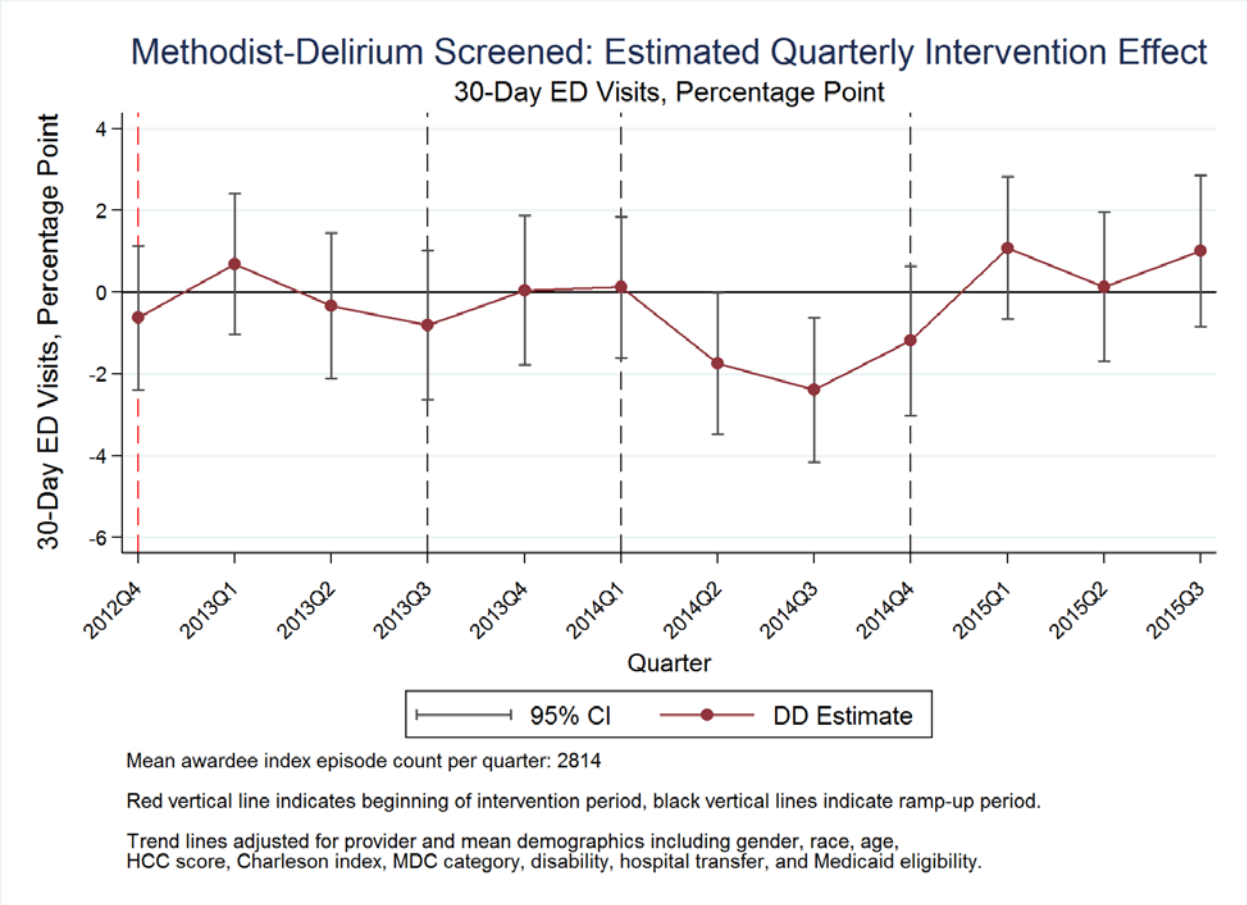
Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6G: Readmissions—Treated Subpopulation



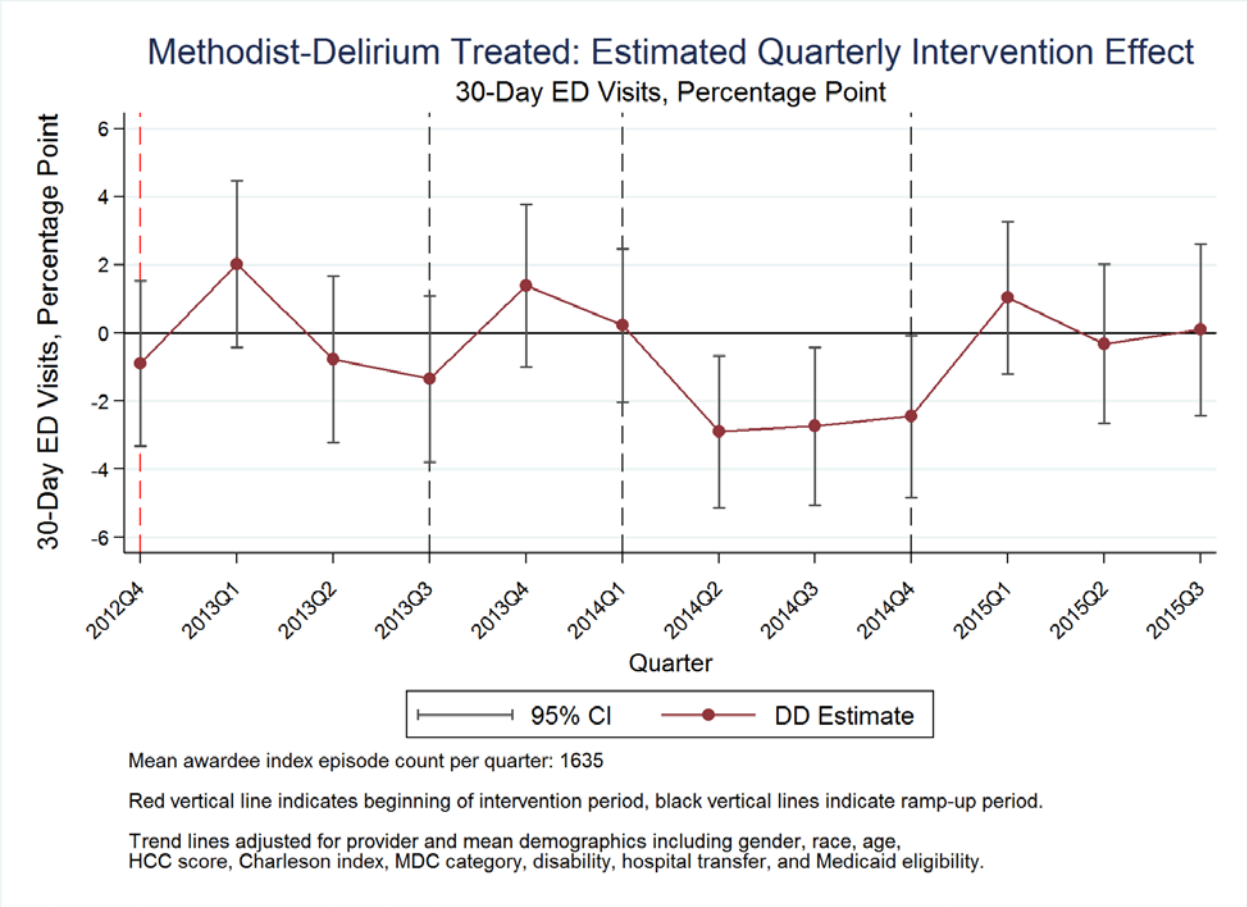
Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6H: Thirty-Day Post-Discharge ED Visits, Screened Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6I: Thirty-Day Post-Discharge ED Visits, Treated Subpopulation

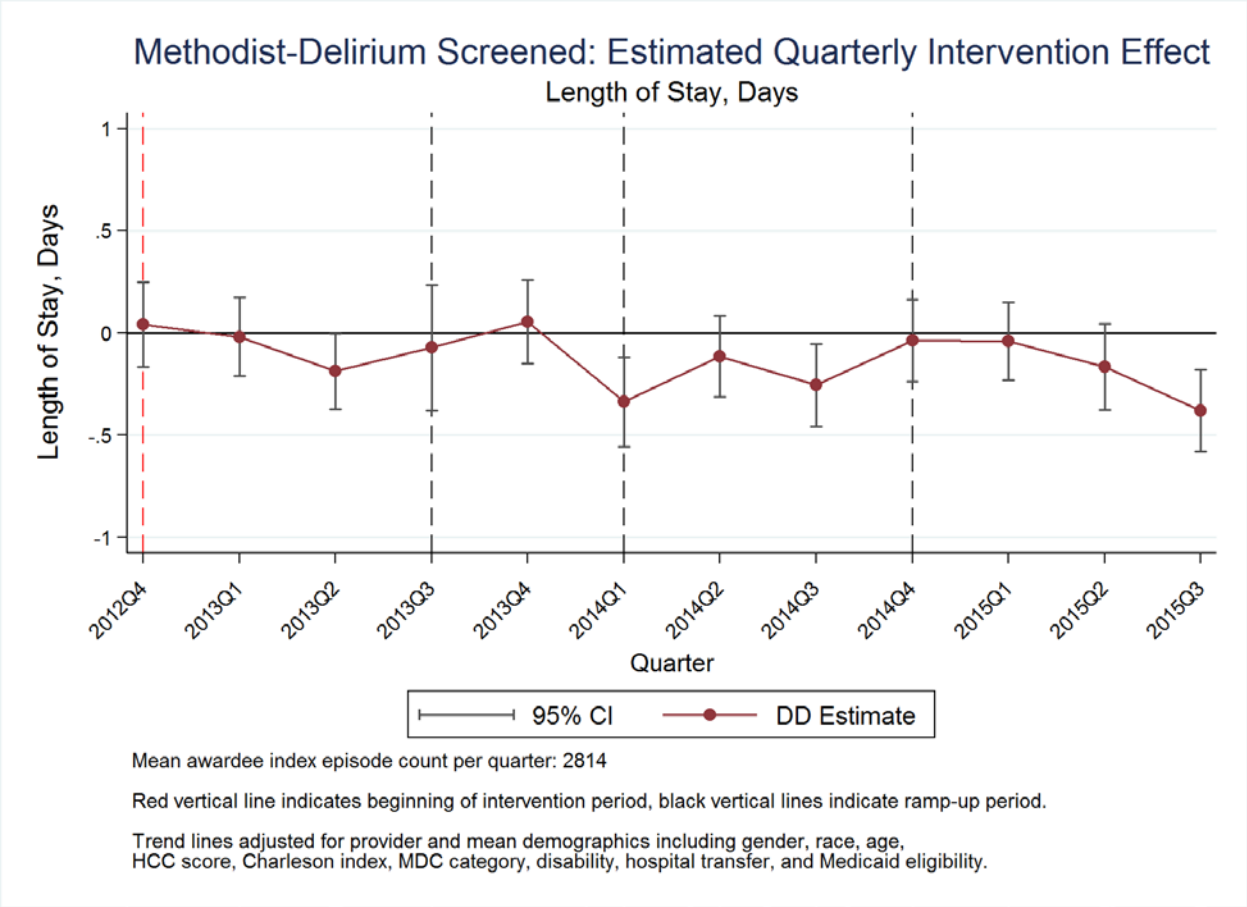


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS

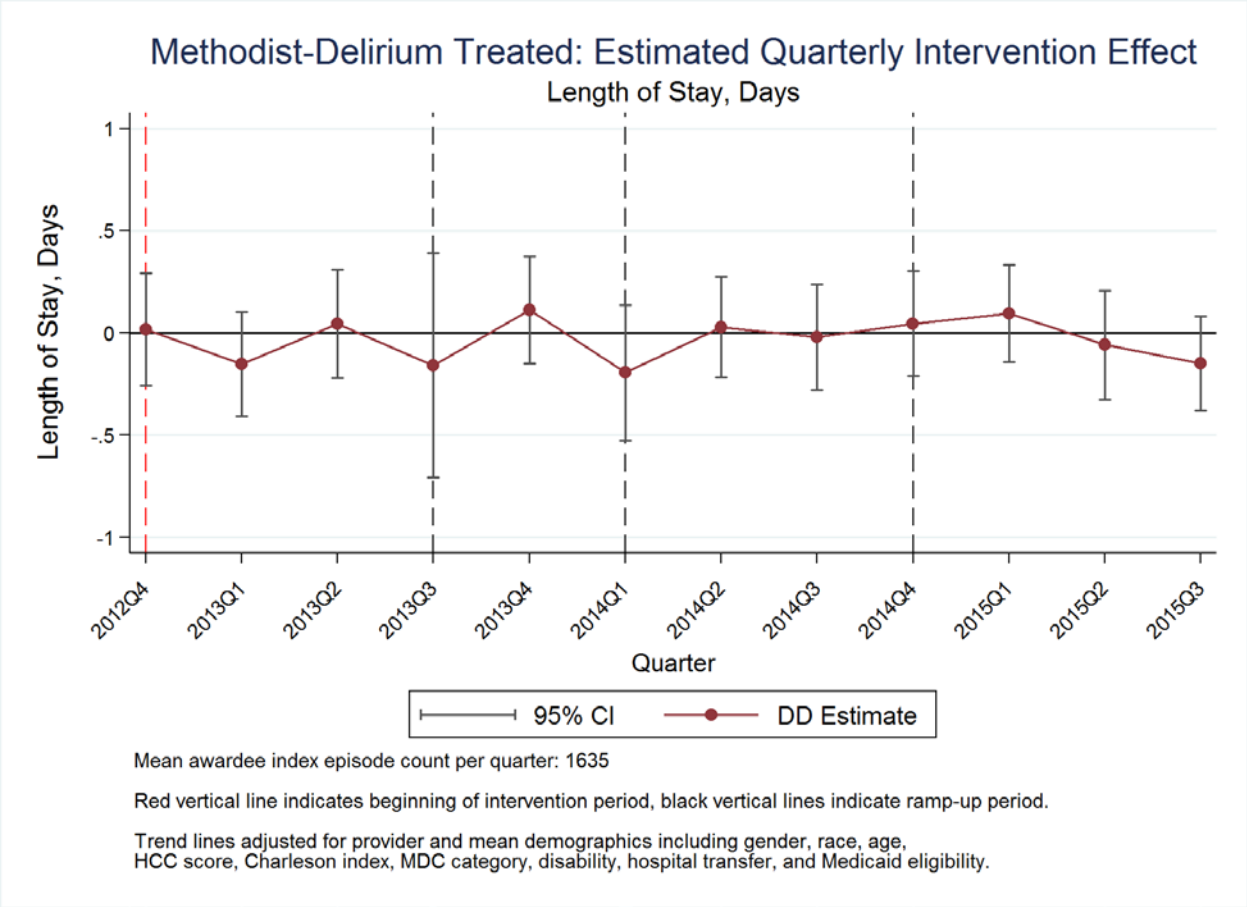
The Methodist Delirium prevention program has the potential to reduce LOS if patient cognitive status does not deteriorate in the hospital. Exhibit 2.6J suggests that LOS may be decreasing among patients screened at participating hospitals relative to comparison patients, although this was not a statistically significant change (Exhibit 2.6L). This pattern was not observed among patients in the treated subpopulation who received additional interventions (Exhibit 2.6K).

Exhibit 2.6J: Index Admission Inpatient LOS, Screened Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6K: Index Admission-Inpatient LOS, Delirium Subpopulation



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.6L: DD Estimated Effect of Intervention on Inpatient LOS

Methodist Delirium: Screened		
Intervention effect	Estimate	-0.07
	Standard error	(0.04)
	Sample size	[216,564]

Methodist Delirium: Treated Subpopulation		
Intervention effect	Estimate	0.01
	Standard error	(0.06)
	Sample size	[106,751]

p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Discharge Destinations for Acute Care Patients

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.6M shows that for the overall screened population, the rate of discharges home without home health care decreased by 3.62 percentage points ($p<0.01$) relative to the comparison group. This was primarily driven by a 2.41 percentage point increase in the rate of discharges to home health care ($p<0.01$) and a 0.95 percentage point increase in the rate of discharge to "other" PAC settings (e.g., hospice, federal hospital, psychiatric hospital) relative to the comparison group. Among patients screened as being at risk for delirium who received additional interventions, the rate of discharges home without home health care decreased by 3.60 percentage points ($p<0.01$) relative to the comparison group. This was primarily driven by a 2.81 percentage point increase in the rate of discharges to home health care ($p<0.01$) and by a 0.68 percentage point increase ($p<0.10$) in discharges to "other" PAC settings.

Exhibit 2.6M: DD Estimated Change in Episode Discharge Destination

Methodist Delirium—Screened Patient Population

	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Home													
DD	1.53	1.15	-1.17	-2.97*	-3.51***	-2.66**	-2.77**	-3.29***	-5.08***	-2.05**	-3.27***	-4.83***	-3.62***
SE	1.04	1.01	1.00	1.02	1.05	1.03	1.00	1.02	1.04	1.03	0.98	1.01	0.43
Home Health													
DD	-2.25***	-1.37*	-0.46	0.25	1.40	2.80***	1.61*	0.49	3.62***	0.58	2.28***	1.94**	2.41***
SE	0.77	0.78	0.80	0.85	0.92	0.94	0.87	0.85	0.97	0.86	0.88	0.91	0.38
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home													
DD	-1.99**	-1.89**	-1.80*	0.34	1.36	-0.37	0.19	1.19	-0.22	-0.71	-0.07	0.19	0.26
SE	0.98	0.95	0.96	1.01	1.03	0.97	0.95	0.98	0.98	0.96	0.94	0.98	0.41
Other													
DD	2.72***	2.12***	3.43***	2.38***	0.75	0.23	0.96*	1.61***	1.67***	2.18***	1.06*	2.70***	0.95***
SE	0.70	0.66	0.73	0.71	0.66	0.56	0.58	0.65	0.68	0.66	0.60	0.68	0.25

Methodist Delirium—Treated Subpopulation

	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Home													
DD	0.61	-0.64	-1.02	-4.77***	-2.21	-1.88	-3.17***	-2.18*	-5.63***	-3.93***	-2.60**	-4.64***	-3.60***
SE	1.46	1.40	1.37	1.37	1.38	1.32	1.28	1.30	1.32	1.31	1.24	1.29	0.57
Home Health													
DD	-2.23**	-0.79	-1.29	0.93	0.36	3.47***	2.22*	-0.31	4.40***	3.42***	0.53	2.67**	2.81***
SE	1.12	1.15	1.08	1.22	1.17	1.25	1.16	1.06	1.32	1.24	1.05	1.22	0.52

	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home													
DD	-1.20	-0.44	-0.23	2.13	2.11	-0.36	0.57	1.77	-0.23	-1.64	0.29	-0.59	0.11
SE	1.47	1.41	1.42	1.48	1.42	1.33	1.30	1.34	1.36	1.31	1.27	1.33	0.59
Other													
DD	2.82***	1.87**	2.54***	1.70*	-0.27	-1.23*	0.37	0.72	1.46	2.15***	1.78**	2.56***	0.68*
SE	1.04	0.92	0.97	1.02	0.85	0.70	0.77	0.83	0.91	0.89	0.86	0.93	0.35

Conclusions

- The facility-wide screening component of the delirium program was associated with a significant $301 increase in mean Medicare spending per episode ($p<0.05$) and $118 increase in median Medicare spending ($p<0.01$). This may have been due to a 3.62 percentage point decrease in the rate of discharge directly home ($p <0.01$), because patients instead were more likely to be discharged to home health care (2.41 percentage point increase, $p<0.01$) or to "other" PAC settings (0.95 percentage point increase, $p<0.01$). These changes in discharge destination and PAC care did not reduce subsequent rates of inpatient readmissions or ED visits. It is possible that the screening program identified more needs for PAC care, which would have otherwise been missed, and this necessitated the small increase in overall spending.
- A similar pattern held for patients who were screened and offered additional services due to risk for delirium. The average Medicare expenditure for these episodes increased $491 more for intervention than for similar comparison patients ($p<0.05$), while median Medicare expenditures was $404 greater ($p<0.01$). This was likely driven by a 3.60 percentage point decrease in discharge directly home ($p<0.01$), accompanied by a 2.81 percentage point increase in discharge to home health ($p<0.01$) and 0.68 percentage point increase in discharges to "other" PAC settings (e.g. hospice, federal hospital, psychiatric hospital) ($p<0.10$).

2.6.4 Summary of Patient Survey Results

In order to address questions related to care quality and patient satisfaction, a sample of beneficiaries who were screened for delirium were surveyed. A sample of patients treated in comparison hospitals was surveyed as well. Most received the survey within three to six months after their hospital discharge and the survey was conducted by mail with phone follow-up with non-respondents. The survey included questions in the following five domains:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

After the removal of decedents, a total of 1,513 beneficiaries (intervention and comparison groups combined) remained for the survey. Of these, 801 completed at least one survey question, representing an overall response rate of 53 percent (54 percent and 52 percent for the intervention and comparison groups,

respectively). If demographics were missing from a completed survey (respondent did not answer those questions), we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The Exhibit 2.6N presents the demographics of beneficiaries selected for the survey sample, and the actual respondents. For a detailed description of the Methodist Delirium patient survey methodology and results, please refer to the Methodist Delirium Patient Survey Report in Appendix C.

Exhibit 2.6N: Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
70-74	192	25%	188	25%	95	23%	49%	97	25%	52%
75-84	364	48%	354	47%	217	53%	60%	202	52%	57%
85+	207	27%	208	28%	99	24%	48%	91	23%	44%
Race										
White	521	68%	395	53%	342	83%	66%	319	82%	81%
Nonwhite	115	15%	135	18%	68	17%	59%	71	18%	53%
Unknown	127	17%	220	29%	1	0%	1%	0	0%	0%
Gender										
Male	301	39%	299	40%	173	42%	57%	173	44%	58%
Female	462	61%	451	60%	238	58%	52%	217	56%	48%
Total	763	-	750	-	411	-	54%	390	-	52%

Source: Abt Associates HCIA Patient Survey.

Patient Survey Results

We observed few statistically significant differences between intervention and comparison survey respondents. While the majority of both groups reported that their mental health was good, a larger portion of the intervention group reported having poor or fair mental health than in the comparison group. This may be because careful screening in the intervention hospitals identified patients at risk for delirium, but these risks were not reflected in ICD9 codes on claims, making it impossible to create an optimal comparison group. Chi-square and univariate regression analyses revealed no statistically significant differences between the intervention and comparison groups on functional status, but comparison group respondents were slightly more likely to engage with medical staff than were intervention respondents. Those in the comparison group were more likely to report that hospital staff explained things understandably and considered their preferences during post-discharge planning. The only significant finding from multivariate logistic regression models showed that intervention patients were less likely to have staff take their preferences into account during discharge planning.

2.6.5 Synthesis of Findings

A synthesis of findings from all available data indicates the following:

Patients in both the Methodist Delirium screening and treatment groups were significantly more likely than those in the comparison groups to be discharged home with home health care, and less likely to be discharged home without additional home health care. Both screened and intervention patients were also significantly more likely than comparison group patients to be discharged to "other" PAC settings.

Survey results found that patients in the intervention group were more likely to report poor or fair mental health than those in the comparison group. This may be because careful screening identified patients at risk for delirium, but these risks were not reflected in ICD9 codes on claims. Similarly, claims analyses indicate that early detection and referral to home health care are evidence of better, more coordinated care. This finding was supported by program staff and bedside clinicians, who reported that their awareness of delirium and ability to detect it were enhanced by program tools and training. Despite these care improvements, there was no significant reduction in 30-day readmissions or ED visits, which might have been expected for patients receiving better PAC. There was no significant change in Medicare episode spending.

2.7 Methodist Hospital Research Institute—Sepsis

2.7.1 Introduction

The Houston Methodist Hospital (HMH) System, in partnership with the Texas Gulf Coast Sepsis Network, received HCIA support to identify and treat sepsis before it progresses. The Sepsis Early Recognition and Response Initiative (SERRI) targeted patients who were admitted to participating ACHs, LTCHs, SNFs, and rehabilitation facilities, including but not limited to Medicare and Medicaid beneficiaries. Through improved training, evidence-based guidelines, systematic screening, and more-timely treatment, HMH and its partners hoped to identify sepsis cases early and prevent progression of the disease, resulting in reduced rates of organ failure, mortality, and LOS, improved patient outcomes, and lower Medicare spending. HMH received a NCE and operated its program with HCIA support through June 2016.

The core clinical tool for this program was the SERRI electronic screening tool, designed to be used by bedside staff (nurses and nurses' aides) every shift, to assess patients' risk for developing sepsis based on the following vital signs: heart rate, respiratory rate, temperature minimum and maximum over 12 hours, white blood cell count, and mental status (mental status was assessed by a bedside nurse). Mental status was added to the screening tool because although older and immunocompromised patients may not mount an immune response that can be measured by the four vital signs; sepsis can present as altered mental status. The program used standard protocols for patient monitoring by first-level nurse responders (Licensed Practical Nurses (LPNs) and Registered Nurses (RNs), as well as procedures for elevating the case to second-level responders (PAs and RNs) when a screening assessment reached a predetermined threshold for beginning treatment and confirming sepsis. The standard sepsis care bundles, based on the Surviving Sepsis Campaign three-hour care bundle for severe sepsis and septic shock, with strong emphasis on checking serum lactate, appropriate fluid resuscitation, and rapid antibiotic delivery, were implemented for the patient if second-level responders determined that the patient required treatment for sepsis.

2.7.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the

Awardee to better understand resources necessary to sustain the programs after HCIA funding ended, and barriers and facilitators for replicating the program in other units or facilities. These new findings regarding sustainability are presented below.

Implementation Effectiveness

Program staff viewed SERRI as bringing many improvements in care quality, including:

- Nurses gained confidence in recognizing sepsis and other emerging health concerns at an earlier stage.
- Nursing assistants felt better able to assess patient vital signs and recognize abnormal findings; they were more likely to communicate an important change in vital signs to first level responders.
- Changes in patients' vital signs were discussed more often during shift changes.
- Sepsis treatment protocols were initiated more quickly due to reduced time between when a first-level responder signaled a concern and when a follow-up assessment was completed by a second-level responder. Program staff advised that a second-level responder was able to initiate treatment for sepsis within an hour of the SERRI tool returning signs of sepsis, a great improvement in the time required to initiate treatment.
- At each facility, the pharmacy team implemented procedures to review any new orders for a suspected sepsis patient and fill antibiotic prescriptions within one hour. The efficiency of the pharmacy team at each institution was vital to the overall success of the SERRI program in treating patients expeditiously.
- Surgical staff viewed the program as effective among their patients. For example, the most common cause of death in liver transplant patients is sepsis and earlier recognition and treatment of sepsis in that population was enhanced by SEERI.

SERRI may also have been responsible for the early detection of other emerging health conditions—a beneficial unintended consequence of the program. SERRI screening detected conditions that required second-level responder attention, such as gastrointestinal hemorrhage, respiratory distress, arrhythmia, acute myocardial infraction, pulmonary embolism, and adverse reactions to medications. Program staff advised that such conditions were often detected earlier than they would otherwise have been, and patient outcomes were better as a result.

There were several implementation challenges.

- During the first two years of HCIA funding, the SERRI tool was not integrated with the EMRs in participating facilities. Vital signs and other data were entered twice—once in the SERRI tool and again in the EMR. This double-entry was noted by staff as being inefficient. In addition, patients were screened and their data entered into the SERRI tool twice a day (once on each shift), rather than pulling more up-to-the-minute data from the EMR. Nurses advised that even earlier identification of sepsis could occur if vital sign information and laboratory result data were updated directly from the EMR into SERRI. For various organizational reasons, the participating ACHs did not use the screening tool in EDs and ICUs. Since most septic patients enter a hospital through the ED (80% according to the program PI), the potential for program impact was considerably reduced.

- A factor that may have inhibited implementation effectiveness in post-acute facilities was that physicians were reluctant to order aggressive fluid resuscitation for patients with early signs of sepsis in these facilities. They instead preferred to transfer patients to ACHs for safe treatment, and this reduced the potential impact of the program in PAC facilities.

- One ACH ended participation in SERRI due to competing demands for quality reporting. At the same time that it was implementing SERRI, this ACH was working to improve SEP1, a CMS core quality measure related to implementing the three-hour and six-hour bundles for severe sepsis. The ACH found that being required to simultaneously report SEP1 and SERRI quality measures was overly burdensome.

Workforce

The Methodist SERRI training program addressed diverse needs. Nurses' aides were trained in some facilities (e.g., HMH) to collect patient vital signs and use the SERRI tool; bedside nurses who served as first-level responders were trained to recognize incipient sepsis; second-level responders were trained to detect sepsis and initiate treatment protocols; and physicians who worked in units where the SERRI program was implemented were trained. Training of first responders was conducted by second-level responders using a train-the-trainer model. Hiring and retaining NPs was challenging, particularly at one ACH. NPs viewed the second responder position as undesirable because as a funded program, it lacked permanent financial support.

Leaders at each institution stressed the importance of training the entire clinical team about the purpose and value of sepsis early detection. Physicians were often the most skeptical about the early detection initiative and needed to be convinced about the strong evidence underscoring the benefits of early detection.

The SERRI program had an impact on the workflow and workload of the nurses' aides, first-level responders, and second-level responders in the various institutions implementing the program. Bedside nurses who served as first responders were challenged to integrate the collection of vital signs and mental status assessment needed for the SERRI tool into their workflow. This was especially challenging for nurses who complete vital signs assessments themselves without the help of aides.

The workload of the second-level responders may have been the most significantly impacted by the SERRI program. In order to provide around-the-clock coverage, NPs and RNs who had other roles in the hospitals also served as SERRI second-level responders, carrying the sepsis alert pager on night and weekend shifts. The second-level responders at two Methodist ACHs juggled their roles in critical care, responding to critical care pages and sepsis pages. When a case of sepsis was definitively diagnosed, the second-level responder stayed with the patient for an hour or more to ensure that the early sepsis treatment protocol was begun and the patient was responding well. Second-level responders in the ACHs advised that more staff were needed to address all the sepsis alerts triggered by SERRI screening.

Sustainability and Spread

SERRI was integrated as standard care at HMH and all but one of the partner HCIA-funded sites. The program staff attributed this program continuation to committed leadership and an implementation plan designed for sustainability. Clinical staff positions that were supported with HCIA funds—trainers and second-level responders—were transferred to permanent positions paid by the Methodist health system. As part of their agreement to participate in the program, all partner sites developed sustainability plans where HCIA financial support would gradually decrease over the three years, with all sites expected to be self-sustaining by the time HCIA funding ended.

The volume of SERRI patients at one small ACH could not support a full-time second responder NP. To address these issues, the staffing model was modified, and the second responder NP role was assumed by RNs from the hospital's rapid response teams, allowing the program to continue.

During the last year of HCIA funding, the SERRI screening tool was fully integrated into the HMH health system's new EMR, an important improvement for sustainability of the program. Two important changes were made to accommodate integration with the EMR.

- The EMR now automatically and continuously pulls new data (e.g., laboratory test results and vital sign) and processes it through the SERRI screening algorithm. This continuous screening differs from the previous approach, which updated screening data twice daily.
- A new component in the EMR requires that nurses indicate whether a patient shows signs of an infection to help determine whether the patient was actually experiencing early sepsis (or whether the SERRI algorithm had generated a false positive finding). By making the response to this item a mandatory part of the assessment, the SERRI project team expects to reduce the number of unnecessary pager alerts for second-level responders.

2.7.3 Summary of Quantitative Findings

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). Methodist Sepsis received a one-year NCE beyond June 30, 2015, and we present here estimated changes in utilization and Medicare spending updated through September 30, 2015, one quarter beyond the original HCIA intervention period. We first present results for all patients screened by the program and then for those patients who screened positive and received subsequent interventions (the treated population).

For Methodist Sepsis patients whose sepsis screening began in an ACH, the results presented below are for the following core measures:

- Total Medicare spending for 60 days including the index admission and all spending for 60 days after discharge.
- Thirty-day (all cause) readmissions to an ACH following an index admission. Index admission was defined as an admission for a patient eligible for the screening innovation, in either an intervention or comparison hospital.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

The following core measures results are presented for Methodist Sepsis patients whose sepsis screening began in an SNF, IRF or LTCH:

- Total Medicare episode spending for 60 days including the index admission and all spending for 60 days after admission. Index admission was defined as an admission for a patient eligible for the screening innovation, in either an intervention or comparison SNF or LTCH.
- Admission (transfers) from SNF or LTCH to ACH.
- Thirty-day post-admission (all cause) visits to an ACH ED following an index admission.

The Methodist Sepsis program also aimed to reduce hospital LOS and avoid complications for patients with sepsis. We therefore present results for the following additional measures:

- Inpatient LOS
- Discharge destination

Please see Technical Appendix B for a description of how each outcome measure was specified, our methods for the DD regression analyses, and how we selected a comparison group for total Medicare episode spending, 30-day hospital readmissions and ED visits, LOS, and discharge destination. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending. All regression models controlled for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred.[27] The regression model also included an indicator for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report is based on final action claims that reflected processing as of three months after initial submission for utilization outcomes, and as of six months for Medicare spending. Any adjustments processed more than three (six) months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included.[28] We believe this approach is an accurate way to capture Medicare spending.

Implementation did not take place on the same day in all participating facilities. In the graphs below, the red dotted vertical line shows the beginning of the intervention period, and the black dotted vertical lines indicate the quarters when various participating facilities began their program implementation. Estimated changes reported below were based on 10 quarters of post-implementation data for the acute care component of the intervention, and eight for the LTPAC component.

Summary of Core Measures—Acute Care Setting

Exhibit 2.7A summarizes the average effect of the Methodist Sepsis ACH screening program on total 60-day spending (including the inpatient stay and all claims in the following 60 days), 30-day inpatient

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[27] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

[28] Due to the different run out times the analytic sample sizes will vary slightly between utilization and cost outcomes.

readmissions, and 30-day ED visits per episode, pooled across all quarters.[29] The exhibit also presents the estimated effect of the program on spending aggregated across all episodes that occurred during the intervention period. Exhibit 2.7B summarizes the same measures for patients diagnosed with sepsis. We did not estimate any significant differences between intervention and comparison patients across any of the measures in either group.

Exhibit 2.7A: Core Measures Summary—Screened Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	1.59	(-9.39, 12.56)
Per episode: (N = 62,495)		
Total 60-day spending	25.38	(-150.28, 201.04)
Thirty-day inpatient readmissions	0.06	(-0.32, 0.44)
Thirty-day ED Visits	0.01	(-0.41, 0.42)

The estimated change in outcomes spans the entire intervention period from 2013Q1 through 2015Q3.

Exhibit 2.7B Core Measures Summary—Septic Patients

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	3.18	(-2.30, 8.66)
Per episode: (N = 6,119)		
Total 60-day spending	519.06	(-376.67, 1414.80)
Thirty-day inpatient readmissions	-0.67	(-1.92, 0.58)
Thirty-day ED Visits	-1.06	(-2.35, 0.23)

The estimated change in outcomes spans the entire intervention period from 2013Q1 through 2015Q3.

*p<0.1 **p<0.05 ***p<0.01

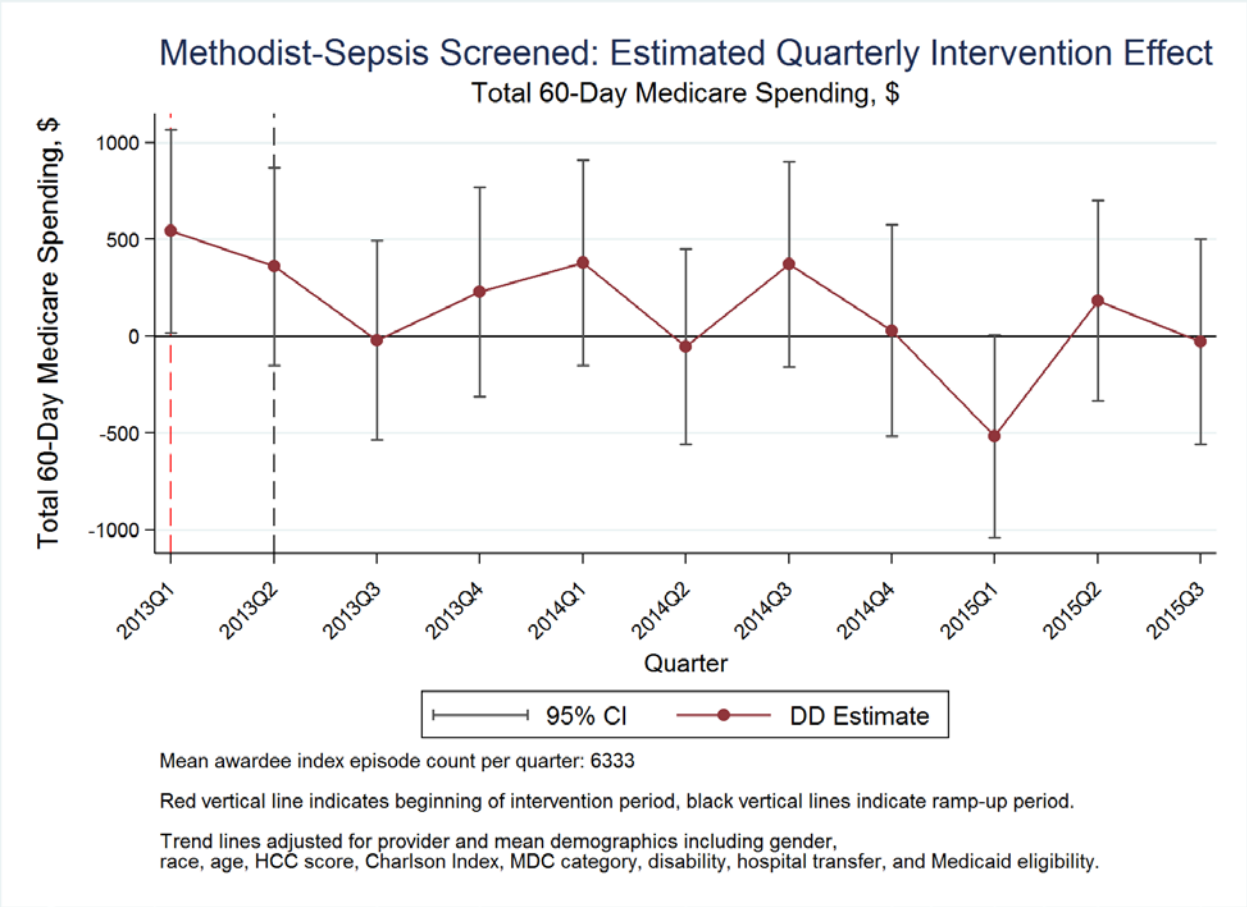
Source: Abt Associates, July 2016.

Exhibit 2.7C (60-day episode Medicare spending) includes the inpatient stay and all claims in the following 60 days, for the entire population that was screened for sepsis. Exhibit 2.7D shows the average Medicare spending per 60-day episode for the subpopulation of patients with sepsis coded on their claims. In both the larger screened population and the smaller septic subpopulation, we saw no consistent correlation between spending and the intervention. This result was consistent with the pooled estimates in Table 2.7A. Exhibit 2.7E shows that median spending per episode increased by roughly $107 per episode relative to the comparison group among the entire screened population ($p<0.01$) and by roughly $1,042 per episode among patients with sepsis coded on their claims ($p<0.10$). These combined results suggest

[29] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

that spending increased for the "typical" patients in both populations but did not change substantially among the most or least expensive patients.[30]

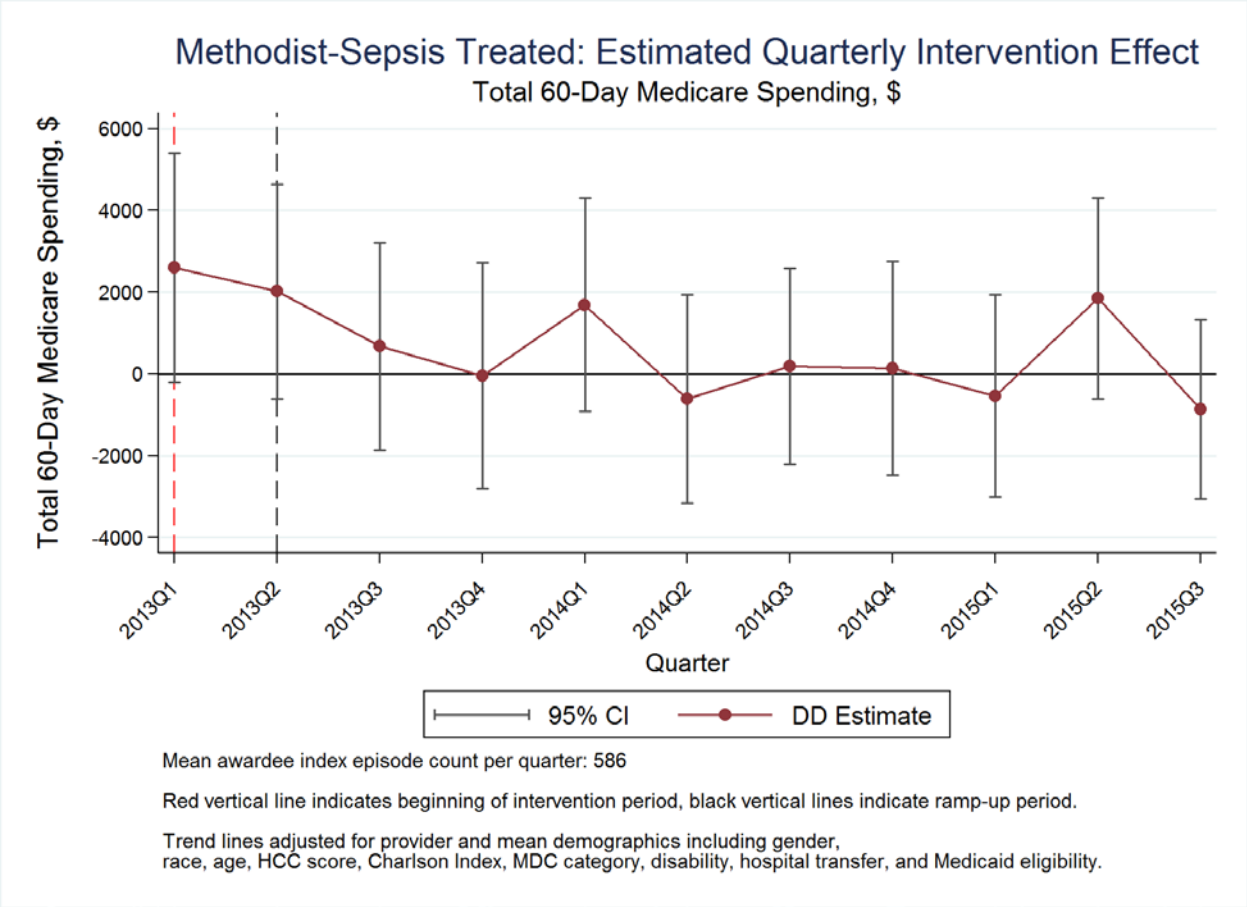
Exhibit 2.7C: Medicare Episode Spending—Acute Care Hospital Patients, Screened Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

[30] Although patients diagnosed with sepsis are more clinically serious than a typical screened patient, the median cost of a septic patient is less than the 75th percentile of the screened cost distribution. Thus, even the typical septic patient is not an extreme cost case among the general screened population.

Exhibit 2.7D: Medicare Episode Spending—Acute Care Hospital Patients, Septic Patient Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7E: DD Estimated Effect of Intervention on Median Total 60-Day Medicare Spending for Screened and Septic Acute Care Patient Populations

Methodist Sepsis: Screened		
Intervention effect ($)	Estimate	106.82***
(Median regression)	Standard error	(33.19)
	Sample size	[445,557]

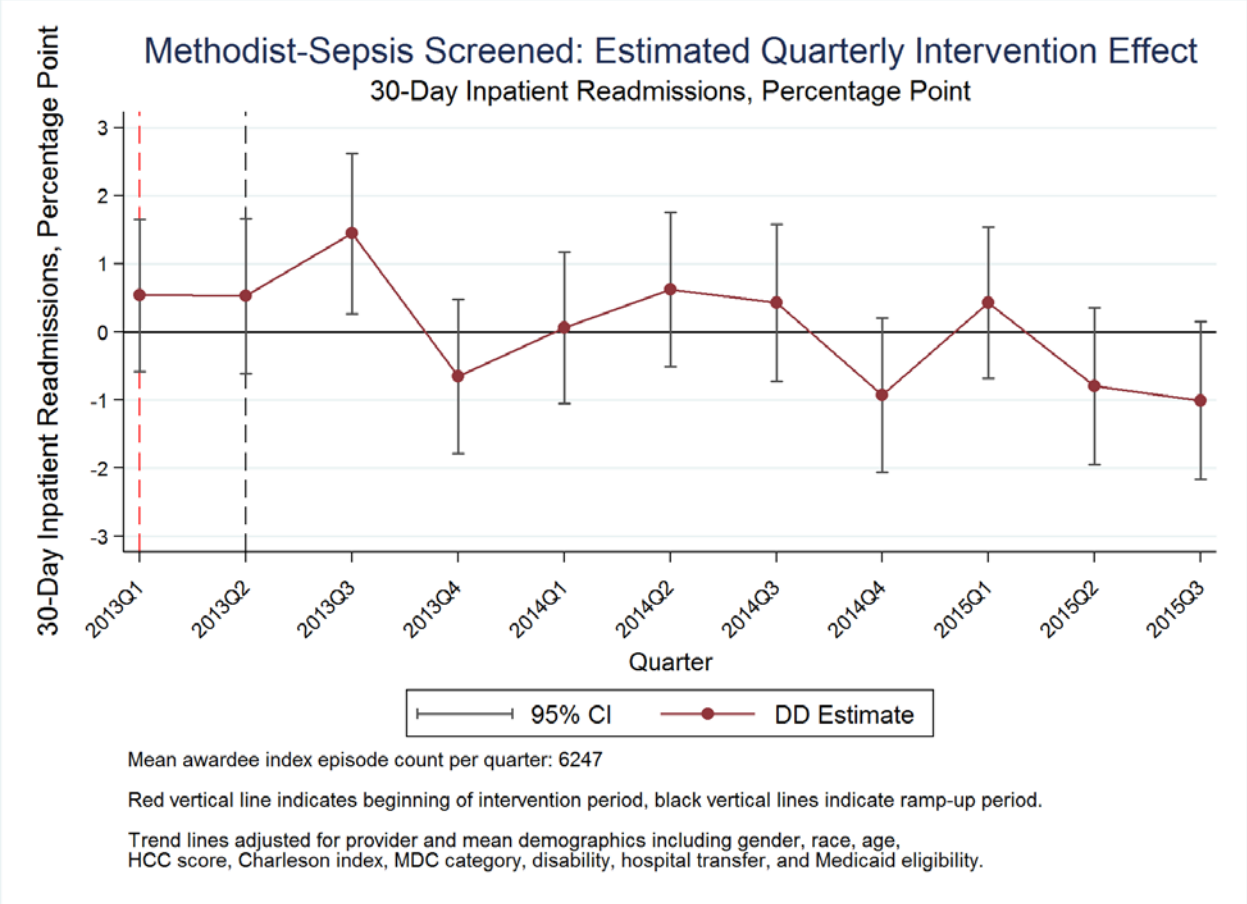
Methodist Sepsis: Received sepsis bundle		
Intervention effect ($)	Estimate	1,042.46*
(Median regression)	Standard error	(540.00)
	Sample size	[43,000]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

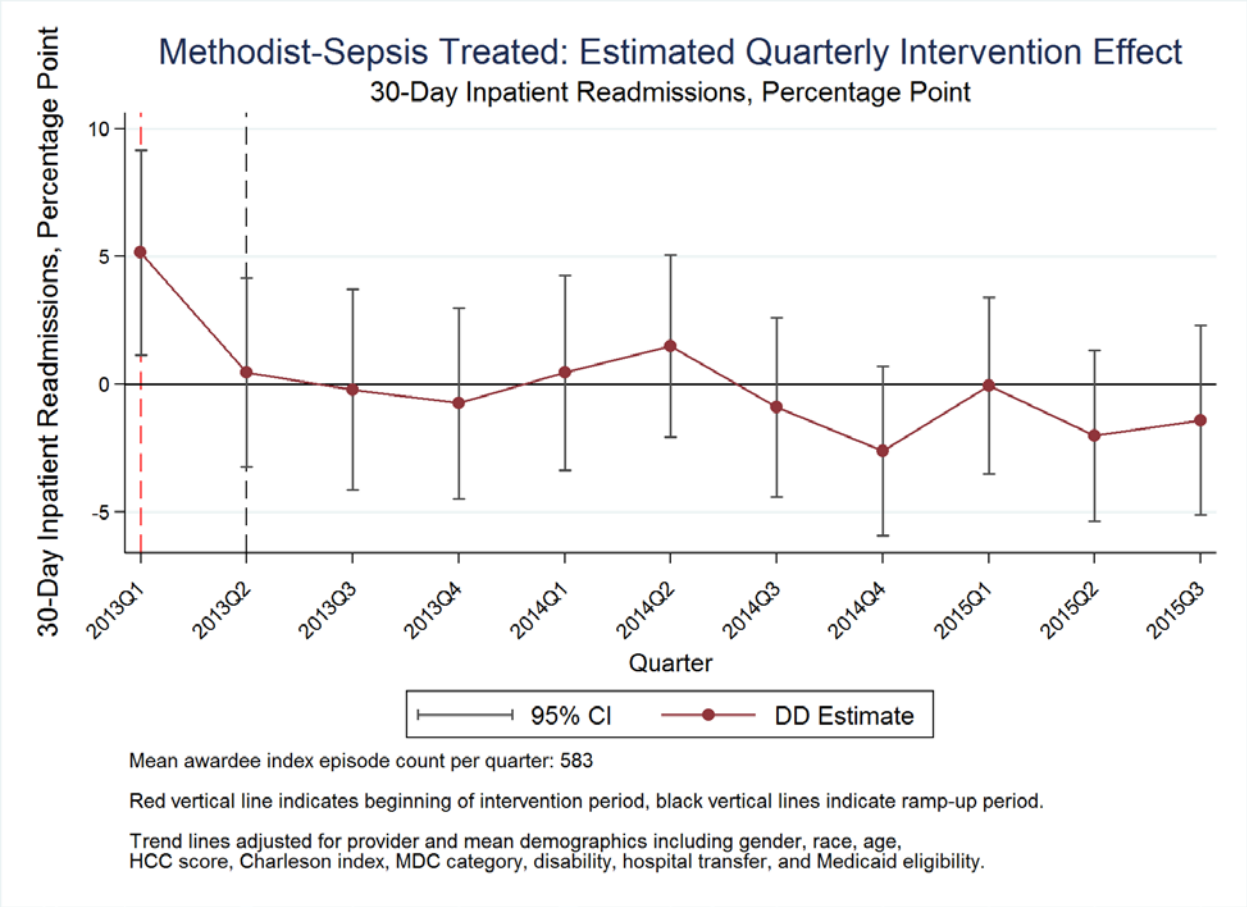
Exhibits 2.7F and 2.7G show hospital discharges followed within 30 days by a readmission. There was no consistent program impact on 30-day readmissions for patients who were first screened for sepsis in an ACH.

Exhibit 2.7F: Readmissions—Acute Care Hospital Patients, Screened Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

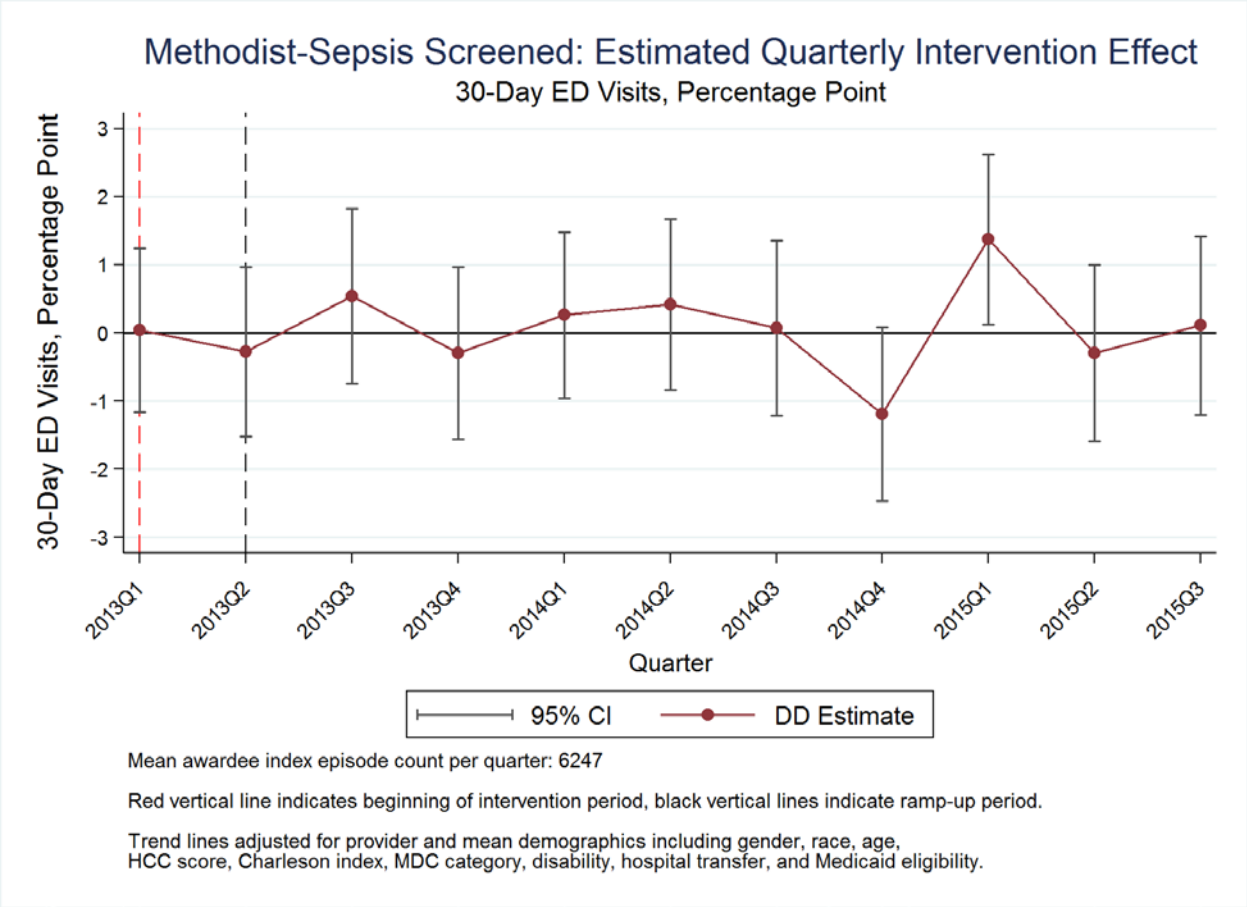
Exhibit 2.7G: Readmissions—Acute Care Hospital Patients, Septic Subpopulation



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

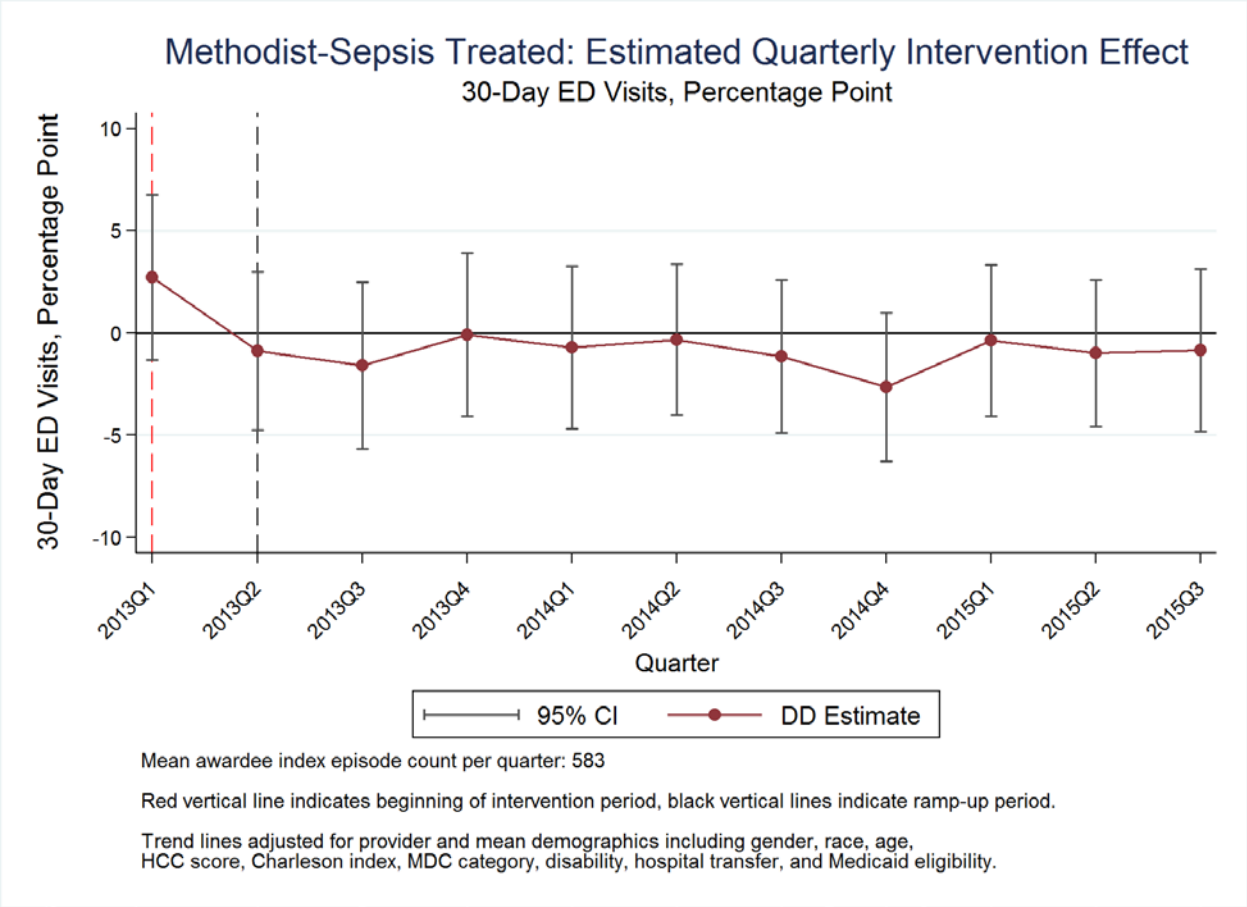
Exhibit 3.7H shows no relationship between the intervention and changes in the rate of post-discharge ED visits among patients screened for sepsis, relative to similar patients in the comparison group. However, Exhibit 2.7I shows that for the subpopulation with sepsis coded on its claims, the intervention was consistently associated with trends toward lower rates of post-discharge ED visits relative to the comparison group, although the difference was small and no individual quarterly estimate was statistically significant. It is possible that the lack of statistical significance may be due to the small sample size rather than the absence of a true underlying difference.

Exhibit 2.7H: Thirty-Day Post-Discharge ED Visits, Screened Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7I: Thirty-day Post-Discharge ED Visits, Septic Subpopulation



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

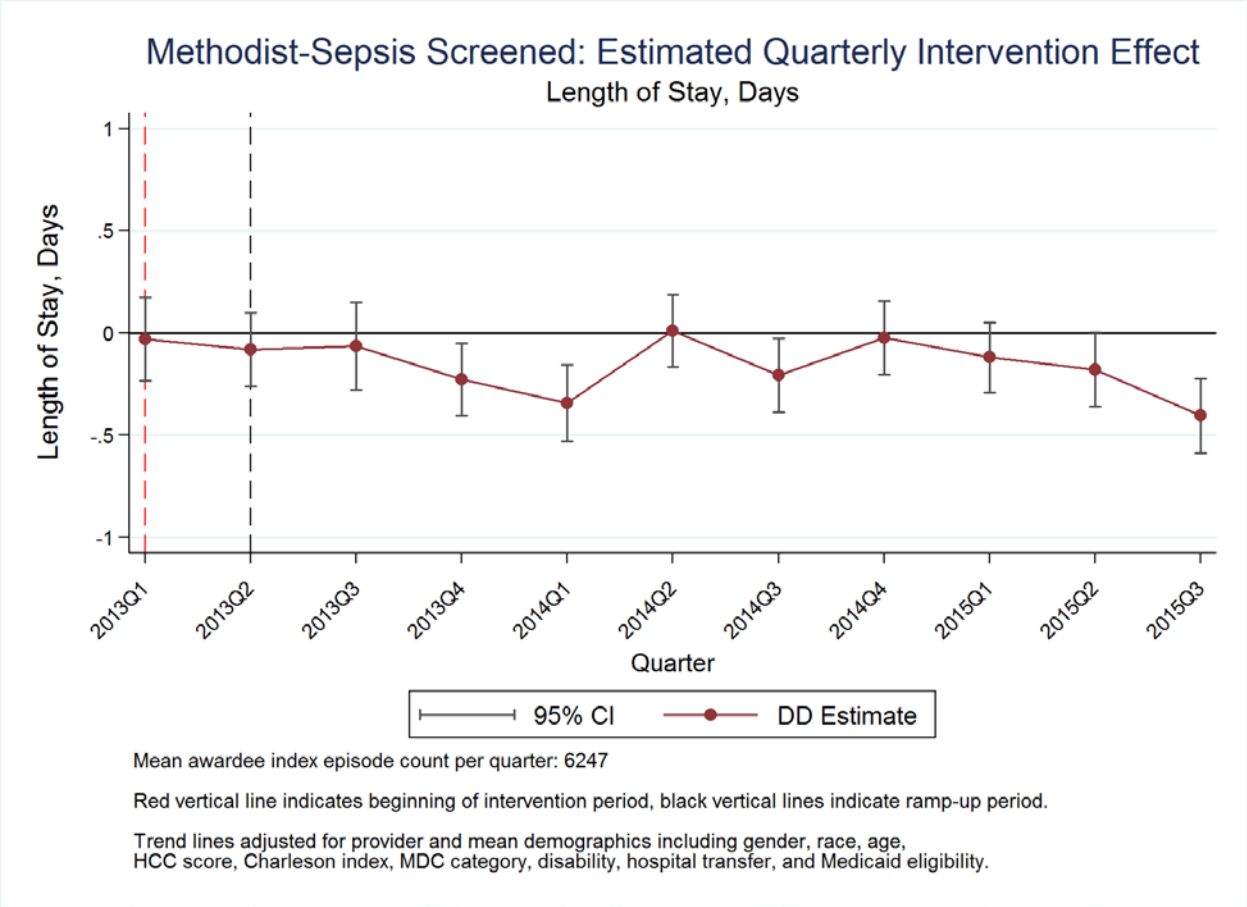
Index Admission LOS—Acute Care Patients

The Methodist Sepsis program aimed to detect sepsis early and prevent its progression to severe sepsis. We might expect to see a reduction in LOS if septic patients are identified and treated early, before the disease progresses. Exhibit 2.7J shows the impact of the program on LOS for the population of patients screened in ACHs, with some evidence that the screening reduced inpatient LOS relative to the comparison group, particularly in the most recent quarter when the estimate was statistically significant. This effect is consistent with Exhibit 2.7K, which shows that over the full course of the intervention, hospital inpatient LOS decreased relative to the comparison group by an average of 0.15 days among patients screened for sepsis ($p<0.01$).

Exhibit 2.7L shows no consistent relationship between inpatient LOS and the intervention for the subpopulation of patients with sepsis coded on its claims. The pooled estimate reported in Exhibit 2.7K was positive but not statistically significant.

This combination of results suggests that if there was an effect of the intervention on inpatient LOS, it was more apparent for the overall screened population than for the subpopulation with sepsis. This may suggest that the additional screening was identifying emerging and serious health conditions other than sepsis, which might otherwise have resulted in longer stays.

Exhibit 2.7J: Index Admission Inpatient LOS, Screened Population



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7K: DD Estimated Effect of Intervention on LOS for Acute Care Patients

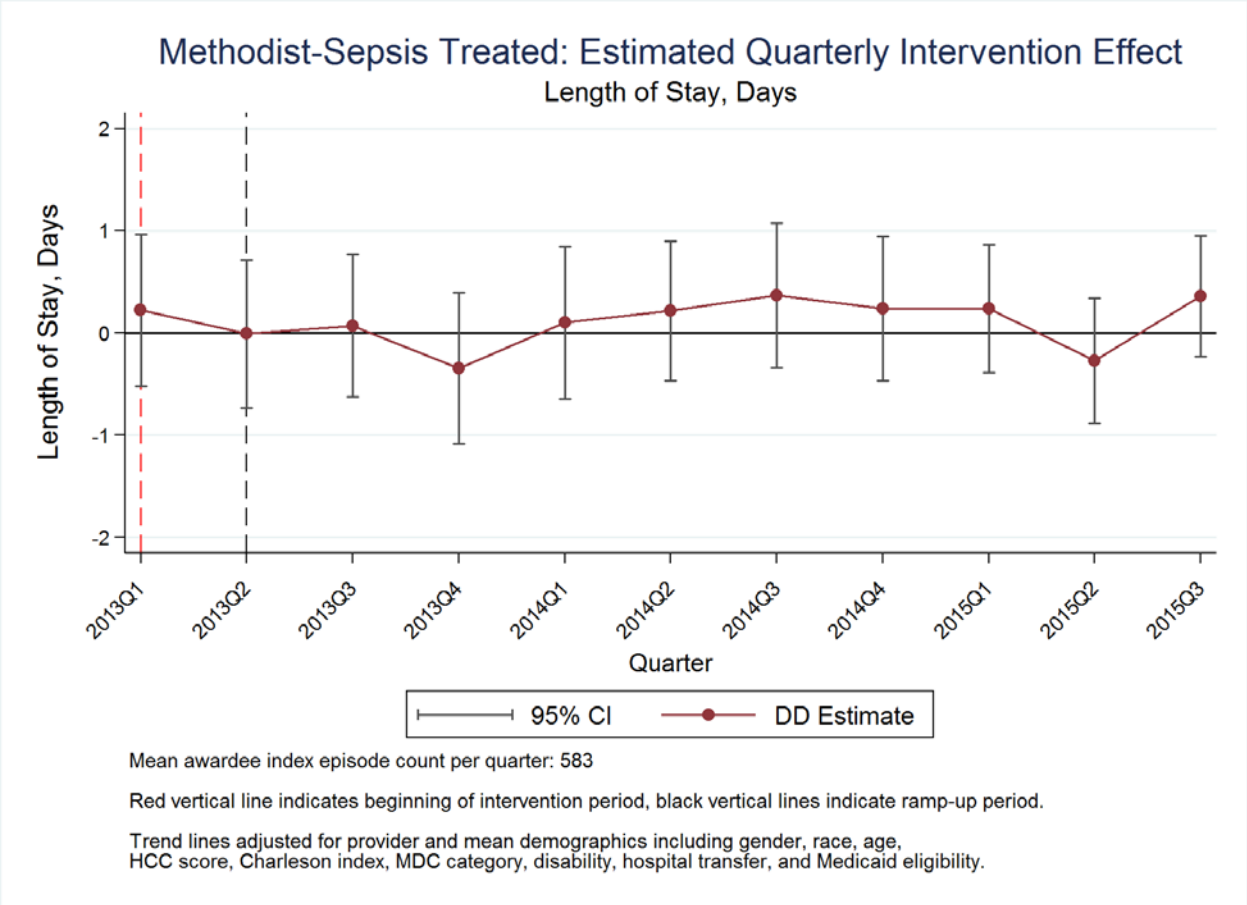
Methodist Sepsis: Screened		
Intervention effect	Estimate	-0.15***
	Standard error	(0.05)
	Sample size	[438,639]

Methodist Sepsis: Received Sepsis Bundle		
Intervention effect	Estimate	0.08
	Standard error	(0.15)
	Sample size	[42,907]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7L: Index Admission-Inpatient LOS, Septic Subpopulation



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Discharge Destinations for Acute Care Patients

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.7M shows that among hospitalized patients screened for sepsis, the rate of discharge to home without home health care declined by 2.58 percentage points ($p<0.01$) relative to the comparison group, while the rate of discharge to LTPAC institutions (IRF, SNF, LTCH) declined by 0.52 percentage points ($p<0.05$). The rate of discharge to home health care increased by 0.96 percentage points ($p < 0.01$), while the rate of discharge to "other" PAC settings (e.g., hospice, federal hospital, psychiatric hospital) increased by 2.14 percentage points ($p < 0.01$).

Among the subpopulation of septic patients, there was a significant 2.05 percentage point increase in the rate of discharge to "other" PAC settings ($p<0.01$). There were no other significant changes in discharge destination.

Exhibit 2.7M: DD Estimated Change in Episode Discharge Destination

Methodist Sepsis—Screened Population

	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Home												
DD	-1.43	-2.95**	-3.31***	-2.54***	-4.06***	-1.94***	-3.25***	-3.01***	-2.57***	-1.90***	-2.74***	-2.58***
SE	0.69	0.70	0.72	0.73	0.72	0.70	0.72	0.73	0.71	0.70	0.73	0.28
Home Health												
DD	-0.55	1.23	1.33**	1.07*	2.13***	1.41***	-0.16	1.02*	0.77	-0.07	0.92	0.96***
SE	0.49	0.54	0.56	0.57	0.59	0.56	0.53	0.57	0.56	0.53	0.57	0.22
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home												
DD	0.64	0.31	-0.30	-0.28	0.37	-0.92	1.22*	-1.00	-0.90	-1.42***	-0.91	-0.52**
SE	0.61	0.61	0.63	0.63	0.63	0.59	0.64	0.62	0.61	0.60	0.62	0.25
Other												
DD	1.34***	1.41***	2.28***	1.75***	1.56***	1.45***	2.19***	2.99***	2.70***	3.38***	2.72***	2.14***
SE	0.41	0.41	0.46	0.44	0.41	0.39	0.43	0.48	0.44	0.48	0.45	0.17

Methodist Sepsis—Septic Subpopulation

	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Home												
DD	-2.19	-3.18	-0.34	-2.34	-1.11	0.69	-0.21	-1.50	-2.18	-3.54	0.62	-1.28
SE	2.15	2.14	2.16	2.11	2.04	2.11	1.96	1.88	1.84	1.79	1.80	0.84
Home Health												
DD	-1.03	1.73	0.48	0.71	-2.82**	1.76	-1.92	0.65	0.66	0.11	-1.74	-0.07
SE	1.57	1.77	1.60	1.63	1.27	1.65	1.31	1.55	1.50	1.51	1.24	0.62
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home												
DD	4.40*	0.77	-2.19	1.75	4.26	-3.14	3.75	-3.71	-2.01	-1.71	-3.59	-0.70
SE	2.51	2.46	2.46	2.49	2.42	2.40	2.31	2.38	2.28	2.29	2.26	0.99
Other												
DD	-1.18	0.67	2.05	-0.12	-0.33	0.69	-1.62	4.57***	3.53**	5.14***	4.72***	2.05***
SE	1.54	1.62	1.71	1.63	1.53	1.64	1.37	1.88	1.69	1.80	1.77	0.70

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Summary of Core Measures—LTPAC Setting

Exhibit 2.7N summarizes the average effect of the LTPAC component of the Methodist Sepsis screening program on total 60-day spending (including the inpatient stay and all claims in the following 60 days), 30-day and 60-day inpatient admissions, and 30-day ED visits per episode, pooled across all quarters.[31,32] It also presents the estimated effect of the program on spending aggregated across all episodes that occurred during the intervention. There were no differences between screened patients and comparison patients in any of the three core measures, nor was the effect on total spending statistically significant.

Exhibit 2.7N LTPAC Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-0.91	(-4.12, 2.30)
Per episode: (N = 5,088)		
Total 60-day spending	-178.27	(-808.89, 452.34)
Thirty-day inpatient admissions	0.52	(-0.70, 1.74)
Sixty-day inpatient admissions	1.42*	(0.02, 2.81)
Thirty-day ED Visits	0.38	(-0.78, 1.54)

The estimated change in outcomes spans the entire intervention period from 2013Q3 through 2015Q3.

*p<0.1 **p<0.05 ***p<0.01

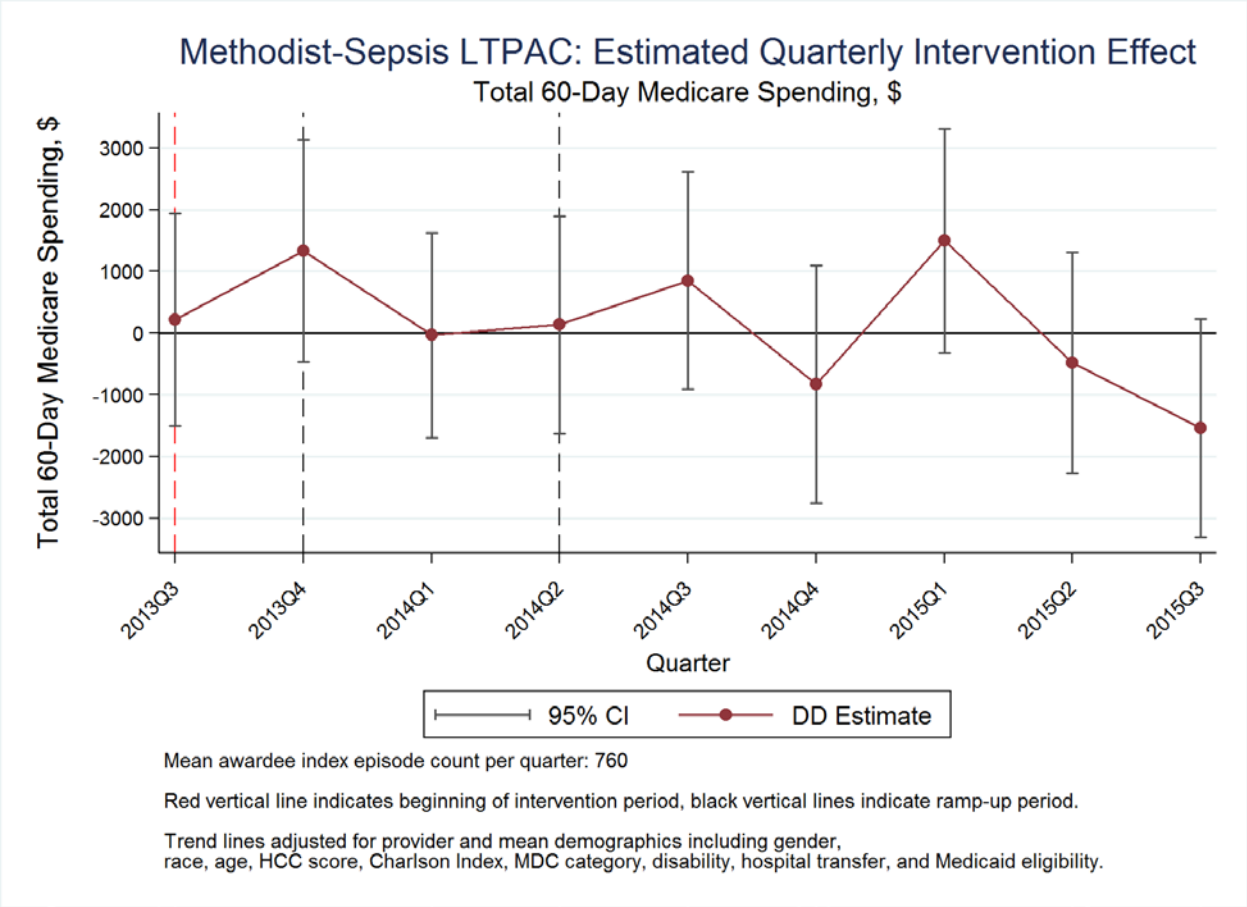
Source: Abt Associates, July 2016.

Exhibit 2.7O shows no relationship between changes in the intervention and mean Medicare episode spending for patients who were first screened for sepsis in a LTPAC setting, relative to those in the comparison group. Estimates of median Medicare episode spending from data pooled across all quarters (Exhibit 2.7P) show a small and statistically insignificant difference in spending between intervention and comparison patients.

[31] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[32] We also estimated changes in 60-day ED visits. The direction and magnitude of the effect was similar to the 30-day value, and statistically insignificant.

Exhibit 2.7O: Medicare Episode Spending—LTPAC Patients



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7P: DD Estimated Effect of Intervention on Median Total 60-Day Medicare Costs for LTPAC Patients

Methodist Sepsis LTPAC		
Intervention effect ($)	Estimate	-248.82
(Median regression)	Standard error	(413.83)
	Sample size	[115,163]

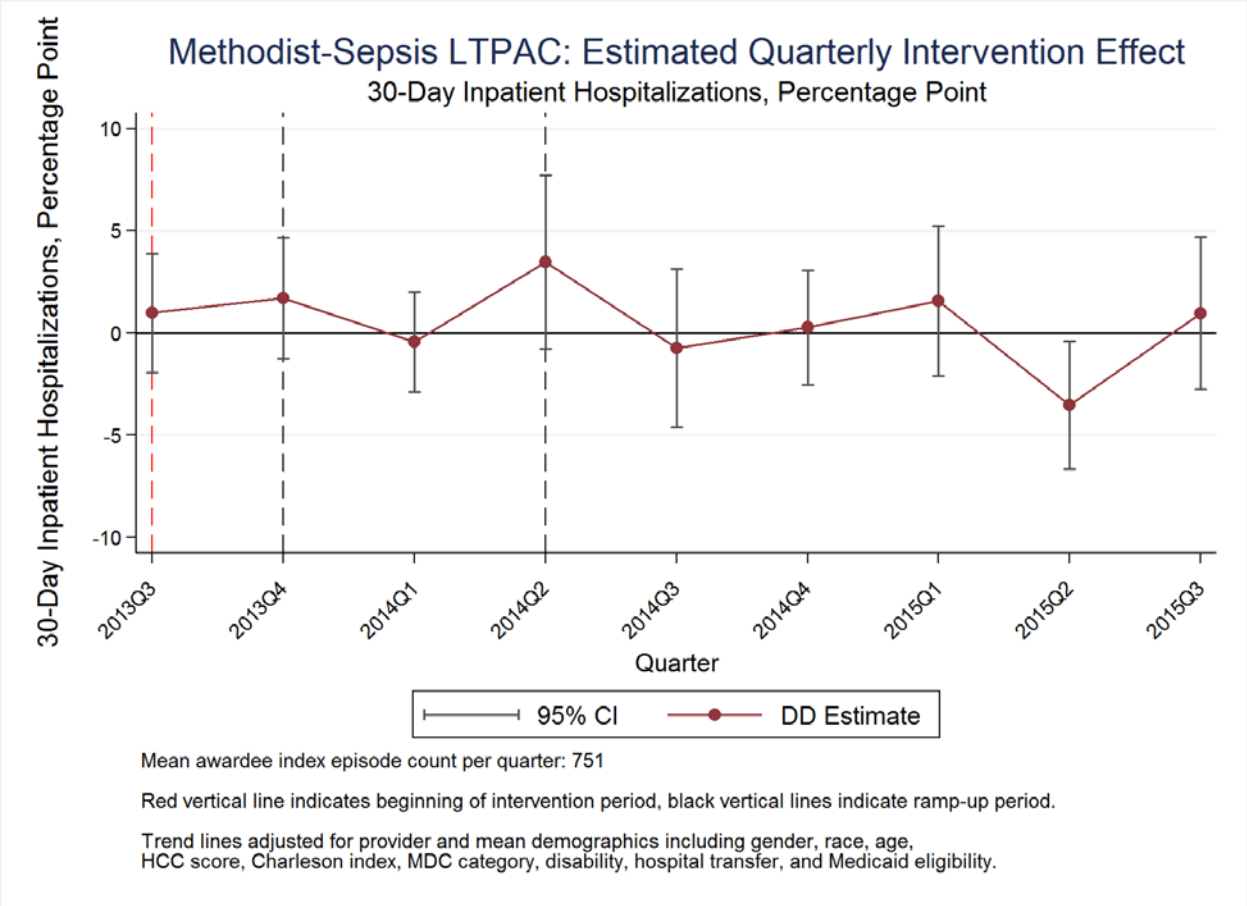
*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.7Q reflects only the patients who were first screened for sepsis while in an SNF or LTCH and shows admissions (transfers) from that facility to an ACH. The episode reported here is for 30 days after admission to the LTPAC rather than discharge. This is because discharge from the LTPAC may be days or weeks after receipt of the screening. We assume that all intervention patients had at least some of the sepsis screening during those 30 days (because few LTPAC stays last longer than 30 days). There was no consistent relationship between the intervention and changes in hospital admissions. Likewise, the estimated quarterly intervention effect shown in Exhibit 2.7R does not indicate a consistent relationship

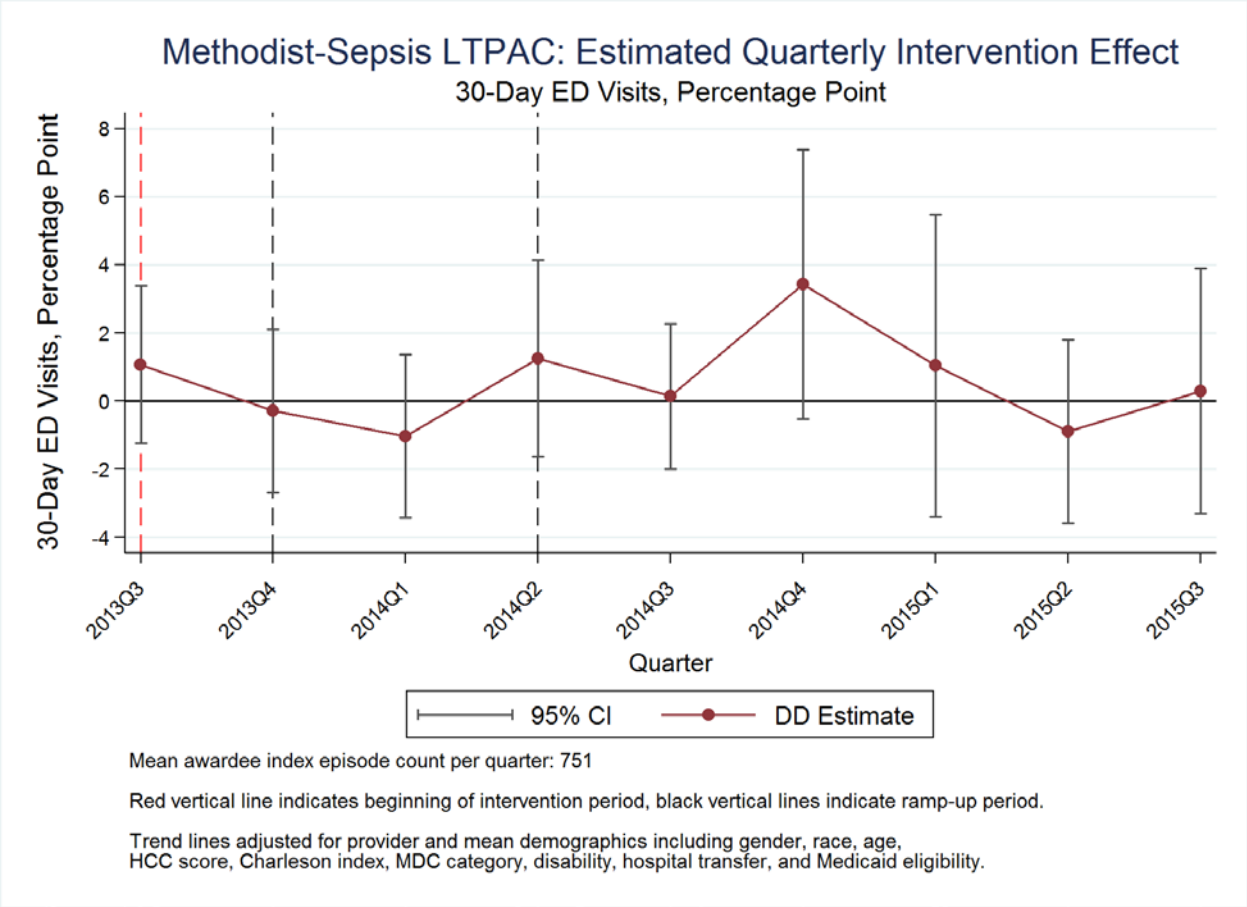
between the intervention and change in the rate of 30-day ED visits. The lack of quarterly trends is consistent with the statistically insignificant pooled estimates reported in Exhibit 2.7N above.

Exhibit 2.7Q: Hospital Admissions—LTPAC Patients



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.7R: Thirty-Day Post-Admission ED Visits—LTPAC Patients



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Conclusions

- The Methodist sepsis screening program was associated with a small but significant increase in median Medicare episode spending for patients screened in the acute care setting, relative to the comparison group. The increase equaled $107 per 60-day episode ($p<0.01$). The estimated change in average Medicare spending was less than $30 and statistically insignificant, indicating that the increased costs is being driven by "typical" patients rather than extremely high-cost or low-cost patients. Among screened patients, discharges directly home without additional care decreased 2.58 percentage points ($p<0.01$) relative to the comparison group, while discharges to an institutional LTPAC setting decreased by 0.52 percentage points (0.05). These declines were offset by a 0.96 percentage point increase in discharge to home health care ($p<0.01$) and a 2.14 percentage point increase in discharge to non-LTPAC institutional settings (e.g., hospice, federal hospital, psychiatric hospital) ($p<0.01$). Additionally, average inpatient LOS declined by 0.15 days for patients screened while in the hospital ($p<0.01$) relative to the comparison group. Taken together, these results suggest that screening detected patient needs that required more PAC. While more patients were transferred to the less costly home setting, more were also transferred to other PAC facilities. On balance, this change in discharge destination slightly increased costs.

- Among patients at Methodist hospitals with sepsis coded on their claims there were no statistically significant changes in mean Medicare spending, rate of inpatient readmissions or ED visits, or inpatient LOS. However, median Medicare spending increased by $1,042 per episode, suggesting that spending increased for the "typical" septic patient, more than for the highest or lowest cost septic patients. Quarterly estimates of the change in rate of ED visits suggest that screening reduced ED visits relative to similar patients in comparison facilities. Although the pooled point estimate is a modest and insignificant 1.06 percentage points, this represents a roughly four percent reduction in ED visits, and the lack of significance may be due to small sample size rather than lack of a true effect. Patients diagnosed with sepsis at a Methodist hospital were 2.05 percentage points more likely to be discharged to non-LTPAC institutional settings (e.g., hospice, federal hospital, psychiatric hospital) than were comparison patients ($p<0.01$), but there were no other significant changes in the pattern of discharge destination.
- When data are pooled across all quarters to increase sample size, none of the estimated effects were statistically significant for the LTPAC patients. The LTPAC sepsis screening program did not appear to be influencing any of the outcomes we were able to measure using claims data.

2.7.4 Summary of Patient Survey Results

To address questions related to care quality and patient satisfaction, a sample of ACH beneficiaries who were screened and treated for sepsis were surveyed. The survey included questions in the following five domains:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

After the removal of decedents, a total of 1,369 beneficiaries (intervention and comparison groups combined) remained for the survey. Of these, 542 completed at least one survey question, representing an overall response rate of 40 percent (42 percent and 37 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer those questions), we replaced the missing values for age and gender using information from that individual's Medicare administrative data.

The Exhibit 2.7S presents the demographics of beneficiaries selected for the survey sample and the actual respondents. For a detailed description of the Methodist Sepsis patient survey methodology and results, please refer to the Methodist Sepsis Clinic Patient Survey Report in Appendix C.

Exhibit 2.7S: Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	203	32%	267	36%	71	27%	35%	79	29%	30%
65-74	204	32%	241	33%	97	37%	48%	109	39%	45%
75-84	135	21%	147	20%	63	24%	47%	58	21%	39%
85+	88	14%	84	11%	34	13%	39%	31	11%	37%
Race										
White	417	66%	351	47%	191	72%	46%	186	67%	53%
Nonwhite	209	33%	260	35%	72	27%	34%	91	33%	35%
Unknown	4	1%	128	17%	2	1%	50%	0	0%	0%
Gender										
Male	290	46%	369	50%	128	48%	44%	141	51%	38%
Female	340	54%	370	50%	137	52%	40%	136	49%	37%
Total	630		739		265		42%	277		37%

Source: Abt Associates HCIA Patient Survey.

Patient Survey Results

The sample consisted of patients with sepsis coded on their ACH claims, not with the larger population who were screened for sepsis in the SERRI program. Overall, we observed no statistically significant differences between intervention and comparison survey respondents related to health outcomes, health-related quality of life, satisfaction with care, or care experiences. Intervention and comparison respondents gave very similar responses across all these domains. However, findings from multivariate logistic regression models indicate that being in the intervention group may be associated with lower probability of being able to walk more than a mile, several months after hospital discharge. We note that none of our qualitative or quantitative results indicates that more-limited mobility could be due to the sepsis screening and treatment interventions. It is likely that there was an unobservable but important difference between intervention and comparison patients in the survey populations that generated this result, and we do not believe it was due to the SERRI program.

2.7.5 Synthesis of Findings

We separately analyzed data for the entire screened population of patients in participating facilities and for the subpopulation of patients who had sepsis coded on their claims. We also examined outcomes for ACHs separately from outcomes for patients who first encountered the screening intervention while in PAC facilities (SNFs and LTCHs). A synthesis of findings from all available sources indicates the following:

- We found no statistically significant changes among the screened population of patients that we attribute to the intervention in terms of rates of readmissions or post-discharge ED visits. The

program was associated with a small but significant increase in median Medicare episode spending for patients screened in the ACH but not in the LTPAC. For screened ACH patients, we did find a statistically significant reduction of 0.15 days in average inpatient LOS ($p<0.01$). We also found a significant decrease in the percentage of screened ACH patients being discharged to home without additional care, and a corresponding increase in discharges to a care setting such as home health, intermediate care facilities, or other outpatient care.

- For the subset of patients in whom sepsis was detected (and coded on Medicare claims), median spending increased roughly $1,042 per episode in the ACH settings. We found no statistically significant change among patients with sepsis in any of our core utilization measures, relative to a matched comparison group. We did find a statistically significant decrease in septic patients being discharged from ACHs to home without home health care, relative to the comparison group, and this decrease was not offset by increased discharges to any other location.
- Patient survey results similarly indicated no statistically significant differences between intervention and comparison patients, other than a difference in mobility that we believe was due to unobserved differences between respondents rather than attributable to the intervention.
- There are four factors that may in part explain the general lack of significant program impacts.
  - For various organizational reasons, the participating ACHs did not use the screening tool in EDs and ICUs, where it might have most value, potentially lessening the gains the program could have achieved in ACHs.
  - Many hospitals and LTPAC facilities had sepsis programs in place prior to this intervention because of widespread recognition that sepsis is a leading cause of morbidity and mortality. The comparison facilities used in our analyses, especially ACHs, may also have implemented sepsis programs in recent years, and the HMH program would have needed to exceed the impact of any comparison programs in order to be detected as significant in our analyses.
  - Patients in LTPAC facilities who show early signs of sepsis usually cannot receive aggressive fluid resuscitation in those settings. Physicians are reluctant to order this care in facilities where no physician is present 24/7 and instead prefer to transfer patients to a hospital for safe treatment.
  - Vital sign monitoring may have detected conditions other than sepsis—conditions that might not have been noticed or treated as aggressively, in the absence of this screening program. Although this may have added to costs for some populations, it may also indicate better care if emerging problems were identified and treated earlier.

2.8 Mount Sinai School of Medicine

2.8.1 Introduction

Mt. Sinai received an HCIA to implement the Geriatric Emergency Department Innovations in Care through Workforce, Informatics, and Structural Enhancements (GEDI WISE) program. GEDI WISE provided enhanced services to ED patients aged 65 and older with the goal of reducing inpatient hospital admissions from the ED, as well as return visits to the ED. The program aimed to change the paradigm for treating older adults in EDs who are at risk for admission to the hospital. By augmenting and training ED staff, enhancing staff-to-patient ratios, and improving the built environment in EDs, the GEDI WISE program allowed more time and staff resources to make careful decisions regarding hospital admission for these borderline cases. Algorithms for patient care and protocols tailored to treating older patients in the

ED were used by new staff hired for the program and by existing ED staff including NPs, geriatric liaisons, social workers, pharmacists, and physical therapists.

The GEDI WISE award involved three hospital EDs: Mt. Sinai Hospital in New York, New York; Saint Joseph's Hospital (SJH) in Patterson, New Jersey; and Northwestern Hospital in Chicago, Illinois. The three EDs incorporated somewhat different innovations as part of their program in five overarching areas:

- **Geriatric ED (Geri-ED)**: Structural enhancements were made to the ED physical environment such as non-slip floors, skylights, diurnal lighting, bars along the walls, larger signage, beds rather than stretchers, and multiple bathrooms.
- **ED multidisciplinary care coordination**: All GEDI-WISE hospitals utilized a multidisciplinary care coordination approach. At Mt. Sinai the interdisciplinary rounds were led by a geriatrician and held five days a week in addition to the usual ED rounds that occurred at shift sign-out. The entire care management team participated on the interdisciplinary rounds.
- **Transitional care:** Social workers or nurse liaisons facilitated discharges from the ED to the community and provided follow-up care. At Mt. Sinai social workers were available to support night discharges to home from the ED. Nurses (SJH and Northwestern) or NPs (Mt. Sinai) made follow-up calls at scheduled intervals (e.g., 24-48 hours, within seven days, and 28 days after discharge from the ED) to ensure that the patient was stable.
- **Workforce education and training on geriatric-specific care protocols:** Training was provided in all GEDI-WISE EDs. At Mt. Sinai, all ED staff (Geri-ED and main ED) received a two-hour interactive lecture about communicating with older patients in the ED. Ongoing training consisted of periodic didactic training for nurses and ED physicians and intensive training workshops for the GEDI WISE teams, although these trainings were not mandatory. The SJH nurses took a 16-hour Nurses Improving Care for Health System Elders (NICHE)[33] training and a structured four-hour training every year. At Northwestern, nurse liaisons received in-depth education including shadowing and attending inpatient geriatric rounds, and took an eight-hour NICHE training.
- **Informatics-enhanced clinical communication and patient monitoring:** The GEDI WISE program used several technological innovations. They implemented a screening process that displayed the results of patient assessments on a geriatric tracking board in the main ED triage area, which was reviewed by the geriatric NP and pharmacist to decide which patients would be seen in the Geri-ED. In addition, clinical protocols were embedded in the EMR to guide patient care such alternative/safer medications for older patients; a special EMR template for social workers to facilitate care coordination; and appointment scheduling used by the NP (at Mt. Sinai) to ensure that patients had follow-up visits scheduled with their PCP before leaving the ED. Specific informatics and patient monitoring varied across the three EDs.

GEDI WISE services were expected to decrease hospital admissions from the ED, with patients instead being referred to sub-acute care (if they'd had a qualifying hospitalization within the prior 30 days), long-term care (without a prior hospital admission), hospice, or home. Supporting safe transitions and reducing the repeated ED visits was another important program goal. For example, ED staff at Mt. Sinai were trained to identify older patients who live alone or without adequate social supports, and arrange additional services before sending patients home.

[33] http://www.nicheprogram.org/

2.8.2 Summary of Qualitative Findings

As described earlier, qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain the programs after HCIA funding ended and barriers and facilitators for replicating the program in other EDs. These new findings regarding sustainability are presented below.

Implementation Effectiveness

Despite the overarching similarities in philosophy and areas of focus for the three GEDI WISE sites, there were differences in historical context, how funds were allocated, specific program components, and implementation processes. For example, both Mt. Sinai and SJH had dedicated geriatric ED units where only geriatric patients were treated (Geri-EDs). At Mt. Sinai, the Geri-ED was only 14 beds which filled rapidly each morning; the geriatric population was much larger, and older patients in both the Geri-ED and the main ED received GEDI WISE services. At SJH, the Geri-ED space was large enough to accommodate all eligible geriatric patients, and the team delivered all the GEDI WISE services within that dedicated space. At Northwestern, although there were structural enhancements made on the second floor of the ED, patients of all ages were admitted to this space; there was no dedicated Geri-ED, and older patients received GEDI WISE throughout the ED.

The GEDI WISE program at SJH was well established before the HCIA award and components, including structural improvements, had been in place for more than a decade. HCIA funds dedicated to SJH were modest and supported the hiring of 2.5 full-time equivalent positions, including one Social Worker and one Advanced NP, while existing hospital staff delivered other components of the program. The programs at Mt. Sinai and Northwestern were entirely new, and HCIA funds were used to make structural changes in the EDs, hire new staff, and train new and existing staff. As a result of the GEDI WISE program, all staff agreed that the culture and approach toward treating older patients changed in the three participating EDs. Although the process took time to gain traction, the Mt. Sinai GEDI WISE leadership team reported greater collaboration and teamwork across its team. For example, early in the program GEDI WISE staff had had to seek out geriatric patients in the ED and intercept them before they were admitted to the hospital. By the end of the program older patients were being held in the ED overnight (rather than being admitted to the hospital) so that they could be seen by the GEDI WISE NP in the morning.

Workforce

At all three participating EDs, the GEDI WISE program hired new staff and also re-assigned existing ED staff, but the type of staff differed. For example, at Mt. Sinai, volunteers were used to reduce the burden on nurses and contribute to the friendly and less rushed atmosphere in the Geri-ED, and interdisciplinary rounds included a neuropsychologist. When the program was fully implemented, in addition to volunteers, the Mt. Sinai GEDI WISE program employed one full-time NP, one full-time RN, and a part-time per diem NP.

The GEDI WISE program at SJH included a harpist and a pranic (alternative medicine energy healing system) healer, who added holistic elements to the care model. A physician was also hired for three days a week to serve as a consultant in a Geri-ED-based palliative care program to help patients and families define goals for end-of-life care. At Northwestern, the GEDI WISE program centered on highly trained nurse liaisons who worked closely with an ED social worker to deliver GEDI WISE care management and transitional care services.

All staff involved in the GEDI WISE program, including physicians, NPs, nurses, nurse liaisons, social workers, and volunteers, participated in some form of training in all three locations. Raising awareness of the needs of older patients in ED settings across the system was a major goal of the GEDI WISE program, and training was designed to encourage ED staff to ask questions about a patient's home setting, lifestyle, self-care abilities, and to focus on safe transitions from ED to home.

Sustainability and Spread

The GEDI WISE program will continue in some form at each of the three EDs, although diminished in some locations. SJH had a robust geriatric ED program prior to the HCIA funding, and it continues. Mt. Sinai and Northwestern expected to receive funding from their respective hospital systems to retain program staff, although Northwestern was receiving funding to continue GEDI WISE on its main Northwestern Hospital campus but not in its community hospital. Mt. Sinai staff told us that the program will be absorbed under a larger initiative called Transitions of Care from the ED (TRACED) through which care coordination services will be offered to older ED patients as well as to other patients who use the ED repeatedly (e.g., those with sickle cell disease, substance abuse disorders, homelessness, undocumented status). This transition to TRACED had not yet been implemented at the end of the HCIA funding period.

The greatest challenge to sustaining the GEDI WISE program was supporting additional staff positions while demonstrating to hospital leadership that the program is profitable—at least in part by reducing unreimbursed hospital readmissions. While both the Mt. Sinai and Northwestern programs expected to receive additional funds from their respective hospitals, staff struggled to show how the program impacts the hospitals' bottom line. The Mt. Sinai PI is seeking additional funding to support a biostatistician and analytic staff to continue analyses of the data generated from the GEDI WISE program in the hope of finding empirical evidence of the positive impacts of the program.

To foster replicability of the GEDI Wise program, one of Mt. Sinai's PIs received funding from the John A. Harford Foundation to convene a Geriatric Emergency Department Collaborative (GEDC). Its purpose was to build a network of hospitals to implement GEDI WISE components, analyze data to generate evidence of financial value, create a data infrastructure, and seek endorsement from national associations such as the American Geriatrics Society and American College of Emergency Physicians.

2.8.3 Summary of Quantitative Findings

Many patients who seemed eligible according to Awardee program definitions (65 years or older, multiple prior ED visits or hospitalizations) were not in the patient registries submitted by the three hospitals, which limited our ability to create a well-matched comparison group. This was especially true for Mt. Sinai, where the small Geri-ED served relatively few patients (who were in the registry), but training improved services for all older patients throughout the main ED (who were not in the registry). The incomplete patient registries did not support creation of a comparison group matched to the specific patients who received Geri-ED services. Instead we used an intent-to-treat approach and included all patients meeting target population definitions, in both intervention and comparison EDs, because staff training throughout the ED was intended to improve care for all older patients, not just those served in the dedicated Geri-ED space. This approach likely reduced the measured impact of the program, because patients who received the most intensive program services (in the Geri-EDs) were combined with others who received few program services in the larger EDs (especially at Mt. Sinai, where the main ED was very large and the Geri-ED quite small). Please see Technical Appendix B for a description of the limitations of comparison group matching for the claims analyses.

A patient survey was not conducted for this larger intent-to-treat population.

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). Since Mt. Sinai was an ED program, the core measures differed slightly from those specified by CMS. Although Mt. Sinai did receive an NCE, its program staff advised that HCIA funds were not used to serve new patients after June 30, 2015. We therefore present estimated changes in utilization and Medicare spending updated through June 30, 2015, which accounts for the entire three-year intervention period.

The Mt. Sinai program had the potential to reduce costs for patients who visited the ED, and we therefore present results for the following measure:

- Total Medicare spending for 60 days including the index ED visit and all spending for 60 days after discharge

We also present the results for the following core measures:

- The number of additional (return) ED visits in the 30 days after inpatient discharge or discharge from the index ED visit.
- The rate of hospitalizations in the 30 days after inpatient discharge or discharge from the ED
- Index ED visits that result in a hospitalization. An index ED visit was defined as a visit in which the patient was eligible for the GEDI WISE interventions, in either an intervention or comparison ED.

Please see Technical Appendix B for a description of how each outcome measure was specified, our methods for the DD regression analyses, and how we selected a comparison group for total Medicare episode spending, ED visits that result in a hospitalization, and 30-day hospital readmissions from the ED.

Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. We additionally report median regression estimates of 60-day Medicare cost.[34]

All regression models controlled for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred.[35] The regression model also included an indicator for individuals with missing HCC scores.

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[34] The lone exception is discharge destination, where quarterly estimates are reported in table form due to the multitude of possible outcomes.

[35] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

The analyses reported below are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. We used claims data for all periods reflecting final action claims processing as of three months after initial submission for utilization outcomes, and as of six months for Medicare spending. Any adjustments processed more than three (six) months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

Implementation did not take place on the same day in all participating EDs. In the graphs below, the red dotted vertical line shows the beginning of the intervention period, and the black dotted vertical lines indicate the dates when other EDs began implementation. Estimated changes reported below were based on 11 quarters of post-implementation data.

Summary of Core Measures

Exhibit 2.8A summarizes the average effect of Mt. Sinai's program on total 60-day spending (including the inpatient stay and all claims in the following 60 days), rate of 30-day inpatient readmissions, and total 30-day ED visits per episode, pooled across all quarters.[36,37] The exhibit also reports the estimated effect of the program on total Medicare spending aggregated across all episodes that occurred during the intervention period. There were no significant differences between the intervention and comparison groups in any of the core measures.

Exhibit 2.8A: Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	-7.51	(-16.81, 1.78)
Total ED visits	254.45	(-192.13, 701.30)
Per episode: (N = 67,615)		
Total 60-day spending	-111.14	(-243.61, 26.33)
Thirty-day inpatient hospitalization	0.19	(-0.19, 0.56)
Total 30-day ED visits	0.00	(-0.00, 0.01)

The estimated change in outcomes spans the entire intervention period from 2012Q4 through 2015Q2.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016

The Mt. Sinai program was effectively three distinct interventions, each offering a different array of services and each having a relatively large volume of patients. We therefore estimated separate changes in average Medicare spending per episode for each of the three participating facilities. Exhibit 2.8B shows that spending decreased significantly at the Mt. Sinai and Northwestern University sites, but increased

[36] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[37] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day total ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

significantly at the St. Joseph's site ($p<0.05$). Combined, these results yielded a small but insignificant decline in total spending at the pooled Award-level.

Exhibit 2.8B: Hospital-Level Changes in Total 60-day Medicare Spending

Outcome	Estimate	90% CI
Aggregated results: Total spending (in millions)		
Mt. Sinai Hospital	-9.69**	(-14.9, -4.5)
St. Joseph's Hospital	9.55**	(4.6, 14.5)
Northwestern University Hospital	-6.68**	(-10.5, -2.9)
Per episode: Total 60-day spending		
Mt. Sinai Hospital (N = 25,282)	-383.29**	(-587.82, -178.77)
St. Joseph's Hospital (N = 22,717)	420.25**	(202.07, 638.43)
Northwestern University Hospital (N = 19,616)	-340.57**	(-534.02, -147.12)

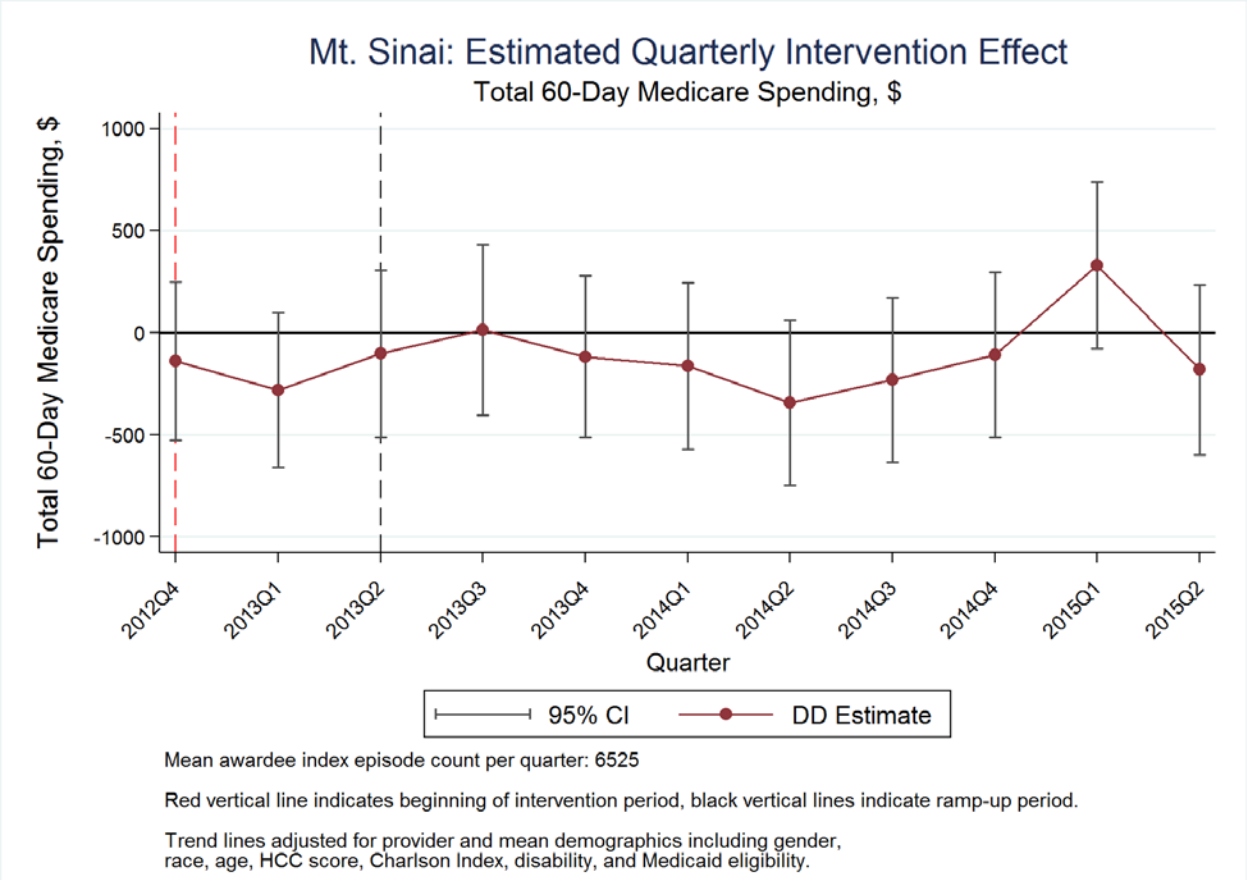
The estimated change in outcomes spans the entire intervention period from 2012Q4 through 2015Q2 for Mt. Sinai and St. Joseph's, and from 2013Q2 through 2015Q2 for Northwestern University.

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016

Exhibit 2.8C shows total Medicare episode spending during the 60 days following an index ED visit, pooled across all three hospitals, whether or not the patient was hospitalized as part of the initial encounter. The quarterly estimates show some evidence that average Medicare episode spending was lower for intervention patients relative to comparison patients, although no quarterly estimate was statistically significant. Exhibit 3.9D indicates that the program had no effect on median Medicare spending, suggesting that any small reduction in spending that occurred was among the most or least expensive patients and not the more "typical" patient.

Exhibit 2.8C: Total Medicare Episode Spending During 60 Days After an Index ED Visit



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.8D: DD Estimated Effect of Intervention on Median Total 60-Day Medicare Spending

Mt. Sinai		
Intervention effect ($)	Estimate	-5.34
(Median regression)	Standard error	(14.95)
	Sample size	[402,254]

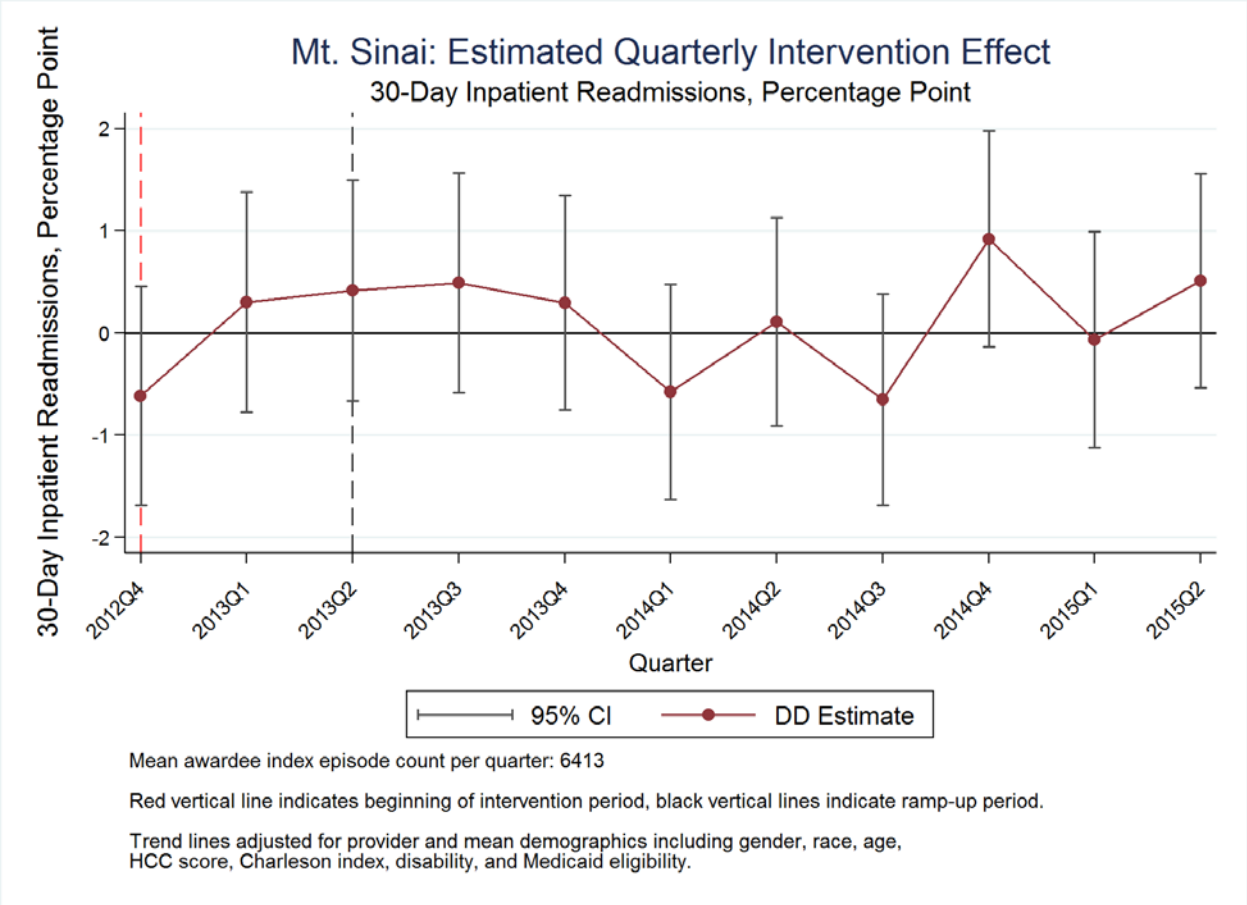
*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Hospitalizations during 30 Days Following an Index ED Visit

Exhibit 2.8E shows index ED visits where the patient had at least one hospitalization in the 30 days after the ED visit, whether the patient was discharged directly from the ED or admitted from the ED to the hospital. There was no consistent pattern of changes in the rate of post-ED hospitalizations, which is consistent with the small and insignificant point estimate reported in Exhibit 2.8A.

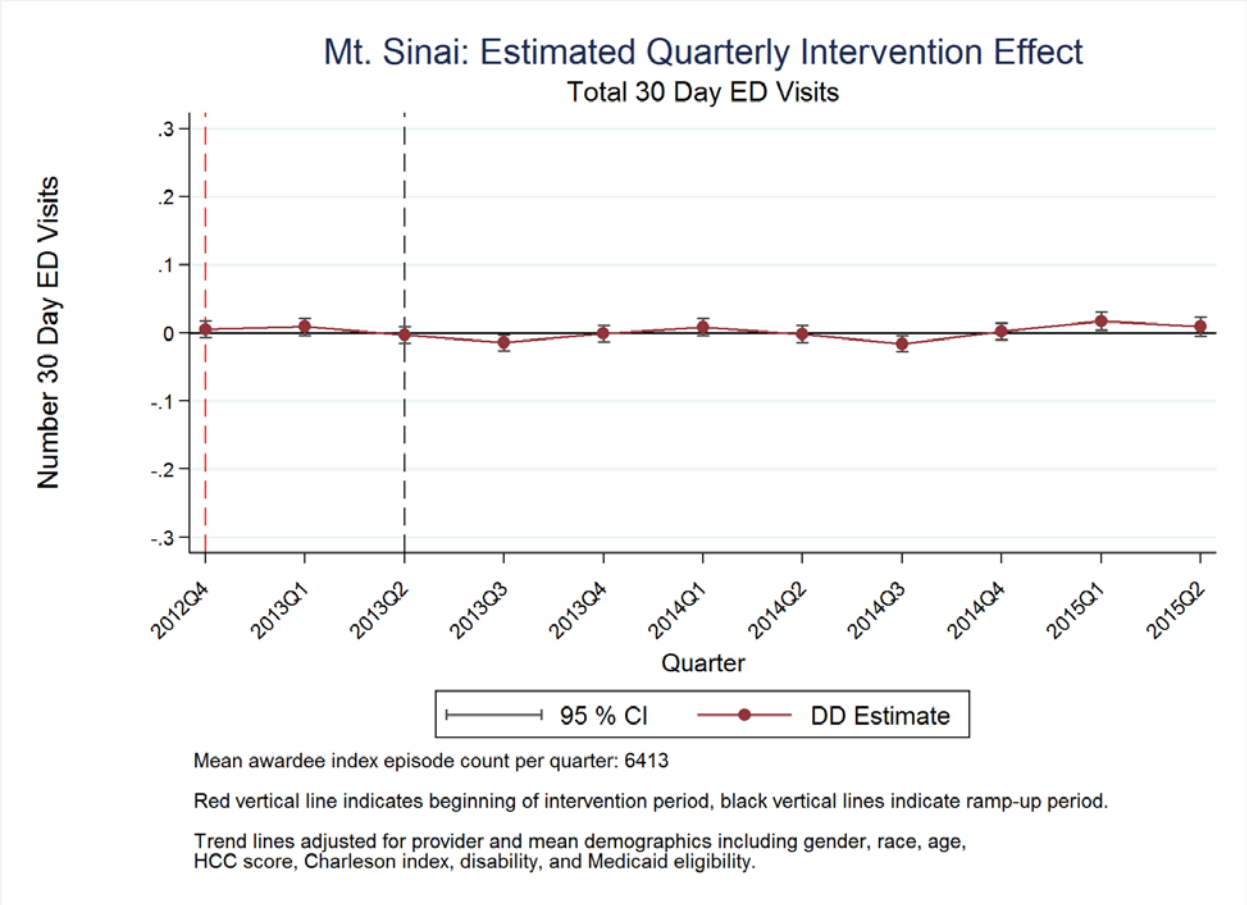
Exhibit 2.8E: Hospitalization during 30 Days after an Index ED Visit



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Another goal of the Mt. Sinai program was to reduce the total number of ED visits among a population that uses the ED extensively. Exhibit 2.8F shows the number of ED visits during the 30 days after an index ED visit, irrespective of whether there was also a hospitalization during this period. Quarterly estimates show no consistent relationship between the intervention and total ED visits.

Exhibit 2.8F: Average Number of ED Visits During 30 Days After an Index ED Visit

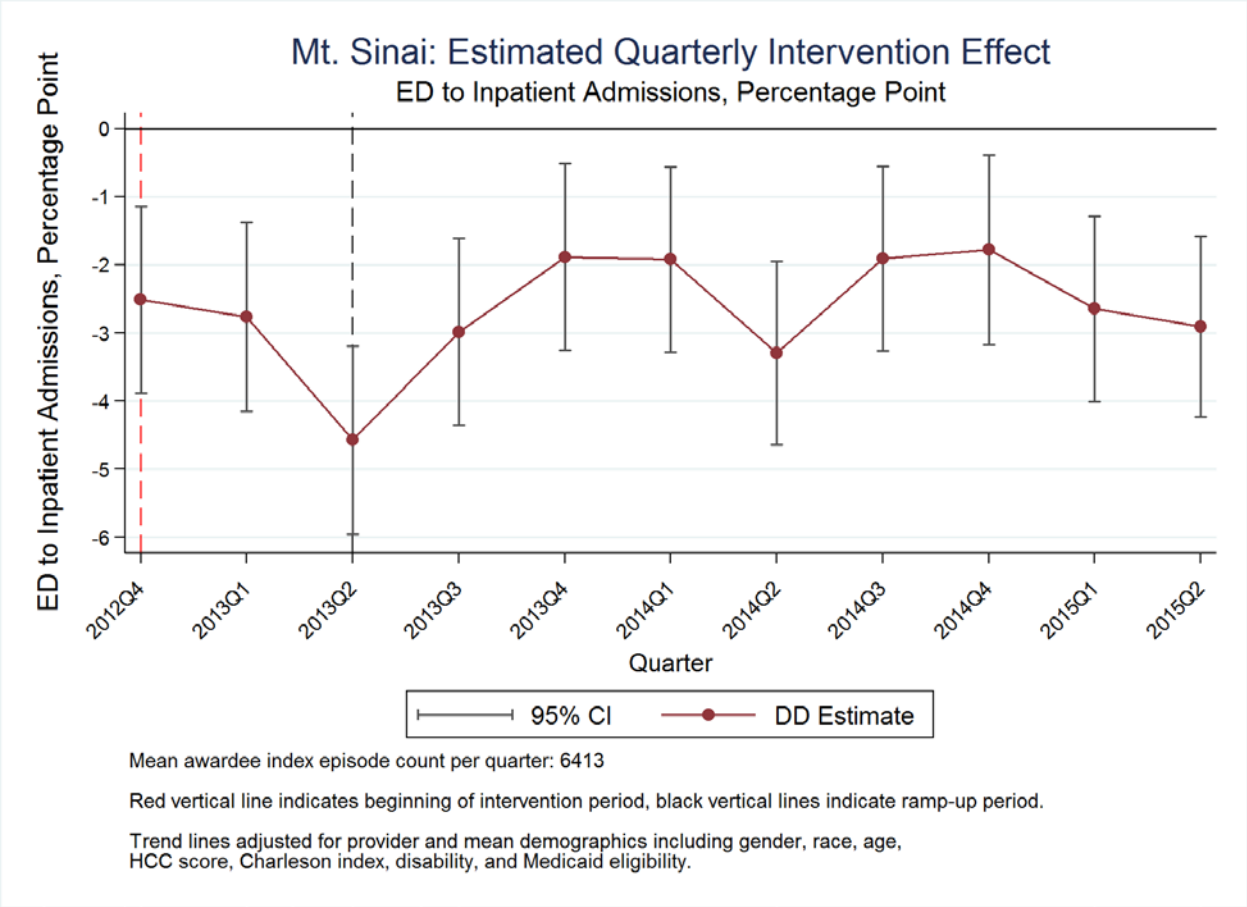


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

ED Visits That Become Hospital Admissions

One goal of the Mt. Sinai program was to avert hospitalizations for ED patients by addressing their care needs in the ED. Exhibit 2.8G shows that the intervention was associated with a significant reduction in the rate of inpatient admission directly from the ED relative to comparison EDs in every quarter since the start of the intervention. Pooled across the entire period of the intervention (Exhibit 2.8H), there was a statistically significant average reduction in inpatient admissions from the ED of 2.7 percentage points ($p<0.01$). However, this reduction in immediate inpatient hospitalization from the ED did not reduce total hospitalizations over the subsequent 30 days, relative to the comparison group. That is, the hospitalizations were apparently delayed, not avoided.

Exhibit 2.8G: Inpatient Admissions through the ED



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.8H: DD Estimated Effect of Intervention on Inpatient Admissions through the ED

Mt. Sinai		
Intervention effect	Estimate	-2.73***
	Standard error	(0.28)
	Sample size	[394,300]

*p<0.1 **p<0.05 ***p<0.01
Source: Abt Associates, July 2016.

Conclusions

- The Mt. Sinai program was not associated with any significant changes in mean or median Medicare spending per episode. However, the pooled estimate masks heterogeneity in the program outcomes. Interventions at the Northwestern University and Mt. Sinai hospitals were associated with reduced average episode spending of $341 and $383, respectively (p<0.05) relative to the comparison group. The intervention at St. Joseph's hospital was associated with increased average episode spending of $420 per episode (p<0.05).

- The Mt. Sinai program was associated with a 2.7 percentage point reduction in the rate of inpatient admission directly from the ED ($p<0.01$). However, there was no reduction in the overall rate of post-discharge hospitalizations within 30 days, or total ED visits in the 30 days after the initial ED visit.

2.8.4 Synthesis of Findings

A synthesis of findings from all available data indicates the following:

- The intent-to-treat approach used to define intervention and comparison groups most likely underestimated the impact of the GEDI WISE program, for reasons described above; better matching of intervention and comparison groups was not possible due to incomplete patient registries from the three participating hospitals.
- The GEDI WISE program was associated with a decrease in admissions to the hospital directly from the ED of 2.7 percentage points, relative to the comparison group. This difference was substantial and statistically significant in every quarter of implementation, ranging from two to nearly five percentage points. However, we did not observe an intervention effect on total hospitalizations in the 30 days following an ED visit (including hospitalizations directly from the ED and those that occurred days after the ED visit).
- Although the program-wide estimated change in average Medicare episode spending was statistically insignificant, the interventions at Northwestern University and Mt. Sinai hospitals significantly reduced Medicare spending per episode, while the intervention at St. Joseph's hospital significant increased Medicare spending per episode. The programs at Northwestern University and Mt. Sinai were new—inaugurated and operated with HCIA funds. The program at St. Joseph's had been present for nearly a decade prior to HCIA funding, had several components not present at the other two sites, and changed little during the HCIA funding period. We do not have an explanation for why episode spending increased for the St. Joseph's program.

We conclude that the GEDI WISE program appeared to better meet patients' needs in the ED and this helped avert some immediate hospitalizations; however, this was essentially a temporary delay that ultimately did not lead to reductions in hospital ED use. There were apparently other benefits in terms of enhanced staff awareness and training and resources for addressing the needs of older patients, which may be important but did not have an observable impact on outcomes such as utilization and cost to Medicare.

2.9 St. Luke's Regional Medical Center EICU

2.9.1 Introduction

St. Luke's HCIA Award used a telemedicine eICU intervention (essentially the same as the Emory intervention but without the NP/PA training program). The program objective was to extend intensivist physician oversight to ICUs on night and weekend shifts and in small rural hospital across a wide geographic area in Idaho. eICU critical care nurses and physicians offered remote monitoring of patients in participating ICUs and access to an intensivist physician on off shifts. The eICU physicians also offered consultations to participating rural EDs that did not always have a physician present at night and on weekends. St. Luke's program was implemented in 12 hospitals in three different settings: ICUs in larger ACHs; and ICUs and EDs in critical access hospitals (CAHs). In the ICUs at larger ACHs, all ICU beds were monitored through telemetry and eICU nurses tracked trends and adherence to clinical guidelines 24/7, and an eICU physician was available at night and on weekends. One of the CAHs had two ICU beds that could be monitored remotely by the eICU when in use for a critical care patient. In the

CAHs' EDs, there was no continuous monitoring/telemetry, but there was a mobile cart of telemetry equipment and ED staff could request a consult from an eICU physician at night or on weekends.

St. Luke's program staff expected that continuous monitoring of ICU patients and intensivist physician access on nights and weekends, would shorten ICU LOS and possibly overall hospital LOS, avoid care delays and unnecessary complications and tests, reduce in-hospital mortality, reduce transfers from CAHs to urban medical centers, and lower costs to the hospital system and to Medicare (and other payers).

2.9.2 Summary of Qualitative Findings

Qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain the programs after HCIA funding ended, and barriers and facilitators for replicating the program in CAHs. These new findings regarding sustainability are presented below.

Implementation Effectiveness

St. Luke's staff believed that the eICU program helped to reduce costs during the first day of an ICU stay (typically the most expensive day), particularly for patients who transferred to the Boise Medical Center from a CAH, through improved care coordination prior to transfer facilitated by the eICU. Further, in multiple interviews we learned that program and clinical staff believed the eICU program improved the quality of care their patients received in the following three high-level categories:

1) ***Improved Continuity and 24-Hour Care.*** It is standard practice in ICUs to perform important procedures and care during the day shift, and delay care at night. During nights and weekends a single physician often covers multiple St. Luke's ICUs, sometimes in more than one hospital, and can care for only one patient at a time. An eICU physician was able to oversee care for many patients simultaneously, wherever and whenever assistance was needed.

   Several eICU physicians emphasized the impact that their availability at night had on patient safety. Rather than making decisions about patient care using the limited information that can be provided over the phone, eICU physicians were able to make fully informed decisions about patient care, drawing on laboratory and test results, their own visual inspection of the patient, and real-time monitoring of vital signs.

2) ***Serving Patients in Their Communities.*** One of the problems the St. Luke's program aimed to address was the shortage of trained and experienced critical care nurses and physicians, in urban and rural areas. In rural areas particularly, leveraging the resources of the eICU had the potential to allow patients to be treated locally, rather than incurring an expensive and potentially traumatic transfer to an urban tertiary medical center. Most CAHs do not have intensivist physicians or nurses, and consultation could improve the critical care skills of rural bedside nurses through the mentoring and teaching provided by eICU nurses and physicians.

   Although these capabilities existed, the CAHs in this program did not take advantage of them. There were only a handful of patients in one CAH that were remotely monitored by the eICU, and even fewer ED consults; several other CAHs made no use of their eICU equipment and consultation services in ICUs or EDs. St. Luke's ICU physician champions explored the reasons for lack of consultation and learned that ED staff in CAHs do not perceive a need for consults

with critical care specialists, but would greatly appreciate real-time consults with other types specialists (e.g., neurologists). In addition, rural physicians and nurses advised that patients who truly require an ICU (e.g., for ventilation support) must be transferred because CAHs have no staff with appropriate training to safely care for these patients, with or without eICU monitoring and consultation.

3) ***Adherence to Standard Clinical Guidelines.*** The monitoring of vital signs by eICU staff and technology, in accordance with clinical guidelines, were where the program was expected to improve quality of care. The vendor software monitored for trends and deviations from established clinical guidelines, for conditions such as sepsis (three-hour care bundles), and prevention of ventilator-acquired pneumonia. Rapid identification of deviation from trending guidelines and reminders to bedside nurses of next steps in care protocols had the potential to enhance care and prevent avoidable complications. We heard several vignettes of situations where monitoring had picked up "near misses" for patients whose gradual downward trajectory was not noticed quickly by bedside staff, prompting earlier intervention.

Workforce

St. Luke's eICU program hired one full-time clinical educator, who provided oversight for all training and workforce development activities related to the eICU program. They staffed the eICU with highly experienced intensivist physicians and nurses who had previously been providing bedside patient care; this left openings in the bedside positions and created a need to hire new bedside nurses. At the time of our follow-up interviews, the eICU physicians were still working day shifts in the ICUs, in addition to rotating the night and weekend eICU shifts, which was burdensome for them. Program administrators discussed alternative staffing models for the eICU program to alleviate these staffing concerns. For example, they discussed the potential for using hospitalists or critical care-trained NPs and PAs in the eICU overnight in lieu of critical care physicians. No such changes were made during the HCIA award period.

The majority of bedside nurses we interviewed did not feel that the eICU program had increased their workload or substantially changed their workflows. They did value the ability to consult with a physician on nights and weekends, without waking a (local) sleeping physician; they especially appreciated immediate consultations without having to wait for a physician to return to the hospital and see the patient in person.

Sustainability and Spread

There were several developments in the eICU program over time at St. Luke's.

1) Two LTCHs implemented critical care monitoring in the fall of 2015. However, St. Luke's severed the relationship with one due to competition from a newly affiliated hospital.

2) St. Luke's also severed its relationships with three CAHs that are outside of the St. Luke's health system. These CAH partners had almost no utilization of the eICU service, and the decision to terminate was mutual. At the end of the program the eICU was still supporting CAHs within the St. Luke's health system as part of the telehealth service line, but at very low rates of use.

3) The eICU continued to serve as a base for telehealth services, with some additional investment in upgraded infrastructure. An RN supervisor was added 24/7 to oversee staff working in the eICU, and St. Luke's hired a telehealth IT manager and two IT analysts dedicated to telehealth. This

additional staffing was dedicated not only to the eICU, but also to a broader telehealth strategy for the dispersed St. Luke's health system.

4) St. Luke's expanded the role of the clinical educator to go beyond eICU to all telehealth services. It also expanded training so that any employee hired within the health system had a basic understanding of telehealth services.

5) The telehealth team and the eICU infrastructure/technology was relocated in a free-standing location and the space was converted to inpatient hospital use.

In anticipation to taking the telehealth service system-wide, St. Luke's planned several changes to its strategy.

1) Exploring the option of adding physicians to the eICU 24/7, rather than just at night and on weekends.

2) After a teleneurology program pilot was completed at one CAH, telestroke services would be offered for St. Luke's EDs, system-wide.

2.9.3 Summary of Quantitative Findings

Note that survey findings are not reported for St. Luke's because no survey was administered; the patient sample was too small to detect differences between the intervention and comparison groups.

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). The admission measure is not relevant for the St. Luke's eICU program because patients had already been admitted when they received the intervention. St. Luke's received an NCE through June 2016, although HCIA funds were exhausted as of September 30, 2015.[38] We present here estimated changes in utilization and Medicare spending updated through September 30, 2015, one quarter beyond the original intervention period, specified as follows:

- Total Medicare spending for 60 days including the index admission and all Medicare spending for 60 days after discharge; index admission is defined as an admission for a patient eligible for the eICU innovation, in either an intervention or comparison hospital.
- Thirty-day (all cause) readmissions to an ACH following an index admission.
- Thirty-day post-discharge (all cause) visits to an ACH ED following an index admission.

The St. Luke's program also aimed to reduce LOS and avoid complications through adherence to best practice guidelines. We therefore present results for the following additional measures:

- LOS
- Discharge destination

[38] Note that in January 2016 a vendor had reimbursed a small amount funding to St. Luke's; however, the funds did not extend the program beyond one month, so data for that month are not included in these analyses.

Please see Technical Appendix B for a description of how each outcome measure is specified, our methods for the DD regression analyses, and how we selected a comparison group. Below we present tables with a single DD estimate for the overall effect of the program for each outcome, averaged across all episodes occurring during the intervention period. For each outcome we also present graphs of DD estimates for each calendar quarter during the intervention. Additionally, we report median regression estimates of 60-day Medicare episode spending.

All regression models controlled for patient age and squared age, gender, race, HCC score in year of treatment and squared HCC score, eligibility for Medicaid at any time during observation period, CCI and squared CCI, whether the patient was transferred from another hospital, whether the patient was transferred from an SNF or other non-hospital health care institution, whether the patient originally qualified for Medicare due to disability, MDC, provider fixed effects, and indicators for the quarter in which the episode occurred.[39] The regression model also included an indicator for individuals with missing HCC scores.

The analyses in this report are based on data from Medicare claims; patients who were served by the innovation but had other forms of primary insurance (managed care, Medicaid, commercial, self-pay) were not included. This report is based on final action claims that reflected processing as of six months for Medicare spending. Any adjustments processed more than six months after a claim was submitted were excluded, and partial claims (i.e., those that are mid-processing) were included. We believe this approach is an accurate way to capture Medicare spending.

Implementation did not take place on the same day in all participating ICUs and hospitals. In the graphs below, the red dotted vertical line shows the beginning of the intervention period, and the black dotted vertical lines indicate the dates when various participating ICUs and hospitals began their eICU implementation. Estimated changes reported below were based on 14 quarters of post-implementation data. Summary of Core Measures

Exhibit 2.9A summarizes the average effect of St. Luke's eICU program on total 60-day spending (including the inpatient stay and all claims in the following 60 days), 30-day inpatient readmissions, and 30-day ED visits per episode, pooled across all quarters. [40,41] The exhibit also presents the estimated effect of the program on total Medicare spending aggregated over all episodes that occurred during the intervention period. The eICU did not produce any large or significant changes in any of the three measures, nor did it significantly affect total spending during the intervention period.

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[39] CMS developed the HCC score to determine an individual's expected Medicare expenditure relative to the average based on the person's health status as well as demographic information (e.g., age, gender). The CCI was developed to predict patient mortality, but controls for many patient comorbidities that may affect patient outcomes. The MDC classification controls for 25 broad classes of patient diagnoses. These classifications are strongly correlated with patient outcomes, but are broad enough to avoid sacrificing statistical power, as well as the risk of endogeneity (i.e., MDC is not determined by the presence or absence of the intervention).

[40] We did not adjust for inflation in measures of Medicare spending. The DD regression estimates are accurate, as inflation applies equally to both intervention and comparison groups.

[41] As a robustness check we also estimated changes in 60-day inpatient readmissions and 60-day ED visits. The direction and magnitude of the effects were similar to the 30-day values, and statistically insignificant.

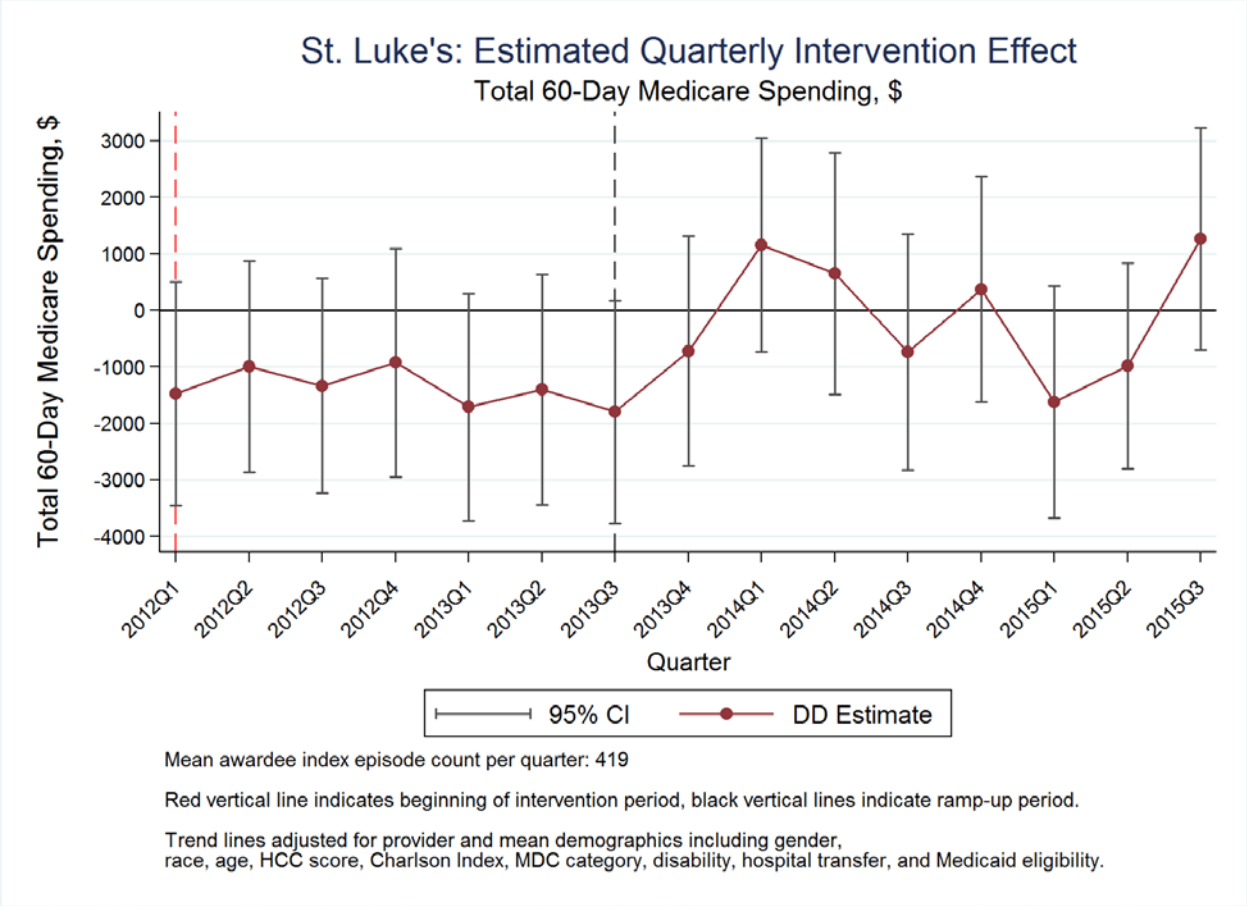
Exhibit 2.9A Core Measures Summary

Outcome	Estimate	90% CI
Aggregated results		
Total spending (in millions)	1.15	(-2.56, 4.86)
Per episode: (N = 5,395)		
Total 60-day spending	213.08	(-475.35, 901.50)
Thirty-day inpatient readmissions	-0.42	(-1.86, 1.02)
Thirty-day ED Visits	-0.90	(-2.64, 0.85)

The estimated change in outcomes spans the entire intervention period from 2012Q1 through 2015Q2.

Exhibit 2.9B shows estimated changes in 60-day episode Medicare spending for each quarter of the intervention. There was no consistent change in spending relative to the comparison group, particularly in the last two years of the program. Exhibit 2.9C shows the estimated change in median Medicare spending pooled across all quarters and does not indicate any significant difference between the intervention and comparison groups.

Exhibit 2.9B: Medicare Episode Spending



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.9C: DD Estimated Effect of Intervention on Median Total 60-day Medicare Costs

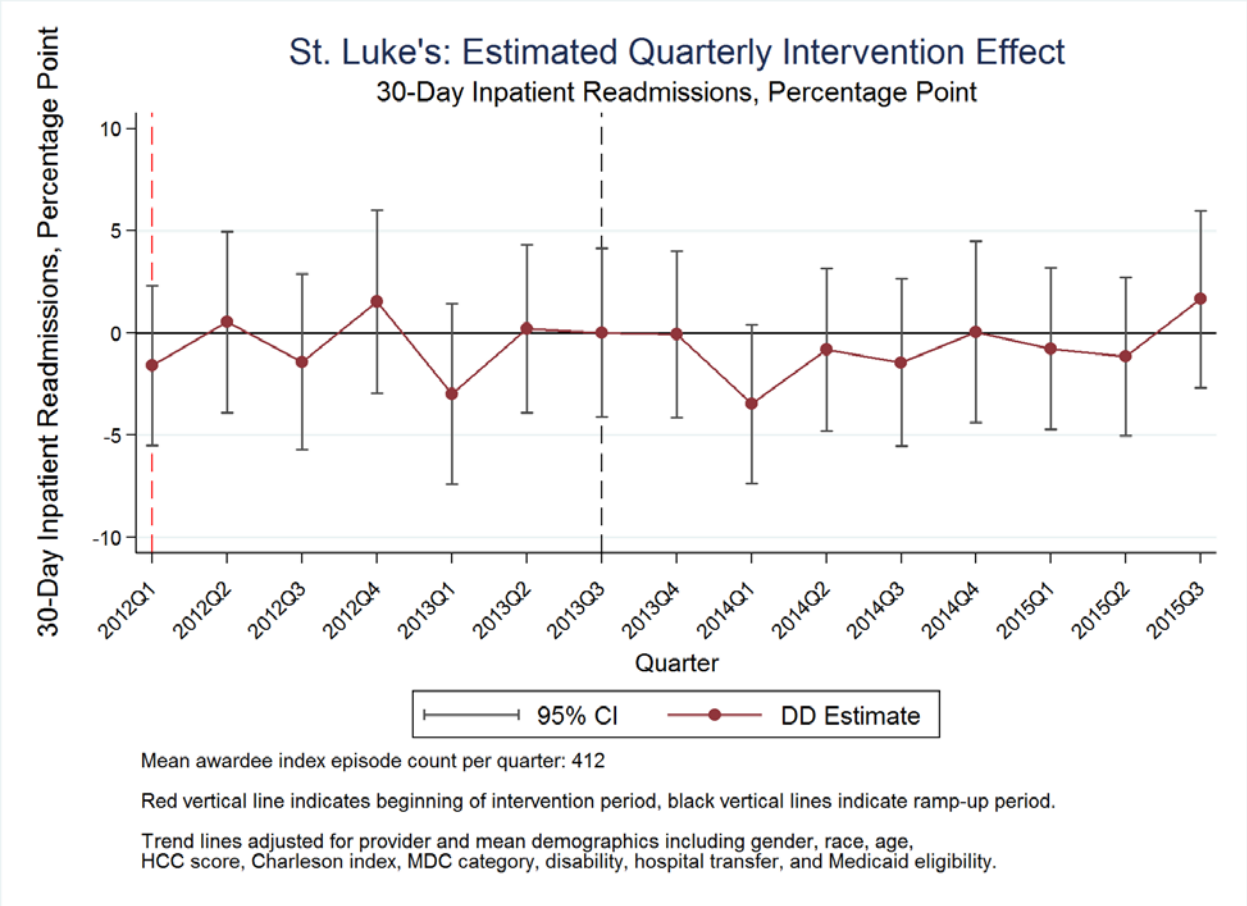
St. Luke's		
Intervention effect ($)	Estimate	58.34
(Median regression)	Standard error	(115.13)
	Sample size	[26,726]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

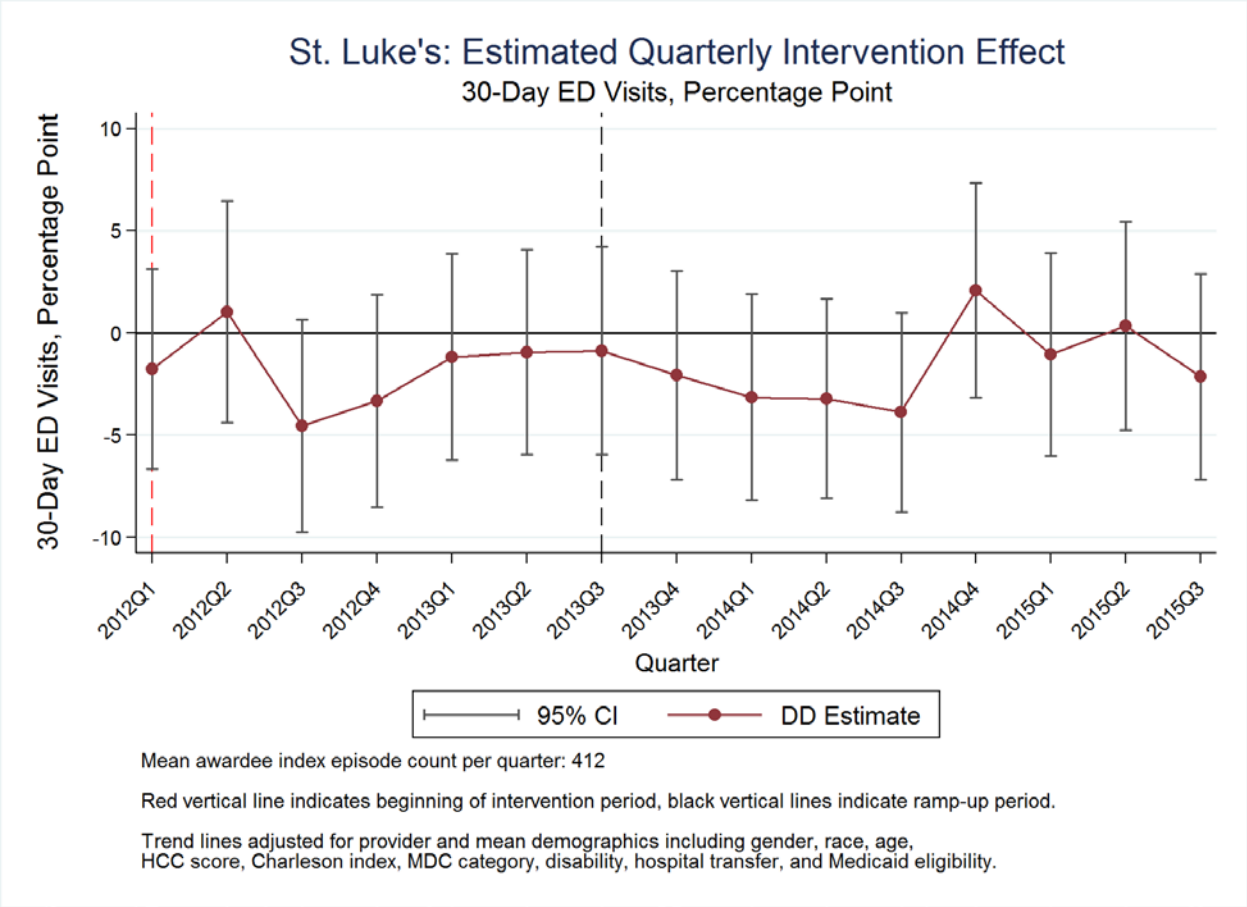
Exhibit 2.9D (hospital discharges followed within 30 days by a readmission) shows small and insignificant changes relative to the comparison group. Conversely, Exhibit 2.9E (discharges followed within 30 days by an ED visit) shows a trend toward reduced post-discharge ED use among patients treated at intervention ICUs, relative to those at comparison ICUs, a trend that began before the implementation was completed in Q3 2013. However, no quarterly estimates were statistically significant, and this trend seems to have dissipated in the most recent four quarters for which we have data.

Exhibit 2.9D: Readmissions



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.9E: Thirty-Day Post-Discharge ED Visits

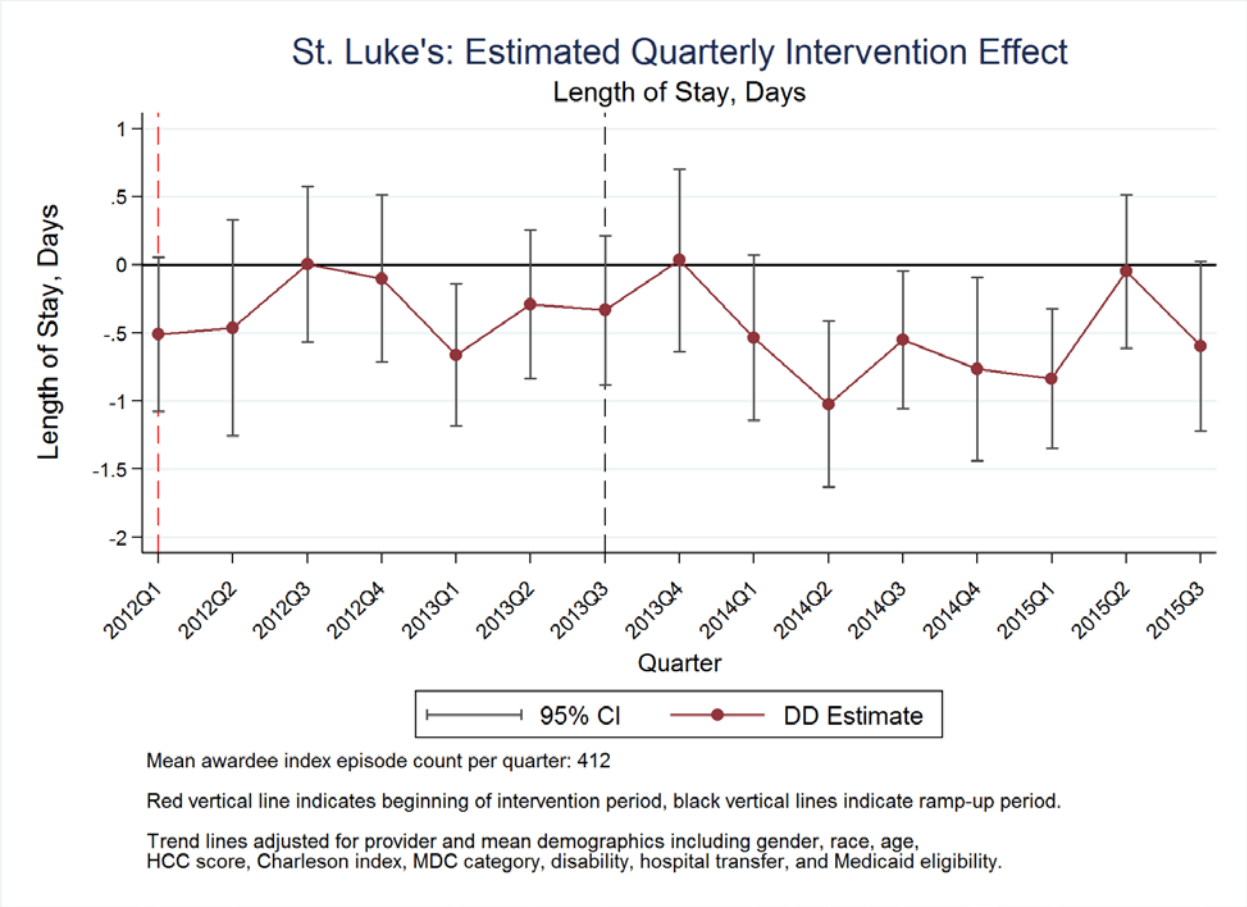


Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Index Admission LOS

Important goals of the St. Luke's program were to improve the timeliness of care delivery in the ICU and to reduce complications, which in turn should contribute to shorter LOS for the Index admission. Exhibit 2.9F shows that LOS declined more for the intervention group, relative to the comparison group, in nearly every quarter since the start of the intervention, including several recent quarters for which the decline is statistically significant ($p<0.05$). However, the magnitude of the effect was small, and the pooled estimate in Exhibit 2.9G, though significant, indicates that the average reduction in LOS was only about 0.22 days ($p<0.10$).

Exhibit 2.9F: Index Admission Inpatient LOS



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.9G: DD Estimated Effect of Intervention on Inpatient LOS

St. Luke's		
Intervention effect	Estimate	-0.22*
	Standard error	(0.12)
	Sample size	[26,279]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2015.

Discharge Destination

Finally, we examined patterns in the settings to which patients were discharged after their index hospitalization. Exhibit 2.9H shows that the St. Luke's intervention was not associated with any changes in discharge destination.

Exhibit 2.9H: DD Estimated Change in Episode Discharge Destination

	2012 Q1	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	Overall
Home																
DD	-0.04	8.58***	3.15	0.00	-0.28	4.02	-0.05	-0.91	-1.91	3.38	-1.54	3.89	3.83	3.66	-2.13	-0.13
SE	3.09	2.81	2.89	2.91	2.90	2.85	2.94	2.81	2.90	2.76	2.76	2.74	2.57	2.71	3.01	1.17
Home Health																
DD	3.58	-0.78	-1.28	-0.68	0.08	0.38	4.07	3.74	3.33	0.22	-0.24	1.30	-0.94	1.23	8.26***	1.71
SE	2.71	1.96	1.97	1.91	2.04	2.12	2.53	2.37	2.40	1.98	1.93	2.03	1.68	1.95	2.91	0.88
Skilled Nursing Facility/Inpatient Rehabilitation Facility/Long-Term Care Hospital/Other Nursing Home																
DD	-2.46	-7.25***	-1.78	0.88	-0.85	-1.70	-3.48	-0.91	-0.43	-1.66	2.45	-5.02**	-3.61	-3.81	-5.17**	-0.90
SE	2.67	2.34	2.65	2.72	2.63	2.57	2.53	2.56	2.62	2.54	2.68	2.29	2.32	2.44	2.51	1.09
Other																
DD	-1.07	-0.55	-0.10	-0.20	1.05	-2.70***	-0.53	-1.93*	-0.98	-1.93**	-0.67	-0.17	0.73	-1.08	-0.96	-0.69
SE	1.22	1.33	1.45	1.38	1.65	0.73	1.20	0.93	1.03	0.97	1.20	1.18	1.35	1.05	1.06	0.54

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Conclusions

St. Luke's teleICU program was not associated with a change in the rate of post-discharge inpatient readmissions or ED visits, patterns of discharge destination, or average Medicare spending, relative to the comparison group. However, it was associated with a 0.22 day decrease in average inpatient LOS ($p < 0.01$), suggesting that the program may have improved patient care without increasing costs, potentially generating savings for participating hospitals if not for Medicare.

2.9.4 Synthesis of Findings

The St. Luke's patient sample size was quite small (approximately 400 patients per quarter), which partially explains the lack of significant differences between the intervention and comparison groups. The eICU program might have had the most impact in ways that are difficult to measure, including preventing medical errors (measuring something that does not happen is difficult, and requires a very large patient population); improving adherence to best practice guidelines; and avoiding care delays at night. These improvements might have also contributed to other desirable outcomes for patients, even if those outcomes cannot be measured directly using claims data.

2.10 University of Chicago

2.10.1 Introduction

The University of Chicago Hospital (UCH) received an HCIA to conduct a randomized controlled trial it called the Comprehensive Care Program study (CCP). The CCP study recruited Medicare-eligible individuals with multiple complex conditions and randomized them to either a control group receiving usual care, or a treatment group receiving primary care coordination and clinical services from UCH hospitalists and CCP study staff.

The CCP program aimed to improve care continuity by having the same physicians (supported by a multidisciplinary team) caring for a patient in inpatient, ED, and outpatient settings at the UCH Medical

Center. Program staff expected that improved care continuity and 24/7 access to the care team would enable better disease management, which in turn would reduce ED and hospital use, as well as Medicare spending. Care team clinicians, led by hospitalist physicians, were available to their patients by phone at all times, scheduled same-day clinic appointments with patients to avert ED visits, met their patients in the ED when a visit could not be avoided, and attended to them in the hospital when an admission was necessary. Halfway through the HCIA funding period, home visits were added for patients who lacked transportation to UCH.

In order to be accepted into the CCP study, patients had to have a diagnosis of a chronic condition and at least one hospitalization in the prior year; be at risk for additional hospital utilization; agree to be served by the CCP care team; and agree to randomization. Patients were recruited in UCH inpatient and outpatient settings, including the ED. To be adequately powered to measure study end points, the CCP team aimed to recruit a minimum of 1,167 patients per study arm and serve them from their date of recruitment until the end of the study period (i.e., some patients had nearly three years of study services, others much less, depending on when they enrolled). Due to slow recruitment, the CCP study team held recruitment sessions at senior housing sites, senior health "fairs," and other community settings.

2.10.2 Summary of Qualitative Findings

Qualitative data and analyses were presented in the First and Second Annual Evaluation Reports; results for Implementation Effectiveness and Workforce are summarized briefly below. Prior to this Third Annual Evaluation Report, the evaluation team collected information from the Awardee to better understand resources necessary to sustain the programs after HCIA funding ended and barriers and facilitators for replicating the program in other units or facilities. These new findings regarding sustainability are presented below.

Implementation Effectiveness

There was widespread agreement among members of the CCP care team that the CCP program offered better care for patients at risk of high health care utilization. CCP staff believed that the clinical program improved outcomes for patients, especially in the area of disease management. Program staff advised that the program improved patient care in the following ways:

a. Additional time spent with patients during outpatient visits.

b. Better and more complete care coordination across care settings.

c. Rapid appointments where patients typically were seen within one day of requesting an urgent care appointment.

d. Assistance for ED physicians caring for patients with multiple complex conditions, through consultations with CCP physicians when their patients visited the ED.

Abt researchers held a small focus group (n=9) with treatment arm patients and family members selected by CCP study staff. This non-random group of patients voiced enthusiasm about the quality of care provided by CCP physicians and staff, the supportive relationships they developed with their care team, and their willingness to contact the team first before going to the ED. Access to the care team 24/7 was the most appreciated feature of the CCP study. Family members and caregivers expressed how helpful the CCP physicians were in keeping them informed about the patient's medical status and care.

Early in the program, the CCP study staff determined that their patient population had substantial unmet needs for behavioral health serves, without which other utilization (e.g., ED visits) would be difficult to

control. These unmet needs were in part due simply to patient diagnoses and social complexities, but also due to long waits for initial and follow-up appointments with UCH behavioral health specialists (an under-staffed resource at UCH). The CCP study team did not initially include behavioral health specialists, and HCIA funding was insufficient to hire adequate behavioral health staff to meet these needs.

Most importantly for the RTC, the CCP study was not able to recruit enough patients to power the study for the end points of interest. Only in the last two quarters of the HCIA funding period did the accumulated number of patients reach the goal of 1,167 per study arm, and the funded study period ended soon afterward. It is possible that with a longer intervention period, additional impact would have been achieved (although as noted below, we saw no evidence that longer tenure in the program achieved greater improvement in health care utilization or Medicare spending).

Workforce

The CCP consisted of a small team of clinicians including a clinical PM, two social workers, an advanced practice nurse, an RN, and five physician hospitalists. A few new clinical staff were hired over time, including an RN, an additional hospitalist, and a social worker to handle the care coordination and the home care program.

Research staff were thoroughly trained on the informed consent process, as well as the specifics of the CCP research study. All new research coordinators and research assistants who helped with recruiting study subjects underwent an extensive period of shadowing more experienced research staff.

Several staff were hired for the CCP care team; some were previous UCH employees and others were new to the health system. There was not a specific CCP training curriculum for clinical staff; instead they learned their new roles in the following ways:

- Social workers were trained in the UCH's social work department and through on-the-job training. The main CCP social worker then trained the social worker who focused on the home care program.
- An advanced practice nurse trained by shadowing a CCP physician in the outpatient clinic for several months to learn her CCP role in care coordination.
- The RN received the same standard training as all new nurses at the UCH; there was no specific training for the CCP program.
- The CCP manager received on-the-job training from staff in the UCH primary care group to learn the administrative requirements and care standards of UCH primary care.
- The CCP hospitalist physicians attended on-boarding lectures provided by the PI and guest lecturers. These lectures focused on topics of special concern, including end of life care, oncology, substance abuse, care coordination, and other common issues that arise in serving the CCP patient population. The first CCP physicians received this training in person, and these sessions were recorded; physicians hired later watched the recorded lectures and had access to the more seasoned CCP physicians as mentors and resources.

Sustainability and Spread

The CCP may be sustained with a mix of internal and external support such as the following:

- The UCH received a two-year grant from the Robert Wood Johnson Foundation to continue the study.

- A new program for community care and cultural arts funded a community health worker and cultural arts program for the CCP to assist with recruiting patients in community settings.
- CCP research staff have applied for additional grants from federal agencies.

The CCP study has expanded to enroll non-Medicare patients, including:

- An agreement with a local private insurer to enroll private pay patients who meet the CCP study enrollment criteria.
- An agreement with the City of Chicago's employee health plan to enroll employees with high-risk factors who also meet the criteria for the CCP study.
- Partnering with a federally-affiliated health center to gain access to its patients as well.

In addition, two community safety net hospitals have expressed interest in being expansion sites for the study.

2.10.3 Summary of Quantitative Findings

Abt researchers did not survey CCP enrollees because the CCP study included quarterly surveys with all intervention and control patients. With CMS we determined that the gains from an additional survey were less than the burden for patients of responding.

As previously mentioned the University of Chicago identified eligible patients and, with their consent, randomized them to intervention or control arms of the study. Most of the patients were enrolled while in the hospital, but some were enrolled when visiting the ED or outpatient departments, or in community settings. After enrollment, intervention patients received program services for all subsequent primary care and acute care at UCH; control patients continued with their usual care, some of which was also at UCH. Patients were added to the panel over time and the earliest enrollees had more quarters of exposure to the intervention than did later enrollees. We therefore used a "rolling entry" approach in our evaluation, and report results were based on duration of exposure to the program.

Core Measures

The four core measures that CMS specified for the HCIA evaluations include three measures of utilization (admissions, readmissions, and ED visits) and one measure of cost (total episode spending). Results presented below show estimated changes in the utilization measures and in Medicare spending through June 30, 2015. Measures presented below include:

- Average quarterly Medicare spending for patients in the intervention and control arms of the randomized study.
- Average number of quarterly admissions to an ACH for patients in the intervention and control arms of the randomized study.
- Average number of quarterly ED visits for patients in the intervention and control arms of the randomized study (we count the number of ED visits, not simply whether or not there was one).

Please see Technical Appendix B for a description of how each outcome measure was specified. Given the randomized nature of the program, all analyses reported below show the difference between the control and intervention group, while controlling for the patient demographics.

We did not measure "episodes" of care because this program continued to offer services to patients from enrollment onward—one continuous episode. We did not calculate the number of readmissions because in this population it is not possible to specify an "index" admission that is distinct enough from the others to be considered the start of a new episode of care. Since the goal of the program was to prevent hospital admissions altogether, and particularly ED visits that become hospital admissions, the total number of admissions seems a more important measure than whether one or more were readmissions. For all of the outcome trends, we retained all patients in the analyses, regardless of mortality.

The analyses in this report are based on claims from all periods reflecting final action claims processing as three months after initial submission for utilization outcomes, and as six months for Medicare spending. Any adjustments processed more than six months after a claim was submitted are excluded, and partial claims (i.e., those that are mid-processing) are included.[42] We believe this is an accurate way to capture Medicare spending.

The analyses reported here are based on data from Medicare claims; patients who were served by the innovation but have other forms of primary insurance (managed care, Medicaid, commercial, self-pay) are not included.

Summary of Core Measures

Exhibit 2.10A summarizes the effect of the University of Chicago intervention on total Medicare spending, total inpatient admissions, and total ED visits, pooled across the length of the entire program. The first three rows of results present the effect of the program aggregated over all beneficiaries enrolled in the treatment arm. The second three rows of results present the average effect of the program on each enrollee in the treatment arm. We estimate that the program was associated with an increase of 0.85 additional ED visits per enrollee ($p<0.10$), totaling roughly 582 additional ED visits over the entire program. This did not result in a statistically significant increase in average Medicare spending, nor was it accompanied by a significant increase in total inpatient admissions.

Exhibit 2.10A: Core Measures Summary

Outcome	Estimate	90% CI
Aggregated Results		
Total spending (in millions)	1.87	(-2.30, 6.05)
Acute care inpatient stays	242.52	(-124.42, 609.46)
ED visits	582.11*	(64.51, 1099.70)
Per Beneficiary: (N = 683)		
Total spending per beneficiary	2,743.24	(-3,365.96, 8,852.44)
Total inpatient admissions per beneficiary	0.35	(-0.18, 0.63)
Total ED visits per beneficiary	0.85*	(0.09, 1.61)

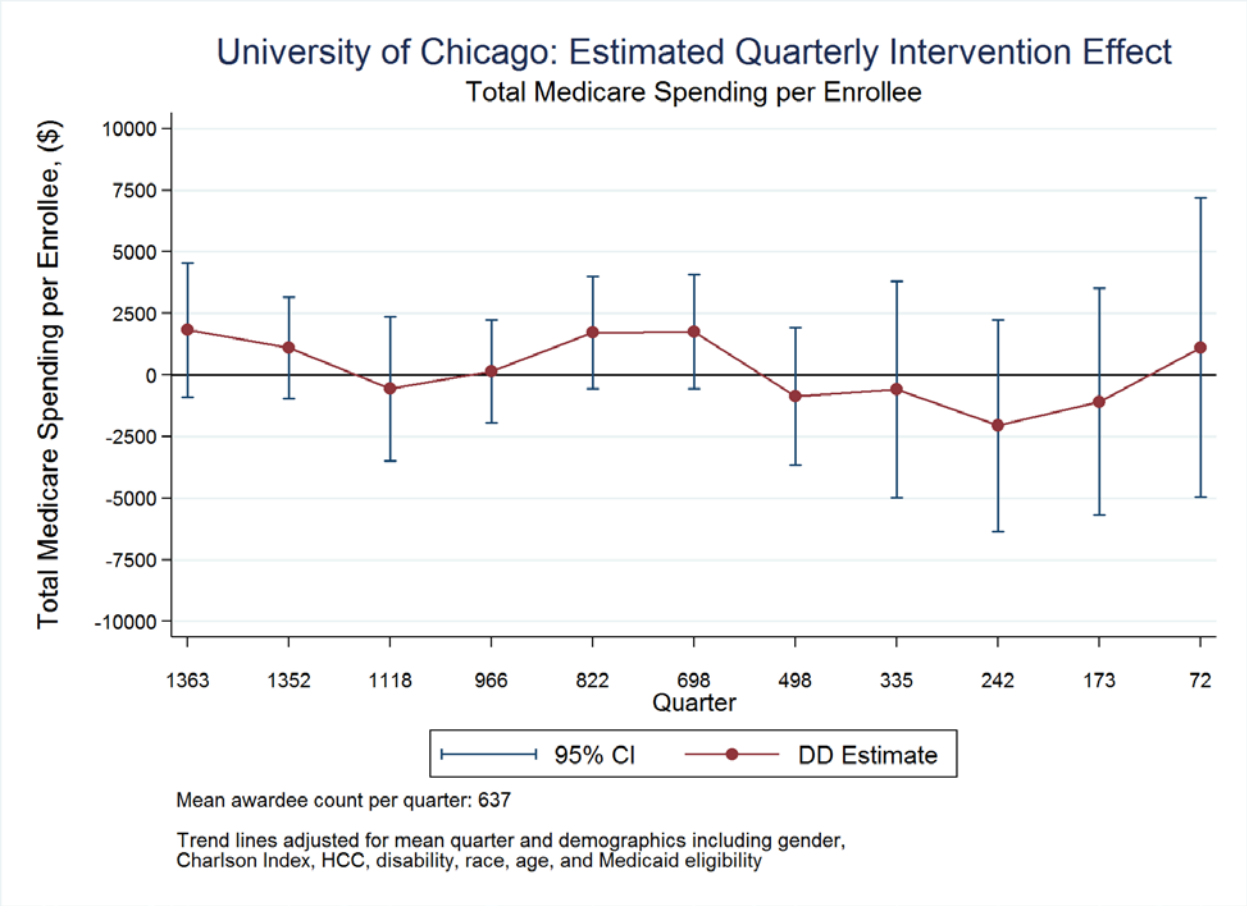
The estimated change in outcomes spans the entire intervention period from 2012Q4 through 2015Q2.

* $p<0.10$

[42] Due to the different run out times, the analytic sample sizes will vary slightly between utilization and cost outcomes.

Exhibit 2.10B shows the average Medicare spending by enrollee quarter attributed to the intervention. We observed no consistent trend in Medicare spending based on the number of quarters patients were exposed to the intervention.

Exhibit 2.10B: Average Medicare Spending



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Exhibit 2.10C shows the median spending attributable to the program, pooled across all quarters. Median total spending was higher among patients receiving the intervention relative to controls, but this difference was far from statistically significant.

Exhibit 2.10C: DD Estimated Effect of Intervention on Median Total Medicare Costs

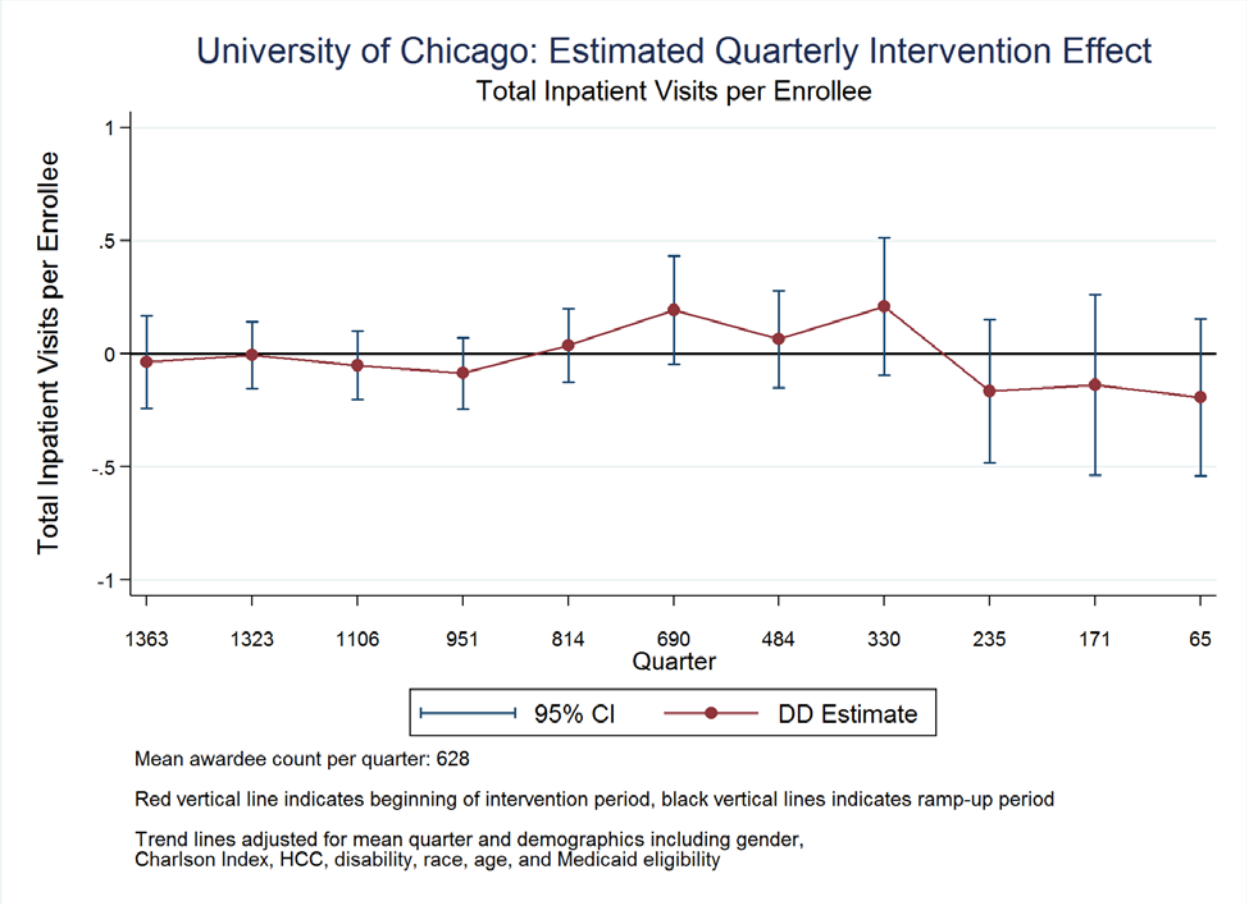
University of Chicago		
Intervention effect ($)	Estimate	1843.96
(Median regression)	Standard error	(1824.74)
	Sample size	[1,363]

*p<0.1 **p<0.05 ***p<0.01

Source: Abt Associates, July 2016.

Exhibit 2.10D shows the estimated intervention effect on hospital admissions by beneficiary exposure quarter. After controlling for patient characteristics, inpatient admissions were stable for beneficiaries regardless of program tenure and did not differ between intervention and control patients. These trends were statistically insignificant.

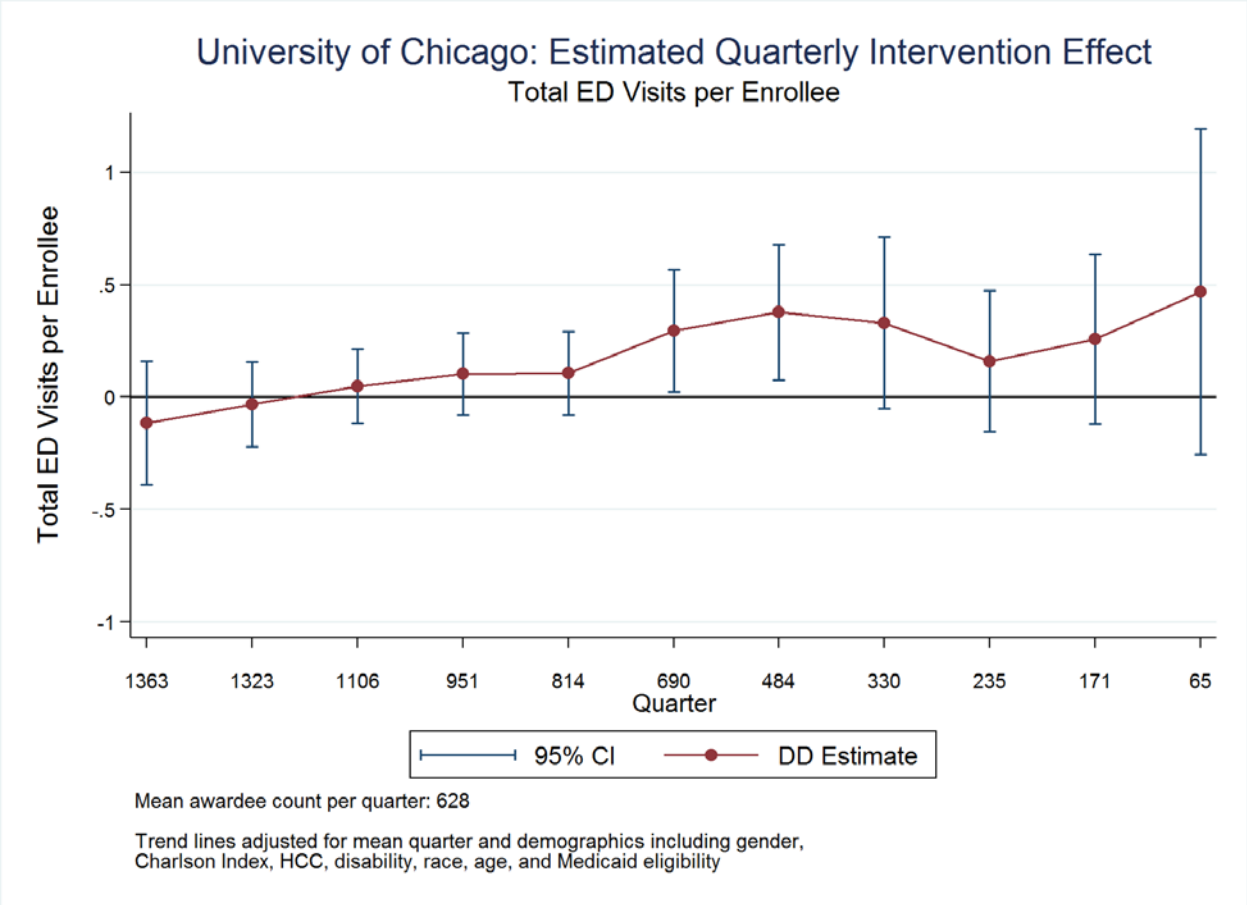
Exhibit 2.10D: Hospital Admissions by Duration of Program Enrollment



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016

Exhibit 2.10E (ED visits) shows the estimated intervention effect by Medicare beneficiary exposure quarter and shows a consistent increase in ED visits for enrollees with longer tenure in the program. This suggests that after about six quarters of enrollment the average intervention patient began visiting the ED more frequently than the average control patient.

Exhibit 2.10E: Average ED Visits by Duration of Program Enrollment



Source: Abt Associates analysis of Registry and Medicare Claims, July 2016.

Conclusions

- There was no significant difference in total average or median Medicare spending per patient over the course of the intervention, relative to the control group (average enrollment was 470 days for patients in the intervention group and 457 for patients in the control group).
- We found no statistically significant impact on hospital admissions, but did estimate an increase in the total number of ED visits, equivalent to roughly 0.85 ED visits per intervention enrollee over the course of the program ($p<0.10$).

2.10.4 Synthesis of Findings

From the perspective of the patients and clinicians we met, this program was successful in better meeting the needs of a high-risk population.

Our analysis did not find a statistically significant impact on Medicare expenditures or hospitalizations. However, we did estimate a small but statistically significant increase in ED visits. Due to the small numbers of patients enrolled in the program, these estimates of program impacts are imprecise, contributing to the lack of statistical significance. A larger population would be needed to observe any small but important changes in Medicare spending.

We note that this population of patients had complex care needs and many had terminal diagnoses (e.g., heart failure, COPD) which tend to require more care over time as the diseases progress, and might help to explain the rise in ED visits (although not why the increase was greater in the treatment group than the control group). We did not observe other patterns suggesting escalating care needs during the relatively brief period patients were served by this program. It is also possible that a comprehensive care team approach like the one evaluated here, can make little difference in utilization or Medicare spending for patients with a terminal diagnosis.

Appendix A

Appendix A – Evaluation of the Hospital-Setting Health Care Innovation Award (HCIA) Sustainability and Spread Follow-up Discussion Guide

Introduction

Hello, this is **[your name]** from Abt Associates.

[If you are familiar with the contact, extend a friendly greeting and thank him/her for taking the time to talk with us this one last time].

[If you are not familiar with the contact:] I am from Abt Associates, the firm contracted by CMS to conduct an evaluation of the hospital-setting health care innovation awards (HCIA). We have been working with **[name previous contact]** over the past two years to gather information about the program at **[name of Awardee].** I want to thank you for taking the time to talk with us this one last time.

[To all:] The purpose of today's discussion is to learn about any new developments in **[name of innovation]** since we spoke with you last year. In particular, we would like to learn more about your plans to sustain and possibly expand your program, and also about your dissemination activities.

Program Status

1. What is the current status of the innovation **[e.g., AWARE]** at the main or 'primary' site(s) where it was implemented?
    a. Still operating as it was last year, all components, no real changes
    b. Still operating, but with important changes
        i. What changes, why?
    c. Absorbed in whole or in part as standard care delivery – no longer a separate program
        i. Which elements are now standard operating procedures (SOP) and how were these functions absorbed into SOP?
        ii. Were any elements dropped?
    d. Largely discontinued
        i. Why?

2. What have been the main challenges in sustaining your program at the primary site(s)?

3. What is the status of your innovation at additional secondary sites (i.e., other than the primary site), where you expanded during the grant period?
    a. Still operating as it was last year, all components, no real changes
    b. Still operating, but with important changes

i. What changes, why?

c. Absorbed in whole or in part as standard care delivery – no longer a separate program
   i. Which elements are now SOP and how were these functions absorbed into SOP?
   ii. Were any elements dropped?

d. Largely discontinued
   i. Why?

4. What have been the main challenges in sustaining your program at secondary site(s)?

5. What would **[Awardee]** have needed to make it possible to sustain **[name of innovation];** what additional resources or support were needed?

[Complete Q6 - 9 only if the program is still being implemented at the primary site, and/or at secondary sites]

6. We are interested in how you were able to sustain your innovation program financially.
   a. Does **[name of innovation]** receive institutional financial support from **[Awardee]**?
   b. Does **[name of intervention]** receive funding from grants or foundations?
   c. Does **[name of intervention]** receive funding from venture capital or other external funding?
   d. If yes to any, is the support on-going support or short-term? Does it cover all costs, or are you still searching for additional support?
   e. Do you have adequate financial resources for both your main primary site(s) and also for secondary sites?

7. We are also interested in how you were able to sustain your innovation in terms of leadership, staff, training, and administrative support.
   a. Has there been any change in leadership of the **[name of innovation]?**
   b. Do you have adequate administrative support and staff?
   c. Do you have adequate IT support for your [name of innovation] program needs?
   d. Do you have adequate clinical staff to carry out the program?
      i. How have you addressed staff turnover, in terms of hiring and training?
      ii. Do you do any refresher training for existing staff?

8. Are you planning to make any changes to the **[name of innovation]** in the future, at the primary site(s) or at secondary sites?
    a. If yes, please explain why.
    b. If yes, please describe the changes.

Spread

9. Is **[name of the innovation]** being implemented at any new settings (i.e., sites that implemented the program after mid-2015)?
    a. If yes, at what settings?
    b. If yes, were modification made to **[name of innovation]** prior to implementing at the new setting?

10. Are there any plans to implement **[name of innovation]** in any additional sites in the future?
    a. If yes, where?
    b. If yes, what if any modifications to the program will be made prior to implementation?

Appendix B

Appendix B – Technical Appendix

Selecting Comparison Providers

To conduct intervention/comparison and difference-in-differences (DD) analyses we selected comparison group patients from non-Awardee providers who were similar to the intervention providers and in the same hospital referral regions (HRRs). We constructed separate comparison groups for each Awardee and provider type ((e.g., hospital, skilled nursing facility (SNF), long-term care hospital (LTCH)) to support the separate evaluations of each program that we conducted. For Awardees with providers in more than one HRR (e.g., Dartmouth, Mt. Sinai), the comparison group included providers for each HRR in their service area. We did not analyze each site separately but rather pooled data for all of an Awardee's intervention sites and compared against data for its pooled comparison sites. This comparison group specification allowed us to estimate the incremental effects of Awardee interventions for fee-for-service (FFS) Medicare beneficiaries (managed care enrollees are not included in our claims analyses) from similar providers within the same market, a comparison of the community standard of care that represents our best estimate of what might have occurred in the absence of Awardee interventions. A key strength of this comparison group specification is that it ensures that intervention and comparison groups share the same local market characteristics (such as availability of different kinds of care), local provider characteristics, local practice standards, and the provider's local competitive environment. It also means that it was unnecessary to adjust for wage differences between intervention and comparison groups, because they were drawn from the same wage areas (with the exception of the Mayo Clinic, which had no comparison in its HRR; see discussion below).

We considered the following factors in selecting comparison group providers:

- **Provider type:** Comparison group hospitals were the same type of provider as those in the intervention group.
- **Provider size:** Comparison group providers were similar in size to Awardee providers. The definition of the size categories varies with respect to Awardee and provider type and was based on the distribution of Awardee-affiliated providers.
- **Teaching status:** For Awardee programs that include teaching hospitals, we considered teaching status in selecting comparison hospitals.
- **Types of services offered:** For Awardees that restrict their program to patients treated in specific units ((e.g., intensive care unit (ICU), emergency department (ED)), we restricted the comparison group to those that provided such services. To increase the strength of the match, we also restricted the Methodist Delirium comparison group to hospitals that provided both ICU and ED services. Note that, for the most part, larger hospitals provided both ICU and ED services, so there was no need to apply this rule to them.
- **Miscellaneous exclusions:** We excluded Special Focus Facilities (SFF) as comparison group nursing homes and also excluded hospitals that specialize in treating pediatric patients. In addition, for Christus, we excluded from the comparison group providers that are not in Arkansas or Texas (there are a few Oklahoma providers in the Christus HRR) since these comparison facilities were subject to

different pricing and regulatory regimes. Finally, no Awardee providers were eligible to be in the comparison group for another Awardee's program.

Note also that Awardees added providers to their programs over time. We augmented our comparison group as appropriate to ensure that it continued to match the expanding intervention group, using the methodology described here.

Exhibit B1: Criteria for Selecting Comparison Group Providers

Awardee	Provider Size	Teaching Status	Specific Types of Services	Misc. Exclusions
University of Chicago	N/A	N/A	N/A	N/A
Christus - Hospital	>250 beds	N/A	N/A	Must be in AR or TX.
Christus- SNF	50-150 beds	N/A	N/A	Must be in AR or TX
Emory	> 250 beds	N/A	ICU and ED services	
Henry Ford	> 500 beds	Major teaching	N/A	
Mayo Clinic	MA: 100-250 beds NY and MN> 500 beds AZ and FL: 250-500 beds	Major teaching	ICU and ED services	For MN, select comparison providers from Minneapolis HRR; FL and AZ comparisons match on size or academic status but not both
Methodist-Sepsis: Hospital	> 300 beds	N/A	N/A	
Methodist - Sepsis LTCH	75 or more beds	N/A	N/A	
Methodist- Sepsis: SNF	50-150 beds	N/A	N/A	Provider category is SNF. There are no SFF facilities in this HRR.
Methodist- Delirium: Hospital	50-150 beds or >300 beds	N/A	N/A	
Mt. Sinai	NY:> 1,000 beds IL, NJ: > 500 beds	Major teaching or graduate	N/A	
St. Luke's Hospital	100-250 beds	Not a major teaching hospital	ICU services	Must be in Idaho (in Boise or Spokane HRR)
Dartmouth	>30 acute care hospitals (ACH), most with 200+ beds	Both teaching and non-teaching	ICU and ED	

Additional Details:

1. The Christus program and the Methodist Sepsis program each had multiple types of participating facilities.
2. The University of Chicago program used a randomized design. The comparison group for this Awardee contained the patients who were randomly assigned to the control group.
3. Provision of ED services was identified using a variable in the Provider of Service (DCTD_ER_SRVC_CD) that reports whether the hospital provided ED services.
4. Provision of ICU services was identified using a variable in the Provider of Service file (ICU_SRVC_CD) that reports whether the hospital provided ICU services.

5. Teaching status was identified using a variable in the Provider of Service file (MDCL_SCHL_AFLTN_CD) that reports the type of medical school affiliation of the hospital.
6. Note that we excluded from the comparison group any providers that were children's hospitals and non-Awardee hospitals that were affiliated with Mayo Clinic.
7. We excluded three providers from the Dartmouth comparison group that were not part of the HCIA intervention, but shared a healthcare system with a provider that was part of the HCIA intervention, and were judged by the Awardee to have received sufficient exposure to the intervention so as to be "contaminated" and inappropriate as comparison providers.

Selecting Intervention and Comparison Patients

We used Awardee patient registry data to inform inclusion/exclusion criteria (rules) and then used these criteria to define intervention and comparison populations.

Registry Overview

Contents of Registry Data

Each Awardee uploaded to Abt (using secure file transfer), a registry of intervention patients treated during the HCIA implementation period. These registry files contained patient-level information including: Medicare health insurance claim (HIC) number, Medicaid identification number, or Social Security number for treated patients; admission and discharge dates for hospitalizations during which a patient received the innovation funded by the award (and the same for those treated in nursing home innovation settings); a Medicare provider number for the institution in which the patient received intervention services; and patient names and dates of birth. A few Awardees were not able to supply all of this information for every intervention patient.

Each patient in an Awardee's registry was matched to a CMS file that contained the identity of all Medicare beneficiaries from January 2010 onward to determine which patients in the registries had corresponding Medicare FFS claims. This match was performed using HIC or Social Security numbers provided by the Awardees. Approximately 75 percent of Medicare patients in the registries had a valid HIC number or Social Security number (Exhibit B2). The exhibit reports the number of patients each Awardee included in their registry data, the number for which we were able to find Medicare FFS claims, and the dates covered by their registry data. Note that this table excludes registry records that had an invalid HIC (e.g., a Medicaid number, private insurance number, or possibly a miss-entered Medicare number). We assumed that Medicare beneficiaries who had an HIC number but have no FFS claims were enrolled in Medicare Advantage plans. Among the programs for which we report the number of registry observations and registry match rates, the Mayo Clinic and the University of Chicago did not receive a NCE, and we ceased receiving registry data from them after Q2 2015. Although Emory University and St. Luke's received NCEs, CMS funding was not used to cover new patients after June 30, 2015 (Emory) and September 30, 2015 (St. Luke's). For these programs, we did not update their information in the exhibit beyond the time period for which they last utilized CMS funding. Registry data from Christus, Dartmouth, and Mt. Sinai were incomplete, and so we did not use registry data to define the analytic sample for these Awardees. However, the Awardees were able to directly specify criteria for us to define the sample using information observable on claims data.

Exhibit B2. Medicare Intervention Patients with Valid HIC Numbers (based on all registry data through Q3 2015)

Awardee	Number of Unique Medicare Patients in the Registry	Number of Unique Medicare Beneficiaries with Claims and Identified by HIC (N)	Number of Unique Medicare Beneficiaries with Claims and Identified by HIC (%)
Christus	N/A	N/A	N/A
Dartmouth	N/A	N/A	N/A
Emory*	4718	1423	30.16%
Henry Ford	6581	3975	62.89%
Mayo Clinic*	5422	4159	76.71%
Methodist Delirium (Intervention)	9557	8946	92.54%
Methodist - Delirium (Screened)	20440	15258	74.64%
Methodist - Sepsis (Screened)	36650	27314	74.52%
Mt. Sinai	N/A	N/A	N/A
St. Luke's	7735	4434	57.33%
University of Chicago*	1405	1363	97.01%

*Through Q2, 2015.

#Emory has an usually high proportion of Medicare patients enrolled in managed care and our analysis is restricted to those for whom Medicare FFS claims are available.

Inclusion and Exclusion Criteria to Define Study Populations

Registry data with admission dates through September 30, 2015 were matched to Medicare FFS claims and used to develop Awardee-specific inclusion and exclusion selection rules. We created inclusion and exclusion selection rules to replicate—as closely as possible—the registry lists provided by each HCIA Awardee. These rules were developed using line-item claims with dates between January 1, 2012 and September 30, 2015.

These rules were then applied to both intervention and comparison hospitals identically, in the baseline and intervention periods, to ensure that the same criteria were used to define both the intervention and comparison groups. Note that selection criteria based on information that is not present on claims (e.g., laboratory tests, observation of patients, clinical judgment) cannot not be replicated in our claims-based inclusion and exclusion selection rules.

The inclusion and exclusion rules were generally developed using the following guidelines, although the specific details varied across Awardees:

1. **Time Criteria:** Using registry data, we determined the first time a patient was treated in each Awardee hospital, during the relevant implementation period for that specific hospital. We also used implementation start dates supplied by Awardee program staff. When the two did not align, we opted to use the start dates supplied by program staff. The claims used for creating selection criteria were then restricted to reflect the dates on or after the implementation start date for each hospital (and its matched comparison hospitals).

2. **Revenue Center Criteria:** Revenue center codes were identified in the claims and used as exclusion or inclusion selection criteria, as appropriate for specific Awardees. For example, the St. Luke's program targeted patients treated in ICUs; patients whose claims did not indicate treatment in an ICU were therefore excluded.

3. **Diagnosis Related Group Criteria:** Based on correspondence and case studies with Awardee program staff, specific Medicare diagnosis related groups (MS-DRGs) were identified as excluded or included for specific Awardee programs. For example, the Methodist Sepsis Screening Program excluded solid organ transplant patients and we therefore excluded claims that had an MS-DRG code indicating a solid organ transplantation.

4. **ICD-9 Criteria:** The Dartmouth program targeted patients with sepsis, and in the first two years its study sites focused on patients treated in the ED or ICU. After the inclusion or exclusion of claims based on ED/ICU revenue centers, we further excluded patients from the treatment group for the Dartmouth program that did not have a diagnosis of sepsis (based on ICD-9 codes).

The steps described above yielded inclusion and exclusion criteria for each Awardee program.[43] We then applied these criteria to the intervention and comparison hospitals, so that the study populations in each were selected using identical criteria. The table below shows the match between Awardee registries and our best approximation of the eligible population from Medicare claims, based on these inclusion and exclusion criteria. Exhibit B3 shows the number of intervention patients that were estimated to be in each Awardee intervention group (based on inclusion/exclusion criteria applied to Medicare claims), the number of patients thus defined who were in the registries, and the percentage of patients who were in both the registry and the estimated intervention group.

Quantifying Accuracy and Completeness of Inclusion Criteria

The percentage of estimated intervention patients that match with registry lists partially determined our program evaluation approach. Ideally, the Medicare intervention population we estimated with inclusion/exclusion criteria matched Awardee registry Medicare lists. Imperfect matches (patients included as intervention group patients who were not in the registry data or patients that were in the registry data but not identified as being in the intervention using claims) added noise to our estimates of program impact. For all Awardees except the University of Chicago, Christus, Dartmouth, Henry Ford, and Mt. Sinai[44], we assessed the degree to which mismatches between our estimated group and the actual intervention group bias analytic results toward zero. Exhibit B3 presents results of this matching exercise for the three Awardees (the Methodist Sepsis and Delirium screening programs, and St. Luke's eICU) all of which continued using CMS funding through 2015 Q3.

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[43] The lone exception was Henry Ford Hospital. There, exposure to the intervention depended on clinical criteria that are not observable on claims data, and we were not able to achieve sufficient accuracy with our matching procedure to produce a valid comparison group.

[44] University of Chicago's randomized design provided us with both intervention and control groups, making it unnecessary to develop inclusion/exclusion criteria. Christus sent only a minimal registry but advised that all patients in all participating facilities are subject to the intervention. Likewise, Mt. Sinai sent an incomplete registry but advised that all patients over 65 in participating EDs are subject to the intervention. Dartmouth's inclusion criteria were developed through discussion with the Awardee rather than use of the registry. This is because their registry contained only a small subset of all intervention patients; therefore matching against their registry is inappropriate.

Exhibit B3: Awardee Registry and Abt-Estimated Counts (based on Q3 2015 data only)

	Methodist Delirium (Screened)	Methodist Delirium (Intervention)	Methodist Sepsis (Screened)	St. Luke's
Registry, Total Unique Medicare Patients	3177	1677	5724	859
Registry with Medicare FFS claim (A)	1210	654	2160	400
Registry Patients Not Captured by Abt rules (B)	40	24	0	37
Miss Rate (B/A)	3%	4%	0%	9%
Estimated based on Abt rules, with Medicare FFS claim (C)	1414	1037	2481	434
Match between Estimated and Registry (D)	1170	630	2160	363
Estimated by Abt rules, Not in Registry	244	407	321	71
Accuracy Rate (D/C)	83%	61%	87%	84%

Including in a regression model any estimated intervention patients who were not actually exposed to the intervention both increases the standard errors and also impacts the average estimated treatment group impact. For example, suppose that 100 patients are estimated to be in an intervention group but only half were actually exposed to the intervention. If the intervention yields a Medicare spending decrease of $10 but this is true only for the actual intervention patients (and not those we incorrectly estimated for the intervention group) the average estimated effect of the intervention will be a decrease of $5 ($10 spending reduction affecting only half of the patients in the intervention group).

At the same time, it is not always clear why some patients were recorded in an Awardee's registry, while others who are apparently very similar were not. For example, staff from some of the hospitals participating in the Mt. Sinai program staff may have entered only patients seen in the geriatric EDs (or GERI-EDs) in their registry, even though other patients received some GEDI-WISE services in the main EDs. Similarly, some hospitals that participated in the Dartmouth Institute program excluded patients who became Do-Not-Resuscitate (DNR) status while in the hospital; others only excluded patients who were DNR status when they entered the hospital. Decisions about which patients to record in the registries may not have been consistently in multi-site programs, affecting the match rates we achieved.

Our inability to perfectly specify inclusion/exclusion criteria using Medicare claims data was a limitation, which potentially increased the standard errors of our estimates and decreased estimated treatment effects. We therefore caution that impact estimations in this report are conservative.

Analytic File Construction

This section describes: a) the data sources for the analytic files, b) the procedures used to identify episodes, and c) methodology for identification of outcome measures.

Data Sources

Medicare enrollment, claims and payment data contained in the Chronic Conditions Warehouse (CCW) and Geographic Variation Database (GVDB) were used for this study. All data files corresponded to calendar years 2010–2014, and the first three quarters of 2015, which span baseline and intervention

periods. CCW Part A institutional claims were extracted for beneficiaries served by HCIA Awardee and comparison hospitals. CCW point-of-service (POS) files were used to identify hospital names and assign them to intervention or provider status. For beneficiaries with Part A claims for HCIA Awardees or comparison hospitals, all Part A and B claim, revenue, and line-level data were extracted from the appropriate CCW source files. Demographic information about beneficiaries was extracted from the CCW Master Beneficiary Summary File, including date of birth, date of death, as well as eligibility information including monthly health maintenance organization (HMO) indicators, Medicare status codes, and reasons for entitlement (see Exhibit B4 below).

In order to standardize baseline period claims to a comparable level of claims maturity as the intervention period, processing date restrictions were applied to all extracted claim, revenue and line-level claims data. Two files were created: the first file was designed for measuring core measures of utilization as defined by CMS. In this file, all claims were limited to those processed within three months of the claim thru date (e.g., for a claim with a thru date of March 15, 2014, the claim would only be included if it was processed by June 15, 2014 and was the final action version of the claim). The second file was designed to capture episode healthcare spending in the inpatient and post-discharge periods, including Part B claims. For this file, to accommodate the lag in filing of Part B claims, claims were limited to those that were processed within 6 months of the claim thru date (e.g., a claim with a thru date of June 15, 2014, the claim would be included if the final action was processed by September 15, 2014 and it was the final action version of the claim).

Exhibit B4: Data Sources

Data Source	Input to Research File
CCW Master Beneficiary Summary File	Demographics, monthly Medicare enrollment information and reasons for eligibility
CCW Part A Medicare Claims	Acute hospitalizations, index and readmission hospitalization indicators, Medicare payments, discharge destination, transfer from hospital or other healthcare facility, inputs to Charlson Comorbidity Index (CCI) and Major Diagnostic Category (MDC).
CCW Part A Revenue Center Medicare Claims	Identification of ED visits and ICU stays
CCW Part B Institutional Medicare Claims	Medicare payments and outpatient ED visits
CCW Part B Non-Institutional Medicare Claims	Medicare payments
GVDB Beneficiary Summary File	Hierarchical Condition Codes (HCC) Risk Scores
Provider of Services (POS) File 2012	Characteristics of SNF (e.g., size, for-profit status, location)
Diagnostic Related Category (DRG) to MDC Crosswalk	Generates MDCs using DRGs from Part A Medicare Claims

CCW = Chronic Conditions Warehouse; GVDB = Geographic Variation Database

Episodes

Inpatient claims were clustered into stays using methodology which groups claims that are overlapping or adjacent with respect to the from and thru dates on the claim, and using information from the claim patient discharge status code. Similarly, for SNF claims the stay methodology was used to group claims based on claim dates. The period following the beneficiary's discharge from the episode-initiating inpatient stay was evaluated for subsequent ACHs, whereas for SNF providers the start date of the stay defined the beginning of the evaluation period.

Outcome Measures

Readmissions

All acute, critical access or other inpatient episodes were evaluated for occurrence and number of inpatient readmissions within 7, 14, 21, 30, 60, 90, and 120 days following discharge from initial hospitalization. For SNF and long term care (LTC) providers, beneficiaries were followed for 7, 14, 21, 30, 60, 90, and 120 days following admission to the SNF or LTC facility for subsequent hospital admission.

ED Visits

All Medicare Part A institutional revenue center claims were extracted for beneficiaries with an acute inpatient stay at an HCIA Awardee or comparison provider. ED visits were classified based on the revenue center codes in the institutional revenue center claim data. An indicator was created specifying whether the acute inpatient stay initiating the episode was an admission through the ED. ED use was also measured at intervals during the evaluation period including 7, 14, 21, 30, 60, 90, and 120 days post discharge from inpatient or post admission for SNF providers. If the Part A revenue center codes for a claim indicated ED use, then the visit was classified as an inpatient visit. In contrast, an outpatient ED visit was counted if the Part B institutional revenue center codes indicated ED use.

Medicare Episode Spending

Calculation of Medicare spending used the second file described above, with longer maturity of claims to accommodate claims submission lags from post-acute settings, and for 30, 60 and 90 day periods following discharge. Standardized payments for inpatient claims were calculated using the following formula:[45]

$$Actual\ payment - (IME + DSH) = Standardized\ Amount$$

where IME is the indirect medical education payment amount and DSH is the disproportionate share payment associated with the claim.

Spending for Medicare Part A inpatient claims during the follow up period were prorated across the days of the stay. For example, if a beneficiary was readmitted to the hospital on the 28th day of the 30-day follow up period for a 5 day stay, 3/5ths of the standardized amount of the claim was attributed to the 30-day spending period for the episode. No standardization was performed for either Part B institutional or Part B non-institutional services.

Note that we did not adjust Medicare spending to account for inflation. Any changes in total spending due to inflation apply equally to both intervention and comparison groups in the DD analysis.

Measure Specification

Core measure specifications must vary somewhat for individual Awardees. For example, the Mt. Sinai intervention began with an ED visit; defining an episode as starting with a particular ED visit (often one among many) is complicated by considerations of whether or not that episode-initiating ED visit went on

[45] IME refers to "indirect medical education," an adjustment made to payments to teaching hospitals to account for the higher per-patient cost at teaching hospitals relative to non-teaching hospitals. DSH refers to "disproportionate share hospital", a payment adjustment that accounts for the share of a hospital's patients covered by supplemental security income (SSI) or Medicaid.

to become an inpatient admission. For another example, the Christus intervention concerned nursing home residents, whose nursing home stays began some time (weeks or months) prior to the intervention, but about which we have little information because Medicare was not the primary payer. Similar idiosyncrasies arose in implementing the core measure specifications for other Awardees as well. We further note that some of the core measures were not targeted by the Awardees themselves. Many of these Awardees' innovations took place entirely during the course of a single hospitalization, and various Awardees focused on reducing mortality, reducing hospital-acquired infections, or reducing length of stay during that admission.

Note that most of the 10 Awardee interventions began when a patient was already hospitalized and ended at hospital discharge. A measure of inpatient admissions therefore was not relevant for most Awardees. Separately estimating planned vs. unplanned readmissions also had little relevance, since it seems unlikely that any physician would deliberately plan repeated sepsis, delirium, or ICU admissions, or plan a sequence of ED visits.

Defining Index Admissions

Core outcome measures were defined in reference to an "index" inpatient hospital admission. An index admission was the first time during a 120 day period that a patient who qualified for treatment in the intervention was treated in either a comparison or intervention (Awardee) hospital. An index admission did not need to occur during the same time period as the intervention, but rather referred to any treatment over the observed time period that would have been eligible for the intervention if it had occurred at an Awardee hospital after the date the intervention program was implemented at that hospital.

The discharge date of an index admission was considered to be Day 0, after which the following outcomes were calculated: 30 day Hospital Readmissions, 30 Day ED visits, and total episode spending (which includes the index stay and 60 days after discharge). A patient discharged from each index admission began a 120-day "episode" period during which no new index admissions were assigned.[46] The 120-day period was applied as a standard time period during which a patient's care was likely to be associated with that index admission. For example: if a patient was admitted to an intervention hospital for a specific condition, qualified for the intervention, and was discharged five days later, we expected that the same condition would not cause another hospital admission more than 120 days later.

After 120 days had elapsed, new index admissions were assumed to be independent events, clinically unrelated to the previous index admission. Testing indicated that multiple admissions happened so infrequently, and the standard errors were sufficiently uncorrelated, that corrections were unnecessary and would have had d no meaningful effect on the standard errors.

Index admissions were assigned in chronological order. For each beneficiary the first observed inpatient stay that qualified for treatment in the intervention was defined as an index admission. The next observed inpatient stay that qualified for treatment, and that occurred at least 120 days after discharge from the previous admission, was defined as a new index admission. This process continued until all admissions for the beneficiary observed during the sample period had been assigned as either index or non-index admissions.

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[46] For observations missing date of discharge, the date of final service was used in place of discharge date. Observations that were missing both date of discharge and date of final service or that were missing date of admission, could not be assigned as index admissions.

Core Outcome Measures

Several utilization and Medicare cost measures were analyzed for each HCIA awardee. These outcomes were specific to the purpose of each intervention, and reflected the core measures that CMMI specified for the entire HCIA program. For most awards, we measured 60-day Medicare episode spending (including the index admission or ED visit); for the University of Chicago we created an aggregate cost measure due to the randomized design of the program and ongoing enrollment of patients. We did not analyze inpatient length of stay for interventions taking place in LTC and SNFs due to the long-term nature of care for many of these residents. Lastly, we evaluated the number of hospital admissions that took place through the ED for Mt. Sinai because the intervention focused on ED patients and efforts to prevent their eventual hospital admission.

Exhibit B5: Awardee-Specific Outcome Measures

		Christus Acute Care	Christus SNF	Dartmouth	Emory	Henry Ford	Mayo Clinic	Methodist - Delirium	Methodist - Sepsis Acute Care	Methodist - Sepsis SNF	Mt.Sinai	St.Luke's	University of Chicago
Cost Measures	60-Day Medicare Cost	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Total Medicare Cost												✓
Utilization Measures	30-Day Inpatient Admissions		✓							✓			
	30-Day Inpatient Readmissions	✓		✓	✓	✓	✓	✓	✓		✓	✓	
	30-Day ED Visits	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	30-Day Admissions from ED										✓		.
Utilization Measures	Length of Stay	✓		✓	✓	✓	✓	✓	✓			✓	
	Inpatient Discharge Destination	✓		✓	✓		✓	✓	✓			✓	
	Total Inpatient Admissions												✓
	Total ED Visits												✓

Hospital Admissions for Long-Term Post-Acute Care (LTPAC) Patients

We computed quarterly hospital admission rates for the SNF component of the Christus intervention, and the SNF and LTCH components of the Methodist Sepsis intervention. These rates measured the proportion of index SNF/LTAC stays after which a patient is admitted to the hospital one or more times within thirty days of the admission date. This can be expressed mathematically as:

$$\text{Admission Rate}_{jk} = \frac{\sum_{i=1}^{n_{jk}} \text{Admissions}_i}{n_{jk}},$$

where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and $Admission_i$ is a binary measure indicating whether the inpatient hospital admission occurred within 30 days of discharge from index admission *i*. This binary definition of admission limits the numerator in the equation above to containing at most one inpatient admission per index stay, which prevents the admission rate from exceeding 100%.

The calendar quarter to which admissions were assigned depended on the calendar quarter in which the relevant index stay began. If an index stay began in one quarter, a hospital admission within 30 days from the index admission counted as an admission, even if the admission occurred in the subsequent quarter.

Hospital Readmissions

We computed quarterly hospital readmission rates for each Awardee as the proportion of index hospital admissions after which a patient was admitted one or more times within thirty days of the discharge date. This can be expressed mathematically as:

$$\text{Readmission Rate}_{jk} = \frac{\sum_{i=1}^{n_{jk}} \text{Readmissions}_i}{n_{jk}}.$$

where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and $Readmission_i$ is a binary measure indicating whether another admission occurred within 30 days of discharge from index admission *i*. This binary definition of readmission limits the numerator in the equation above to containing at most one readmission per index admission, which prevents the readmission rate from exceeding 100%. This is consistent with the approach used by Hospital Compare and other CMS readmission monitoring programs.

The calendar quarter to which readmissions were assigned depended on the calendar quarter in which the relevant index admission occurred. Therefore, if an index admission began in one quarter, a new admission within 30 days of discharge from the index admission counted as a readmission, even if the readmission occurred in the subsequent quarter.

Patients whose program intervention began in a LTPAC setting (in the Christus and Methodist Sepsis programs) were not included in the hospital readmission rates presented here.

30-Day Post-Discharge ED Visits

Quarterly ED visit rates were computed for each Awardee as the proportion of index hospital admissions after which the patient visited an ED within thirty days after the hospital discharge date. This can be expressed mathematically as:

$$\text{Post} - \text{discharge ED Visit Rate}_{jk} = \frac{\sum_{i=1}^{n_{jk}} \text{ED}_i}{n_{jk}},$$

where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and ED_i is a binary measure indicating whether any ED visit occurred within 30 days of discharge from index admission *i* . This binary definition of post-discharge ED visits limits the numerator in the equation above to containing at most one ED visit associated with each index admission, and prevents the post-discharge ED visit rate from exceeding 100%.

As with 30-Day Inpatient Readmissions, post-discharge ED visits were assigned to the calendar quarter in which the relevant index admission occurred, rather than the quarter in which the ED visit occurred.

30-Day Post-Admission ED Visits

We computed quarterly rates of ED visits for the SNF component of the Christus intervention, and the SNF and LTCH components of the Methodist Sepsis intervention. These rates measured the proportion of index SNF/LTAC stays during which a patient visits the ED at least one time within thirty days of the admission date. This can be expressed mathematically as:

$$\text{Post} - \text{admission ED Visit Rate}_{jk} = \frac{\sum_{i=1}^{n_{jk}} ED_i}{n_{jk}},$$

where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and ED_i is a binary measure indicating whether any ED visit occurred within 30 days of the admission date for index admission *i* . This binary definition of post-admission ED visits limits the numerator in the equation above to containing at most one ED visit associated with each index admission, and prevents the ED visit rate from exceeding 100%.

As with 30-Day Inpatient Readmissions, post-admission ED visits were assigned to the calendar quarter in which the relevant index admission started, rather than the quarter in which the ED visit occurred.

60-Day Total Medicare Spending

Average total Medicare spending for the 60 days after patient discharge was calculated by quarter. This can be expressed mathematically as

$$\text{Total Medicare Spending}_{jk} = \frac{\sum_{i=1}^{n_{jk}} \text{Spending}_i}{n_{jk}}$$

Where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and spending refers to the sum of all Medicare spending (as defined in section 1.3.3) incurred by patients during the index admission and the following 60 days. All Medicare spending was assigned to the calendar quarter in which the relevant index admission occurred, rather than the quarter in which the spending occurred, and we truncate Medicare episode spending at the 99th percentile.

Discharge Destination

Rate of discharge from the hospital to one of five destinations was computed for each Awardee as the proportion of index hospital admissions that ended with the patient discharged to a given destination. The four destinations included: home without assistance from a home health agency, home health care, SNF/inpatient rehabilitation facility/other nursing home/LTCH, and discharge to “other” destination (includes hospice, planned readmissions, etc.). The discharge rate for each of the *l* destinations can be expressed mathematically as

$$\text{Discharge Destination Rate}_{jkl} = \frac{\sum_{i=1}^{n_{jk}} \text{Discharge Destination}_{li}}{n_{jk}}$$

Where n_{jk} is the total number of index admissions for Awardee *j* in quarter *k*, and discharge destination *l* refers to discharge to the l^{th} location. All discharges were assigned to the calendar quarter in which the relevant index admission occurred, rather than the quarter in which the discharge occurred.

Patients whose program intervention began in a LTPAC setting (subpopulations in the Christus and Methodist Sepsis programs) are not included in the discharge destination rates since the measures only apply to discharges from an ACH.

Special Considerations

Emory

The Emory eICU program was implemented at three large, urban ACHs, and two smaller community hospitals, one of which is part of the Emory system (in the Atlanta suburbs) and the other of which is a rural regional hospital in east Georgia. We omitted the two smaller community hospitals from our primary analyses in this report. Although these hospitals are larger than critical access hospitals, the number of episodes in these hospitals never achieved a level that would be sufficient to detect any significant differences in outcomes.

Mt. Sinai

The intervention for Mt. Sinai took place during patient ED visits. We defined an index event as an ED visit, some of which went on to become inpatient hospital admissions. For the 30 days following an index ED visit, we calculated the mean number of ED visits per beneficiary, as well as the rate of subsequent hospital admissions. The rate of hospital admissions was based on the 30 days after the index discharge, whether patients were discharged from the ED or inpatient setting. Similarly, total Medicare episode spending was estimated for the index ED visit and all additional spending for 60 days, whether or not the patient was admitted to the hospital immediately following the index ED visit. Finally, we present the proportion of index ED visits that became inpatient hospital admissions. Because this intervention occurred in the ED setting, and not all episodes ended with an inpatient admission, we did not analyze inpatient length of stay or inpatient discharge destination.

St. Luke's

Part of St. Luke's intervention took place at several CAHs in the region, as well as larger urban hospitals, surrounding the flagship regional medical center. Beginning with the Q5 report, we omitted the CAHs (and all comparison CAHs) from our analyses. CAHs are fundamentally different from ACHs, in the services they offer and the patients they serve, and the intervention effect for CAHs would likely be different than for the larger and more urban St. Luke's hospitals. Because the CAH subsample was very small and lacked sufficient power to distinguish a separate intervention effect, we could not conduct a separate CAH analysis. We therefore limited the analysis to the more homogenous ACHs to be more confident about the estimated intervention effect. Although we continued to monitor the number of CAH patients to determine if it was feasible to support a separate analysis, the sample size remained small across the entire study period (less than 100 episodes) and we did not analyze outcomes for these hospitals.

University of Chicago

- Admissions and ED Visits

The University of Chicago intervention was intended to reduce total inpatient admissions among a specific sample of high-risk patients who were recruited for the program while in the hospital or while in the community. This program targeted patients with a high number of ED visits and hospitalizations. Once enrolled and randomized to receive the intervention, patients continued to receive program services; the intervention did not end. Instead of 30-day readmission rates or 30-day ED visit rates, we therefore calculated the average total number of admissions and the average number of ED visits. This can be expressed mathematically as:

$$\text{Average Admissions}_k = \frac{\sum_{i=1}^{n_k} \text{Admissions}_i}{n_k}$$

where n_k is the total number of patients participating in the intervention in quarter *k* and admission refers to the total number of admissions for patient *i* observed in quarter *k*. Graphical representations include the sum of admissions or ED visits per 90 days after enrollment.

- Medicare Spending

Patients were enrolled in the University of Chicago program on a rolling basis and randomized to intervention or control arms of the study. To understand whether program impacts increased with longer tenure in the program, we calculated total Medicare spending from the point of enrollment, and summed these amounts during every 90 day period. These calculated costs were for all enrollees, including those who died. Aggregated cost and utilization regressions included total spending and utilization by enrollee, while controlling for the amount of time exposed to the treatment.

- Demographic Information

Charlson Index scores are directly calculated based on a claim's diagnosis codes, and could therefore be influenced by the University of Chicago intervention. We calculated the mean Charlson Index during the year before a beneficiary's enrollment in the program. We weighted this value by the amount of time that a beneficiary exhibited a specific index score; if a beneficiary had no claims from which we could extract the Charlson index during the baseline year, the value was missing, and we replaced the missing value with the mean baseline Charlson index from the entire beneficiary population. We included this baseline Charlson score in all analyses for this awardee.

- Test of Significance

Although it was the smallest program in this evaluation, the strong randomized controlled design employed by the University of Chicago program permitted tests of significance between the intervention and control groups. We used a Students t test for comparison of two groups and report significance at the .10 level.

Patients Whose Intervention Begans in LTPAC Settings: the Christus and Methodist Sepsis Programs

The Christus and Methodist Sepsis programs included both patients in an ACH setting and those in nursing and rehabilitation facilities and LTCHs. Patients who were first exposed to the intervention in an LTPAC setting were accounted for separately from those who were first exposed to the intervention in an ACH inpatient setting. Outcomes of interest for LTPAC patients included 30-day hospital admissions, 30-day ED visits, and 60-day average Medicare spending. The index cases were defined and assigned in the same way as for the hospital readmission measures described above, except that in this case the index event referred to an LTPAC stay rather than a hospital admission. LTPAC outcomes were defined in reference to the beginning of the LTPAC stay, rather than the end. For example, 30-day admission, and 30-day ED visits, referred to outcomes that occurred within 30 days of the start of a LTPAC stay.

Programs that Span Multiple HRRs: Dartmouth, Mayo Clinic, and Mt. Sinai Programs

Four Awardee programs had participating hospitals (and therefore, comparison hospitals) located in more than one HRR. Since the average of the outcomes of interest (particularly Medicare spending) may could vary across HRRs, it was important that the distribution of Awardee episodes among relevant HRRs equaled the distribution for comparison episodes, or else the match would have been imperfect. To ensure equality between the distribution of Awardee and comparison observations in HRRs, all comparison observations for Dartmouth, Mayo Clinic, Methodist (Sepsis), and Mt. Sinai – the multi-HRR programs –

were weighted. For all outcomes displayed in the trend charts, weights were computed and applied on a quarterly basis (i.e., the distribution of comparison outcomes were weighted to match the Awardee outcomes within each quarter). In regression analyses for these four programs, weights were applied so that the distribution of comparison episodes by HRR in the baseline and post-intervention periods was equal to the distribution of Awardee episodes by HRR in the baseline and post-intervention periods. The weights can be mathematically expressed as:

$$W_{jt} = \frac{P_{Ajt}}{P_{Cjt}},$$

where W_{jt} is the final applied weight, P_{Ajt} is the proportion of Awardee episodes in HRR *j* in time period *t*, and P_{Cjt} is the proportion of comparison episodes in HRR *j* in time period *t*.

Multi-Site Programs with Different Starting Dates

The majority of Awardee programs had more than one participating institution, and began the intervention at different times in each site, sometimes with months or years of lag between the first implementation and adoption by subsequent facilities. Within each HRR, each Awardee comparison group was comprised of a group of hospitals, not just one comparison hospital for each Awardee hospital. To avoid measurement error that would arise if the entire comparison group were assigned a post-period that corresponded with only one of the Awardee intervention hospitals, we created a separate comparison group for each Awardee hospital. We implemented the following algorithm within each HRR where Awardee hospitals had more than one start date:[47]

- Computed the proportion of Awardee episodes within the HRR that came from each of the K Awardee hospitals within the HRR (P_k).
- Assigned all comparison episodes a random number from the uniform distribution.
- Using the random draw, assigned all comparison episodes (without replacement) to share a start date with one of the K Awardee hospitals with probability P_k.

This approach constrained the proportion of Awardee and comparison patients in the pre-intervention and post-intervention periods to remain roughly consistent over time, as opposed to the alternative solution of assigning the start to one date for the entire comparison group.

To illustrate, consider the following example with two Awardee hospitals: one that began at t_1 and one that began at t_2. Suppose that each hospital contributed exactly 50% of the episodes. Each comparison episode was assigned a random number between 0 and 1. If the comparison episode's random number was less than 0.5, then it was assigned a start date of t_1. All comparison episodes with a random number greater than 0.5 were assigned a start date of t_2. Therefore, roughly 50% of all comparison observations would have a pre-period of 0 to t_1, and roughly 50% a pre-period of 0 to t_2, consistent with the Awardee episodes.

[47] The exception to this rule was Emory University. The intervention began at all three primary facilities within a single week, which we considered too short of a time frame to introduce any substantial measurement error.

Regression Analysis

Difference-in-Difference (DD) Regression and Estimated Intervention Effects

For nine of the ten Awardees we estimated the effect of the intervention on each of the outcomes of interest described above, including total episode Medicare spending, length of stay, 30-day readmissions, 30-day ED visits, and discharge destination.[48] DD is a quasi-experimental design that accounts for time-invariant differences between the Awardees and their comparison groups. The regressions included all episodes from all quarters to increase sample size and power, producing a single point estimate of the average cumulative intervention effect for each Awardee. The regression model for each outcome varied based on the nature of the outcome (e.g., binary, continuous); Exhibit B6 below summarizes the model used for each outcome.

Exhibit B6 – Regression Models by Outcome

Model	Outcomes
Logit	30-day admissions (from PAC) 30-day readmissions 30-day ED visits ED to Inpatient Admission (Mt. Sinai)
Negative Binomial (NB)	Length of Stay Total ED Visits (U. Chicago) Total Inpatient Admissions (U.Chicago)
Ordinary Least Squares	Total Medicare Spending (U. Chicago) Total 60-Day Medicare spending
Quantile	Median Total 60-Day spending
Multinomial Logit	Discharge Destination
Hurdle at Zero Poisson	Total 30-day ED Visits (Mt. Sinai)

Each outcome can be generalized as:

$$Y = f(\mathbf{X}\beta + \mathbf{P}\gamma + \mathbf{Q}\alpha + I\theta + (A * I)\delta)$$

where $f(\cdot)$ is the distribution of Y, **X** is a vector of patient-level covariates including gender, race, age, squared age, Hierarchical Condition Category (HCC)[49] score, squared HCC score, and Medicaid eligibility; **P** is a vector of hospital-level fixed effects; **Q** is a vector of quarter-level fixed effects[50]; I is a

[48] We did not estimate the effect of the intervention on outcomes for Henry Ford because patient selection depends on clinical criteria not available on claims, and we were could not create a baseline or comparison sample.

[49] The HCC score was developed by CMS to determine an individual's expected Medicare expenditure relative to the average based on their health status as well as demographic information (e.g. age, gender).

[50] The quarterly effects controlled for seasonal trends that affected both comparison and intervention groups. For instance: If a bad flu season affected both the comparison and the intervention group, we include a variable for that effect in the regression. The estimated coefficient that we report shows the difference in outcomes net of all quarterly effects that affected both the comparison and intervention groups.

binary indicator signaling that an index stay occurred during the intervention period; and A*I is an interaction term indicating that an index stay occurred at an awardee hospital during the intervention period. We assumed that conditional on **X**, **P**, **Q**, and I, that exposure to the intervention was exogenous (i.e. was uncorrelated with anything that might influence Y that was not controlled for in our regression equation) and so δ can be interpreted as the effect of the intervention on Y.

We interpreted the OLS estimate of total Medicare expenditure(δ) as the effect of the intervention on Medicare expenditure. However, the other outcomes were estimated using nonlinear models that required additional calculations to arrive at an estimate of the intervention on the outcome. For each outcome besides total expenditure, we estimated the "Average Treatment Effect" (ATE). The ATE can be expressed mathematically as:

$$\text{ATE}_i = \frac{1}{n}\sum_{i=1}^{n}\left(E[Y_i|\mathbf{X}_i, \mathbf{P}_i, \mathbf{Q}_i, A_i * I_i = 1] - E[Y_i|\mathbf{X}_i, \mathbf{P}_i, \mathbf{Q}_i, A_i * I_i = 0]\right)$$

where $E[Y_i|\cdot, A_i * I_i = 1]$ is the outcome Y for individual *i* that would be observed if the individual was exposed to the intervention, and $E[Y_i|\cdot, A_i * I_i = 0]$ is the outcome Y for individual *i* that would be observed if the individual was not exposed to the intervention. Since no individual was both exposed and not exposed to the intervention, the ATE requires estimating a counterfactual prediction of the outcome that would have been observed if the individual received the opposite level of intervention as actually occurred. We operationalized $E[Y_i|\cdot]$ as $f(\mathbf{X}_i\hat{\beta} + \mathbf{P}_i\hat{\gamma} + \mathbf{Q}_i\hat{\alpha} + I_i\hat{\theta})$ where f(·) was the distribution of $E[Y_i]$. The counterfactuals were then generated by imposing $A_i*I_i = 1$ for all patients, and $A_i*I_i = 0$ for all patients, regardless of the observed status of the patient. This yields:

$$\widehat{\text{ATE}} = \frac{1}{n}\sum_{i=1}^{n} f\left(\mathbf{X}_i\hat{\beta} + \mathbf{P}_i\hat{\gamma} + \mathbf{Q}_i\hat{\alpha} + I_i\hat{\theta} + \hat{\delta}\right) - f\left(\mathbf{X}_i\hat{\beta} + \mathbf{P}_i\hat{\gamma} + \mathbf{Q}_i\hat{\alpha} + I_i\hat{\theta}\right).$$

We estimated Huber-White heteroskedasticity robust (henceforth "robust") standard errors that account for potential correlation between the variance of Y and the covariates (Green, 2008a). Due to the inclusion of hospital fixed effects in the regression equation, the robust standard errors also accounted for the potential correlation of outcomes within a given hospital. Standard errors of the ATE were estimated using the delta method, incorporating the robust covariance matrix estimated for the coefficients (Green, 2008b). [51]

Quarterly Intervention Effects

At CMMI's request, beginning in the Q6 report we replaced graphs of quarterly trends with graphs of quarterly estimated intervention effects. The effects were estimated for each calendar quarter in the period after the intervention was implemented at the first hospital for a given Awardee. Quarterly estimates were produced using the same approach as the pooled estimates described above, except that separate awardee-interaction terms were included for each intervention quarter in place of a single (pooled) intervention-period awardee-interaction. Additionally, the ATE was computed based on only patients who visited the

[51] We did not cluster the standard errors at the provider level for each awardee because the number of individual facilities within each award was fewer than 50, the smallest number of clusters recommended by in the literature (Bertrand, Duflo, Mullainathan, 2004; Cameron, Miller, 2015). Our solution instead corrected for heteroscedasticity in the error terms, in addition to accounting for mean facility-level effects.

hospital in that particular quarter, so that the "counterfactual" cases did not include patients who visited the hospital in other quarters. The number of patients in each quarter was small for most Awardees and the quarterly estimates had less statistical power than the pooled estimates described above.

Since an intervention period was considered to have started in the first calendar quarter that any Awardee facility began the intervention, estimates from quarters in which some but not all facilities were implementing the intervention were attenuated by observations from facilities that had not yet begun. Additionally, since the intervention typically began in the middle of a calendar quarter, results in that first intervention quarter were attenuated by the inclusion of some observations that occurred in the early weeks of that calendar quarter, prior to the start of the intervention.

Quantile Regression

The OLS estimation of total Medicare spending models the *mean* Medicare spending per episode. Due to the skewed nature of expenditure data, the mean may be unduly influenced by a few observations with unusually large expenditures (i.e. outliers). As a robustness check against our results in the pooled-over-time model, we estimated total Medicare spending using quantile regression, which allowed us to model the *median* expenditure per episode (i.e. expenditure at the 50^{th} percentile). This helped to limit the influence of outliers in the data.

Data Challenges

Other important data issues were addressed to the best of our ability for this report, but our findings do have limitations. For example, the use of final action claims vs. submitted claims, and claims run-out/processing cut-offs, were not addressed in detail in CMS's core measures specifications but are of considerable importance when trying to create identical measures for baseline and intervention periods. The core measure specification also did not recommend standardizing Medicare spending to remove the various penalties, incentives, and discounts that may apply to payments related to value-based purchasing, use of electronic health records, bundled payment, and other initiatives and that may vary over time and for intervention vs. comparison hospitals.

Given these data and definitional issues, and especially the fact that we could not estimate the study population with perfect precision, we caution that all estimates in this report should be considered conservative.

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Appendix C – Patient Survey Reports

Executive Summary

The patient survey is part of Abt Associates' evaluation of Hospital Setting HCIA Awards. The patient survey provides insight regarding the effect of HCIA Awards on measures of patient care experience and health and functional status by comparing patients' responses across the intervention (HCIA Award) and comparison (non-HCIA Award) groups. We conducted the survey for the five Awardees that had sufficient sample size and for which we could identify a valid comparison group using Medicare claims data.

Research Questions

In order to address questions related to care quality and patient satisfaction, a sample of beneficiaries were surveyed regarding their health and functional status, satisfaction with care, and care experiences they recently received. Questions asked of surveyed beneficiaries are covered under the following five broad categories:

- Health Outcomes
- Health-Related Quality of Life
- Satisfaction with Care
- Care Experience
- Demographics

The main study question was how the programs affected patient perceptions in the first four domains above.

Methods

Instrument Development

The survey contains 34 multiple-choice questions across five domains inclusive of Health Outcomes, Health-Related Quality of Life, Satisfaction with Care, Care Experience, and Demographics.

Domain and Item Selection: We conducted a targeted literature review/environmental scan to identify measures, surveys, questionnaires, and test barriers that include items specific to each of the domains. Appendix C.1 presents the domains used in the survey and the sources from which items were drawn. Some items selected were used verbatim from existing survey tools while others were modified for use with our target population and/or for use as a self-administrated survey. For example, to address the domain of Health Outcomes, items from the PROMIS Global Health Scale[52] were used to rate physical and mental health. An item from RAND's HRQoL[53] (Health Related Quality of Life) was used to collect information on patients' Health-Related Quality of Life, and items from the CPoCQ (Client Perception of

[52] http://www.nihpromis.org/measures/instrumentoverview?AspxAutoDetectCookieSupport=1

[53] Hays, R. D. & Morales, L. S. (2001). The RAND-36 measure of health-related quality of life. The Finnish Medical Society Duodecim, Annuals of Medicine, 33, 350-357.

Coordination Questionnaire)[54] collected data in the domain of Satisfaction with Care. Other items were modified from the original source. The Boston University AM-PAC "6 Clicks" Daily Activity Inpatient Short Form was modified for use as a self-administered survey, and Hospital CAHPS was simplified to address Care Experiences[55]. Health and Human Services (HHS) Standards[56] were used to guide the development of items on race, ethnicity and other demographics. The final set of survey items can be found in Appendix C.2.

Cognitive Testing: Abt SRBI conducted five cognitive interviews in advance of the HCIA patient survey to ensure that the flow of questions and skip patterns were understandable for respondents and that the questionnaire was not overly burdensome. All test participants were recruited by Abt Associates from a small convenience sample of friends and family who had been hospitalized for an acute health event within the past year. Test participants received survey materials through the mail, and the cognitive interviews were conducted over the telephone. During the interview, participants were asked to read all instructions and questions out loud. As participants selected their responses, they were encouraged to "think out loud" and explain their reasoning behind responses, discuss any hesitation, and comment on confusing or ambiguous instructions, question wording or response categories. All test participants were sent a thank you letter and $75. After completing the five interviews, Abt SRBI staff compiled findings across the interviews, and appropriate changes were made to the final survey instrument.

Survey Administration

The patient survey was fielded between April 7 and August 10, 2015, with intervention patients and a matched comparison group for each of the five Awards. A self-administered survey was mailed to selected patients, accompanied by a cover letter signed by a CMS official that explained the purpose of the voluntary survey and promised confidentiality. The letter specifically referenced the hospital where the patient's stay occurred, and the discharge date, to anchor the respondent to the events of interest. For most respondents, those events took place 3-6 months prior to receiving the survey. The reverse side of the letter contained the same information in Spanish. Using a modified Dillman[57] approach, the initial mailing was followed by a postcard reminder, a second mailing of the instrument and letter, a second postcard reminder, and a third mailing of the instrument and letter. Respondents who completed the survey were excluded from the next consecutive survey mailing.

Respondents were offered the option of calling a toll-free number to complete the survey (in English or in Spanish) or over the phone. Two vendors were used to obtain telephone numbers for non-respondents, 55 percent of whom had listed numbers, and at least 15 attempts were made to reach each non-respondent. Bilingual interviewers were available to conduct the survey with respondents who preferred to do so in Spanish. Proxy respondents were accepted. Upon completion of an interview, or upon final disposition of a call, each record was assigned a final disposition code based on the American Association for Public

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54 http://intqhc.oxfordjournals.org/content/15/4/309.full.pdf+html

55 Boston University Activity Measure for Post Acute Care™. AM-PAC Short Form Manual ©2007 (revised 2/1/13), Trustees of Boston University, under license to CREcare, LLC.

56 http://aspe.hhs.gov/basic-report/hhs-implementation-guidance-data-collection-standards-race-ethnicity-sex-primary-language-and-disability-status

57 Dillman, D.A., Mail And Internet SurveysJohn Wiley & Sons, NY; 2000.

Opinion Research (AAPOR) definitions. Survey procedures, cover letter, questionnaire, confidentiality protections, and data security were reviewed by Abt Associates' Institutional Review Board.

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. Sampling details for each Awardee are provided in the Awardee-specific sections below.

Weighting: We constructed both sampling weights and nonresponse weights. The sampling weight is the inverse of the selection probability within each of the sampling strata. The nonresponse weight was computed for all survey respondents who completed the survey and reflects the inverse of the probability of response among eligible beneficiaries in the sample, after removing decedents from the sampling strata. The final weights are the product of the sampling weights and the nonresponse weights, and account for differential non-response and sampling issues.

Analytic Approach

We assessed response rates for every survey item by Awardee sample to identify any differential item nonresponse between the intervention and comparison groups. We found item nonresponse rates to be nearly the same for intervention and comparison respondents, reflecting the differential in overall response rate between the two groups for each of the five Awardee samples.

For three sets of questions (Q3-Q7, Q9A-Q9I, which ask about functional status, and Q11A-A11I, which ask about respondent mood) we combined the questions into a single index or composite variable.[58] Prior to combining each set of questions, we examined the correlations among the component items and computed the Cronbach's alpha for each Awardee sample, a coefficient of reliability that indicates the level of internal consistency among the items, or how closely related the set of items are as a group. Typically, a coefficient of reliability of 0.7 or higher indicates a high inter-correlation among the items and is considered acceptable. The coefficients of reliability (Cronbach's alpha) for the three sets of question for each Awardee are presented in the Awardee-specific sections below.

After reaching a confirmation of internal consistency, we combined each set of questions into an index/composite measure. Specifically Q3-Q7 asked about how much help respondents needed to perform activities such as taking clothing on/off, bathing, toileting, etc. Each question has the same four response categories. We first combined the best two functional status categories (patients needing little or no help to perform each activity), into one category. We then combined the worst two functional status categories (patients needing a lot of help or totally dependent in the specified activity) into a second category. We then counted the number of activities where a respondent needed a lot of help or total help resulting in a minimum of value zero (patient was not dependent in performing any of the five activities) and a maximum value of five (patient was dependent in performing all five activities). A binary variable was created with one (1) indicating that a respondent did not need much help in performing any of the activities and zero (0) indicating that a respondent needed a lot of help or total help in performing at least one of the five activities.

[58] Although summing up values across variables might lead to loss of information on specific functional status, it does reduce the extent of missing values, thereby adding fuller information for a more robust result.

An index/composite variable for the nine components of Q9A-Q9I was created in a similar manner. The nine sub-questions under Q9 asked whether a respondent's health limited him/her in performing health related quality of life activities like running, lifting groceries, climbing stairs, etc. All nine questions in this set have the same three response categories. We first combined the worst two, that is, where patients indicated that they were limited (a lot or a little) in performing each activity into one category. We then retained the best response (that is, where patients indicated they were not limited in performing each activity as a second category. We then created a variable that counted the number of activities with which a respondent had some limitation. This resulted in a minimum of zero (the respondent was not limited in performing any of the nine activities) and a maximum value of nine (the respondent was limited in performing all nine activities). A binary variable was similarly created with one (1) indicating that a respondent was not limited in performing any of the nine activities and zero (0) indicating that a respondent had limitations in performing at least one of the nine activities. We also created a binary variable with one (1) indicating that a respondent was discharged to a post-acute setting such as a nursing home, long-term care hospital, etc. and zero (0) indicating that a respondent was discharged to his/her own or someone else's home, specified as a non-institutional setting.

To understand potential differences in functional status between respondents in the intervention and comparison groups, we created individual binary indicators for each of Q3-Q7 as well as for each of Q9A-Q9I to estimate risk-adjusted logistic regression models.

The survey contained three overall satisfaction (rating) questions:

- Q13: Overall, how satisfied are you with the care you received?
- Q19: Overall, how satisfied are you with your recovery since you left the facility? and
- Q25: How much do you agree or disagree with this statement? "The facility staff took my preferences and those of my family or caregiver into account in deciding what health care services I would have when I left the facility."

We also created dichotomous variables for these overall satisfaction questions by collapsing the responses such that positive responses were assigned a value of 1 and 0 otherwise.

Using the binary variables described above, we estimated multivariate logistic regression models to examine the program effect on the index/composite variable that measures the ability of respondents to perform all the five functional status activities (Q3-Q7) with little or no help, as well as the index/composite variable that measures whether or not respondents had some limitations in performing all of the nine health related quality of life activities (Q9A-Q9I); on the individual function status variables, as well as on the overall satisfaction of respondents. We computed the average treatment (marginal) effect of the intervention on these outcome variables. The average treatment effect measures the change (increase or decrease) in the probability of the outcome occurrence.

The risk factors we controlled for in the regression models included respondent age, gender, educational attainment, race, living arrangement, Medicare/Medicaid dual eligibility, and Hierarchical Condition Categories (HCC) score.

Finally, Q11 contains nine sub-questions asking respondents about their mood and how they had felt over the past three months. The nine sub-questions have the same six response values. Four of these questions were worded in the negative and we reverse-coded so that more positive outcomes take on higher response values. For example, Q11A asks 'Have you felt full of pep?' and the original response values

were 1 for the most positive response ‘All of the time’ and 6 for the least positive response ‘None of the time’. This question and three others (Q11D, Q11E, and Q11H) were reverse-coded so the most positive outcome was assigned a value of 6 and the least positive a value of 1. Then the response values of these nine questions were summed to create a ‘mood’ index as follows: Each of the nine questions have six response values for an index with a maximum value of 54.After an examination of the distribution of the index we divided it into four quartiles, with the first quartile representing respondents indicating the worst overall mood and the fourth quartile representing respondents indicating the best overall mood, based on the nine sub-questions.

For survey questions with qualitative or categorical responses, we performed chi-square tests to assess for differences in the responses between the intervention and comparison respondents. We also calculated descriptive statistics for all survey items.

The following sections present Awardee-specific methods and results for each of the five programs for which patient surveys were conducted.

Christus Health

Overview

We surveyed patients served by the Christus Health Integrated Nurse Training and Mobile Device Harm Reducation (INTM) Program (hereinafter Christus Health) and a matched comparison group. The Christus Health program combined intensive classroom and simulation laboratory training with a software algorithm implemented using iPads to improve patient health outcomes. The ITNM program, combined with nurse training and supportive technology, was designed to improve the ability of nursing care staff to recognize early warning signs of congestive heart failure, sepsis, and other high risk conditions and intervene to mitigate harmful outcomes. The ultimate goals of the program were to reduce the number and severity of hospital admissions for nursing home residents in 12 partner skilled nursing facilities (SNFs), reduce readmissions for general hospital inpatients, reduce serious preventable medical conditions, reduce rates of 'failure to rescue' for hospital patients and nursing home residents, and reduce Medicare and Medicaid spending.

Methods

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. All inpatient stays were included in sampling.

To create the comparison group, we first matched hospitals in the Texarkana HRR that resemble the Christus St. Michael Health System and its partnering skilled nursing facilities (50-150 beds for SNF, and >250 beds for hospitals). Within selected hospitals we then defined intervention and comparison populations using identical inclusion and exclusion rules. Abt's Third Annual Report and Technical Appendix B detail more information about the creation of intervention and comparison groups.

In addition to the claims-based inclusion/exclusion rules, stays during which the patient expired in the hospital were excluded. In order to minimize recall bias, the sampling frame was limited to index stays that began between April 1 and September 30, 2014, which was the most recent quarter of claims data available at the time that we constructed the survey sample. Duplicate index stays for a given beneficiary were removed from the sampling frame so that each individual would only be surveyed once.

Within the intervention and comparison groups the sampling frame was stratified by age (<65, 65-74, 75-84, 85+) and gender, yielding eight strata for each intervention and comparison group. We then selected a probability sample of 800 intervention and 800 comparison group beneficiaries. The survey sample was allocated to the gender and age group strata in proportion to the number in the intervention group population in that stratum, using an equal probability sample.

Beneficiaries who expired during the period covered by our data were included in the sampling frame but not included in the survey sample. Using beneficiary identification numbers in the Medicare claims data set that was originally used to select the sample, we applied the survey field date of April 7 as the cut-off date to identify and remove all such deaths that occurred prior to the start of survey administration.

After the removal of decedents, a total of 1438 beneficiaries (the intervention and comparison groups combined) remained for the survey. Of these beneficiaries, 806 completed at least one survey question, representing an overall response rate of 56 percent (58 percent and 55 percent for the intervention and

comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer) we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The table below presents the demographics of beneficiaries selected for the survey, and the respondents.

Table 1.1. Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	135	19%	137	19%	71	18%	53%	48	12%	35%
65-74	256	36%	256	35%	164	41%	64%	155	39%	61%
75-84	199	28%	221	30%	118	29%	59%	133	33%	60%
85+	112	16%	122	17%	51	13%	46%	66	16%	54%
Race										
White	553	79%	576	78%	326	81%	59%	332	83%	58%
Non-White	148	21%	158	21%	78	19%	53%	69	17%	44%
Unknown	1	0%	2	0%	0	0%	0%	1	0%	50%
Gender										
Male	307	44%	326	44%	182	45%	59%	184	46%	56%
Female	395	56%	410	56%	222	55%	56%	218	54%	53%
Total	702	-	736	-	404	-	58%	402	-	55%

Source: Abt Associates HCIA Patient Survey

Analytic Approach

As noted above, we assessed response rates for every survey item to identify any differential item nonresponse between the intervention and comparison groups. The coefficients of reliability (Cronbach's alpha) for the three sets of question for the Christus sample were at least 0.87 as shown in Table 1.2 below.

Table 1.2. Reliability Statistics

Question Set	Number of Survey Items	Cronbach's Alpha
Q3 through Q7	5	0.94
Q9A through Q9I	9	0.91
Q11A through Q11I	9	0.87

Source: Abt Associates HCIA Patient Survey

Results

This section presents results showing weighted frequency distributions, and other analyses discussed above, by respondents in the intervention and comparison groups.[59]

General Profile of Respondents

Respondents in the intervention and comparison groups were similarly distributed with respect to educational attainment, living arrangement, race and ethnicity (Table 1.3). There was, however, a slight difference between the intervention and comparison groups regarding Medicaid/dual-eligibility status. Thirty-six percent of respondents in the intervention group were eligible for both the Medicaid and Medicare programs compared to 30 percent in the comparison group ($p<0.10$).[60]

Table 1.3. Demographic Profile of Respondents

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total respondents	405	100%	401	100%
Highest Grade Level Completed (Q31)				
Not high school grad	90	24%	90	23%
High school grad	156	41%	161	42%
Some college	99	25%	92	24%
College graduate	39	10%	45	11%

[59] Unweighted frequency distributions of responses to all survey questions in their original form are presented in Attachment 1.A. All estimates presented in the result section of this report have been weighted to reflect the intervention and comparison populations.

[60] Note: Medicaid/dual eligibility status was obtained from Medicare administrative data.

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
With Whom Do You Live (Q32)				
Alone	114	30%	116	30%
With spouse	192	48%	183	45%
With family	66	18%	74	21%
With friends	4	1%	3	1%
Other residents	9	3%	12	3%
Ethnicity (Q33)				
Hispanic	5	1%	6	2%
Non-Hispanic	305	91%	306	90%
Not answered	26	8%	24	8%
Reported Race (Q34)				
White	295	76%	310	78%
Non-White	86	22%	74	21%
Preferred not answering	6	2%	6	1%
Medicaid-Eligible *				
No	258	64%	294	70%
Yes	147	36%	107	30%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

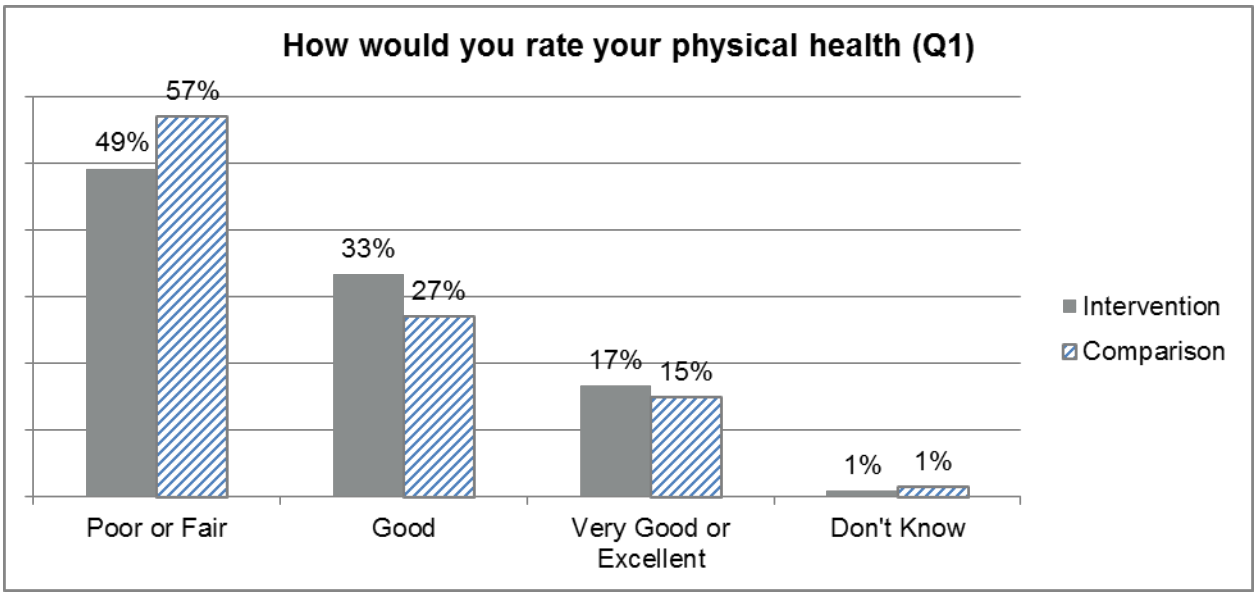
Respondents who indicated that English was not their preferred language were asked whether the facility staff spoke to them in their preferred language (Q27) and how often the respondents used an interpreter provided by the facility (Q28). Only one respondent in the comparison group indicated that English was not their preferred language.[61]

Respondents' Health and Health-Related Quality of Life (Q3-Q12)

In the intervention group, 50 percent of respondents reported that their physical health was good to excellent compared to 42 percent reporting the same in the comparison group (Figure 1.1). Approximately 75 percent and 70 percent of the respondents in the intervention and comparison groups, respectively, reported that their mental health was good to excellent (Figure 1.2).The differences between the intervention and comparison groups on self-reported physical and mental health were not statistically significant.

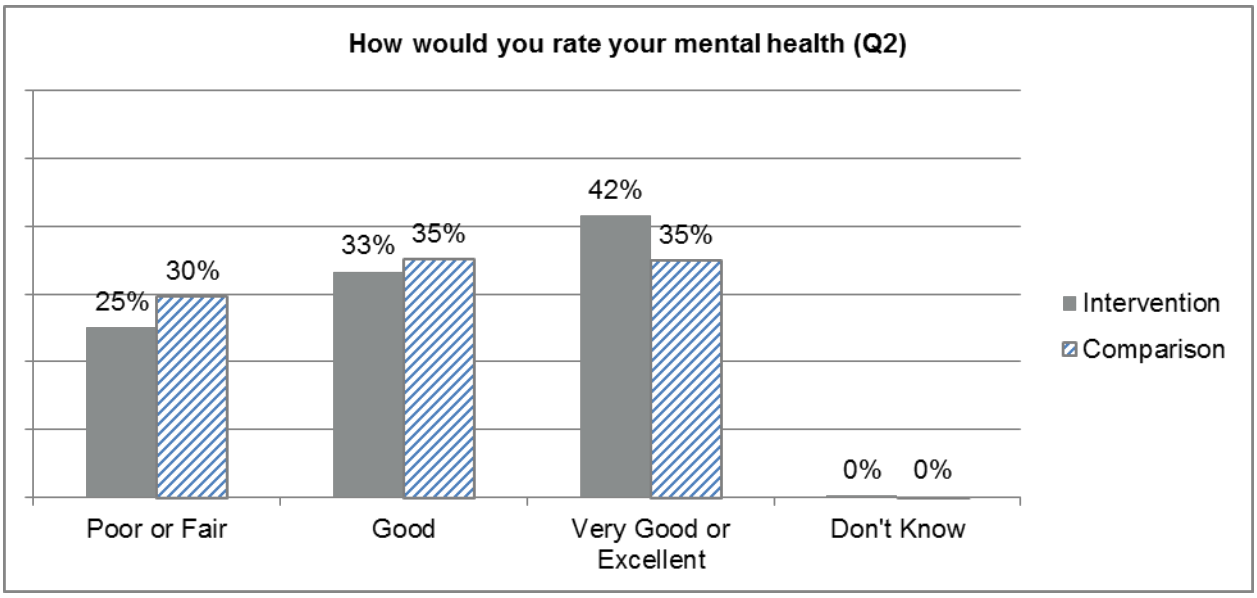
[61] For the two questions (Q27 and Q28) on preferred language of communication, we did not conduct tests of statistically significant differences in responses across the two analytic groups due to very small sample sizes.

Figure 1.1. Respondents' Self-Reported Physical Health Status



Source: Abt Associates HCIA Patient Survey

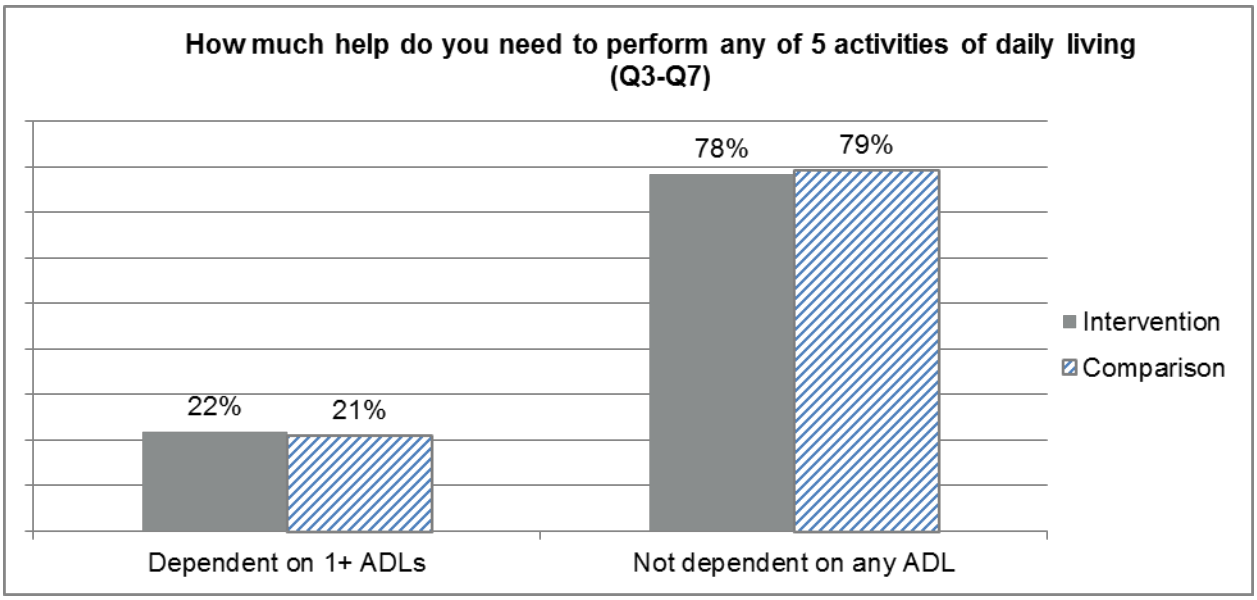
Figure 1.2. Respondents' Self-Reported Mental Health Status



Source: Abt Associates HCIA Patient Survey

To assess functional status, respondents were asked how much help they needed in performing five activities such as putting on and taking off clothing, bathing, toileting, etc. (Q3-Q7). As described in the overall Analytic Approach section, these five items were combined into one index variable to compare overall functional status with respect to all five questions combined. More than three-quarters of respondents in both intervention and comparison groups needed little or no help to perform any of the five activities (Figure 1.3). There were no statistically significant differences between the intervention and comparison groups for the combined index variables or any of the five individual items.

Figure 1.3. Respondents' Index/Composite Functional Status

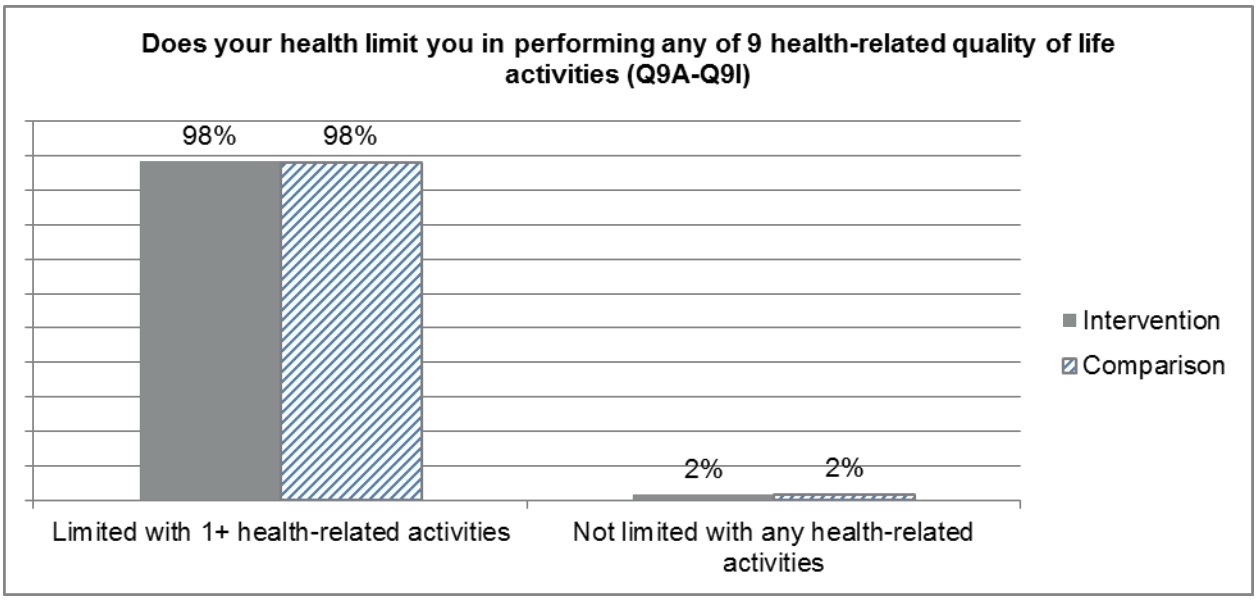


Source: Abt Associates HCIA Patient Survey

Nine questions (Q9A-Q9I) asked respondents whether their health limited their performance of certain moderate to vigorous activities like lifting or carrying objects, climbing stairs, bending, bathing/dressing, and walking various distances. These nine items were combined into a single index variable to examine overall differences. As Figure 1.4 displays, almost all respondents, in both groups, reported that they were limited in performing at least one of the nine activities.[62]

[62] We also created multiple categories indicating the number of activities in which respondents had limitations and considered alternative cut-off points for the categories, for example 1-2, 3-5, 6+. The results of this robustness check were substantially similar to the results presented in this report.

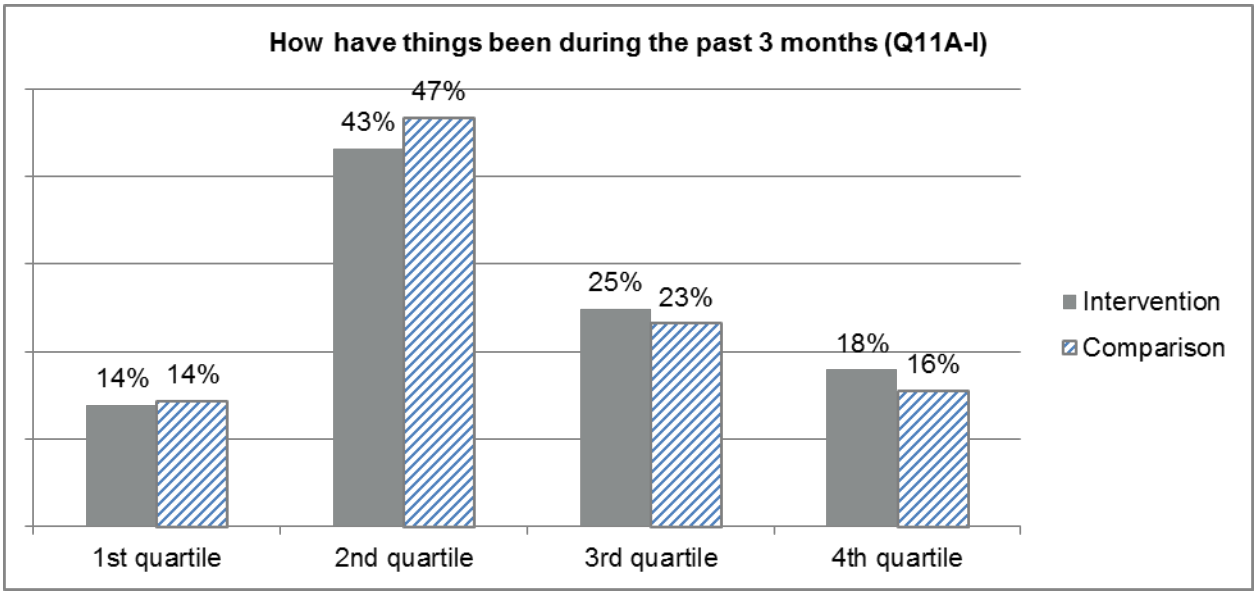
Figure 1.4. Respondents' Performance of Health-Related Quality of Life Activities



Source: Abt Associates HCIA Patient Survey

Figure 1.5 displays the perception of respondent's overall mood as measured by the index/composite variable combining Q11_A through Q11_I. Approximately 60 percent of the respondents in the intervention and comparison groups indicated a poor mood (in the 1st or 2nd quartile) while the remaining 40 percent indicated a more positive mood (in the 3rd or 4th quartile). The differences observed between the intervention and comparison groups were not significant.

Figure 1.5. Respondents' Mood Index

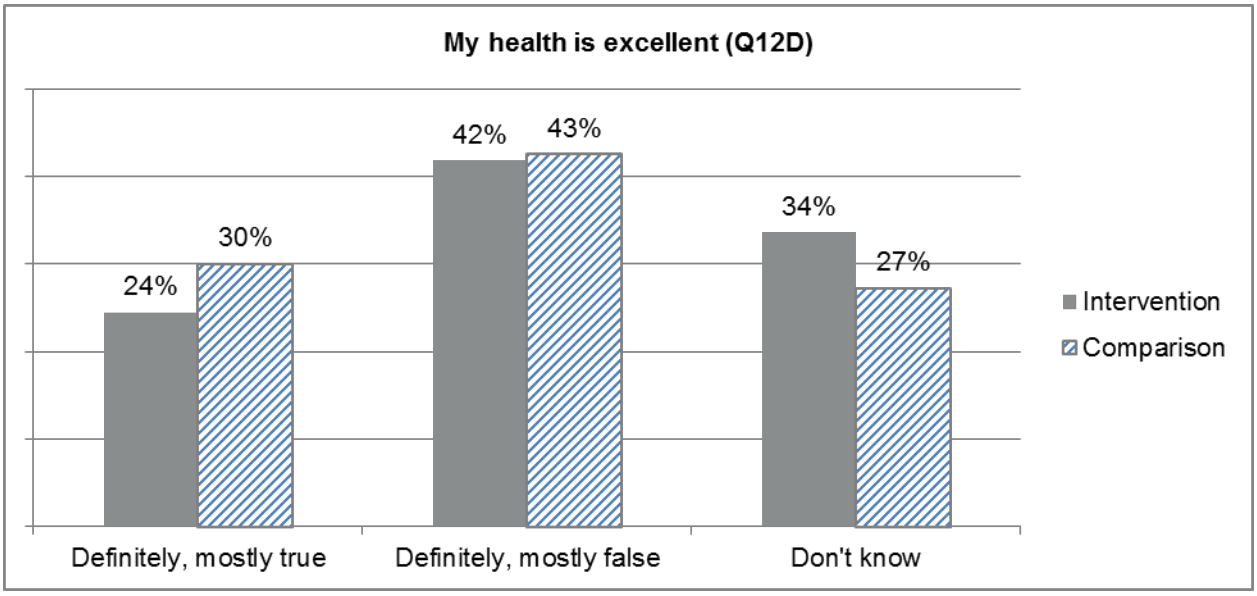


Source: Abt Associates HCIA Patient Survey

Regarding respondents' outlook (or expectation) about their health (Q12_A-Q12D), a significant proportion of respondents in both groups seemed unsure of their health outlook for three of the four

questions, and there were no significant differences between intervention and comparison respondents. Figure 1.6 shows the respondents perception of their health as being excellent. However, there were slight differences between respondents in the two groups regarding current state of health (Q12D): Twenty-four and 30 percent of intervention and comparison respondents reported having excellent health, respectively ($p<0.10$) (detailed results of other variables are presented in Table 1.B.3, Attachment 1.B).

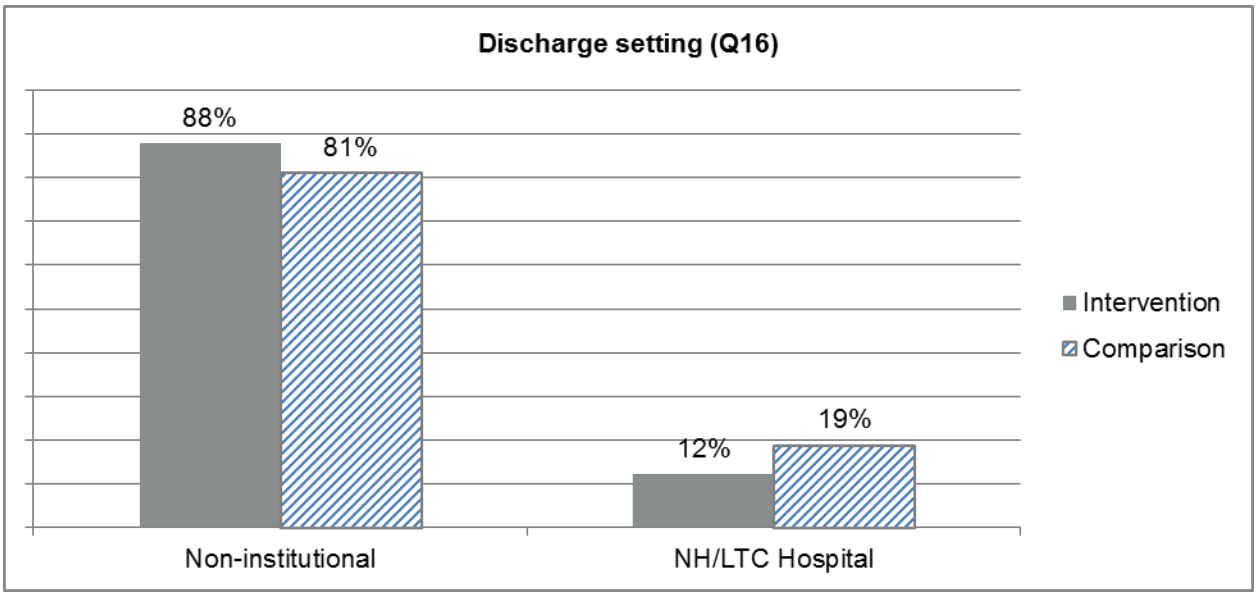
Figure 1.6. Respondents' Perception of Own Health



Source: Abt Associates HCIA Patient Survey

Intervention and comparison respondents differed in the settings they transitioned to upon discharge from the facility. More than 80 percent of the respondents in both intervention and comparison groups returned home after leaving the hospital versus going to a long-term care facility (Figure 1.7). Twelve percent of respondents in the intervention group returned to long-term care facilities compared to 19 percent in the comparison group ($p<0.01$).

Figure 1.7. Post-Discharge Destination

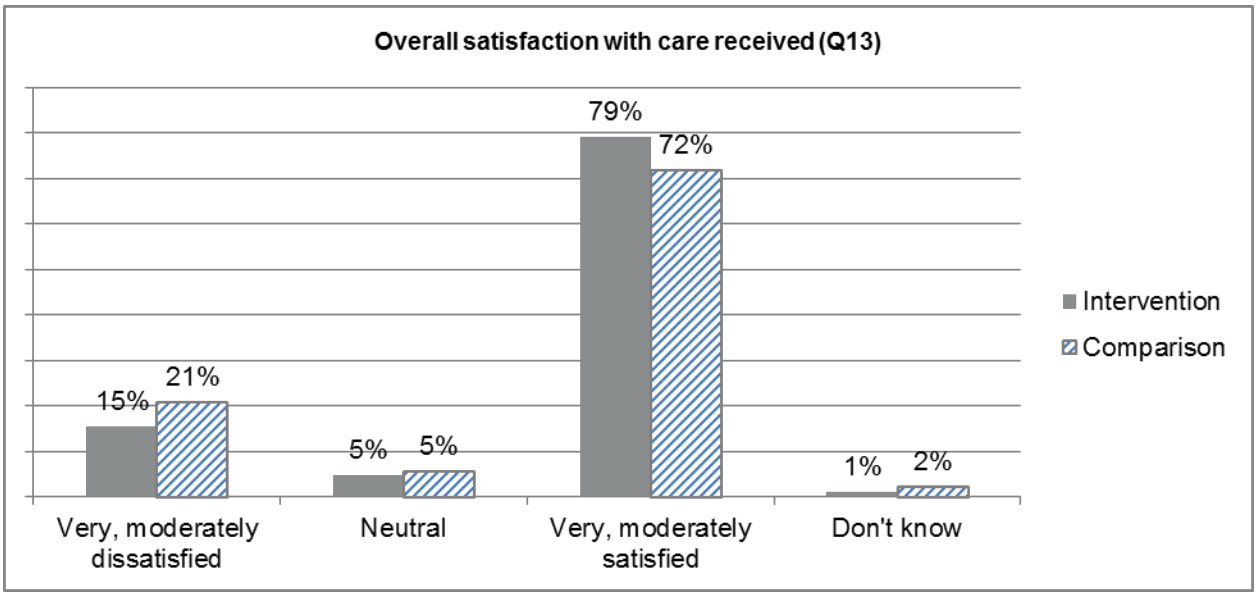


Source: Abt Associates HCIA Patient Survey

Satisfaction with Care/Care Experience (Q13-Q28)

For questions about satisfaction with care, participants in the intervention group generally gave more favorable responses regarding the care and services they received compared to respondents in the comparison group. Figures 1.8 displays the overall satisfaction with care received and shows that more intervention respondents (79 percent) reported being satisfied than the comparison respondents (72 percent) about the care they received. Correspondingly, fewer intervention respondents, 15 percent, reported being very to moderately dissatisfied compared to 21 percent in the comparison group ($p<0.10$).

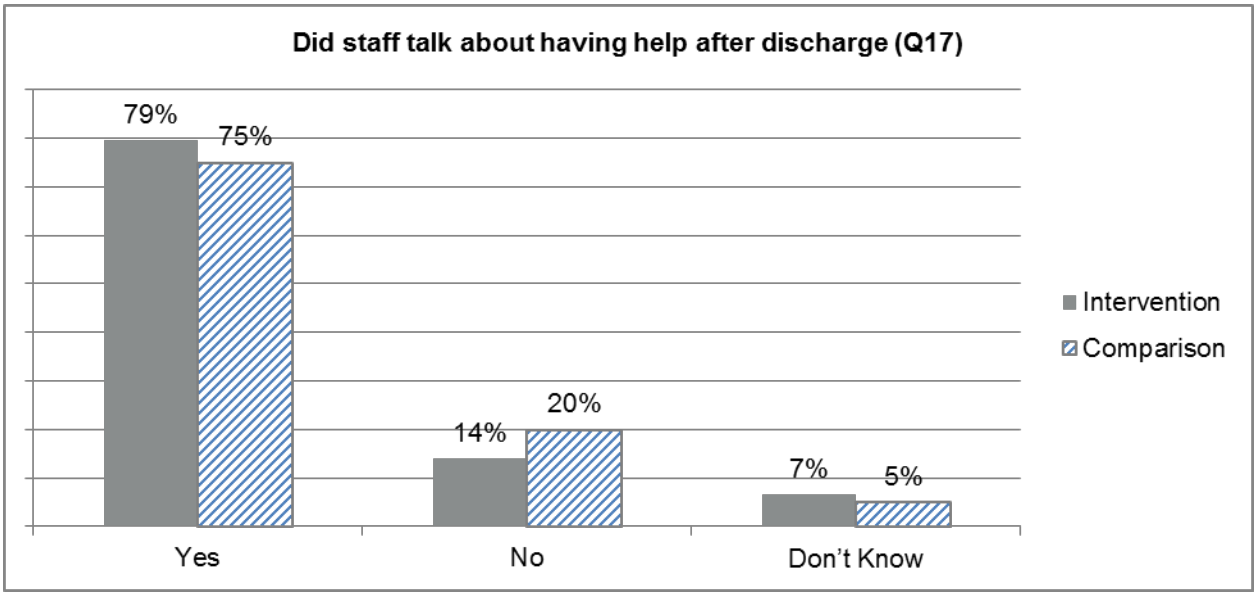
Figure 1.8. Satisfaction with Care Received



Source: Abt Associates HCIA Patient Survey

Figure 1.9 shows that 79 and 75 percent of respondents in the intervention and comparison groups, respectively reported that the hospital staff talked to them about having help after discharge ($p<0.10$).

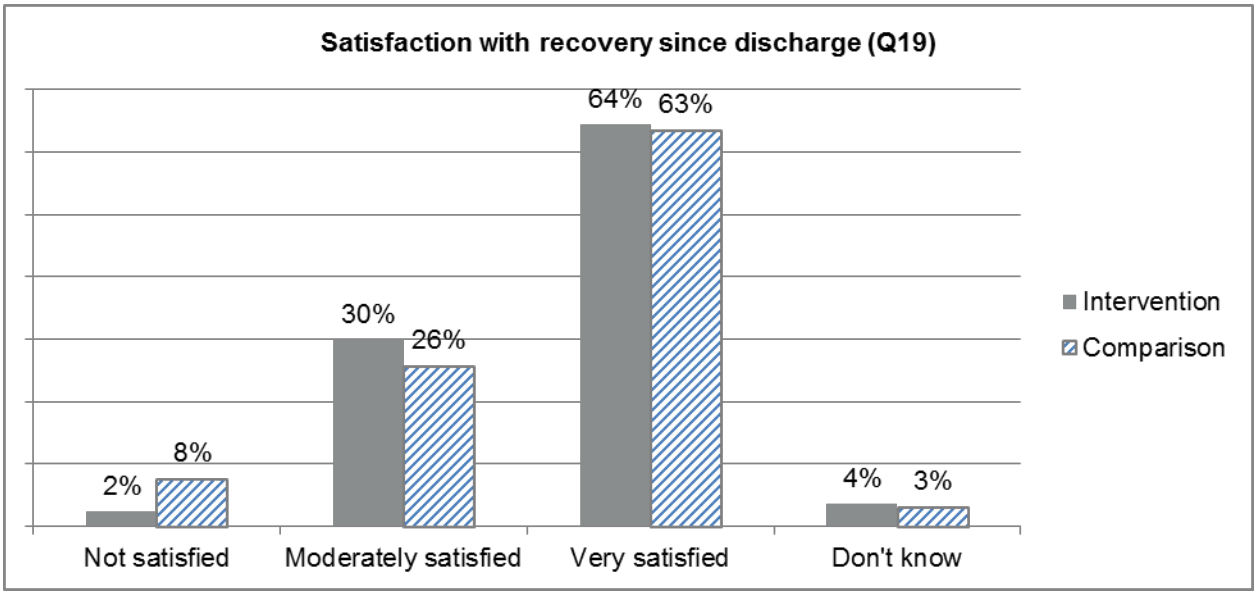
Figure 1.9. Staff Communication Regarding Post-Discharge Assistance



Source: Abt Associates HCIA Patient Survey

Figure 1.10 shows that more than 90 percent of respondents in the intervention and almost 90 percent in the comparison group reported being satisfied with their recovery since discharge. There was significant difference between the two groups as two percent of intervention respondents reported dissatisfaction compared to eight percent of the comparison respondents ($p<0.01$).

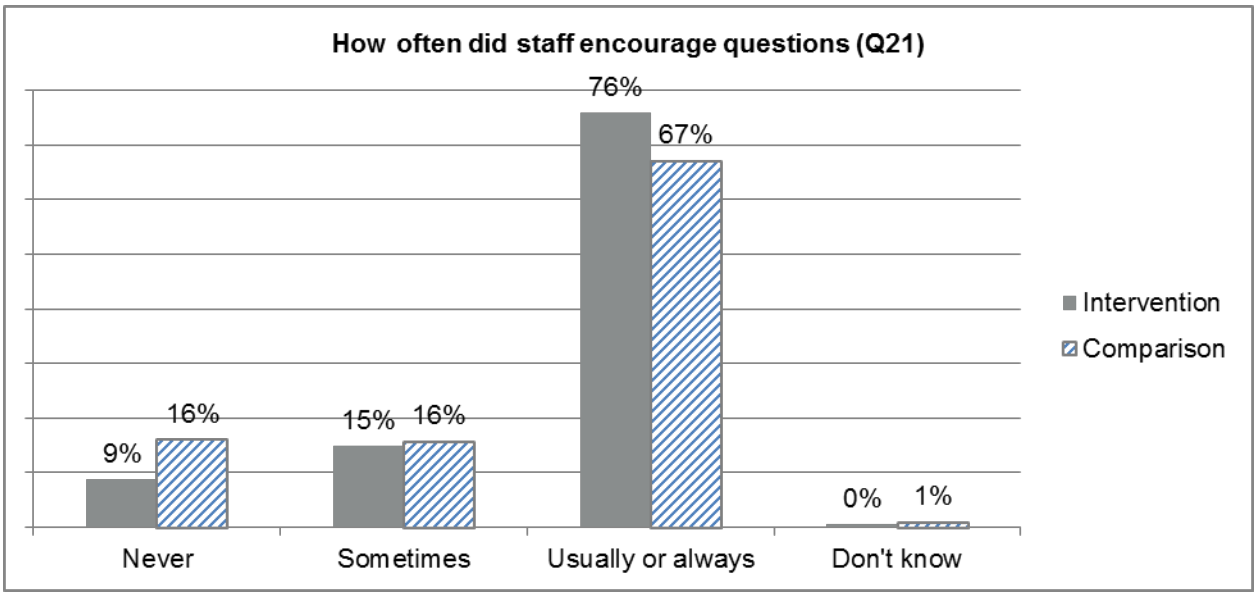
Figure 1.10. Satisfaction with Recovery Post-Discharge



Source: Abt Associates HCIA Patient Survey

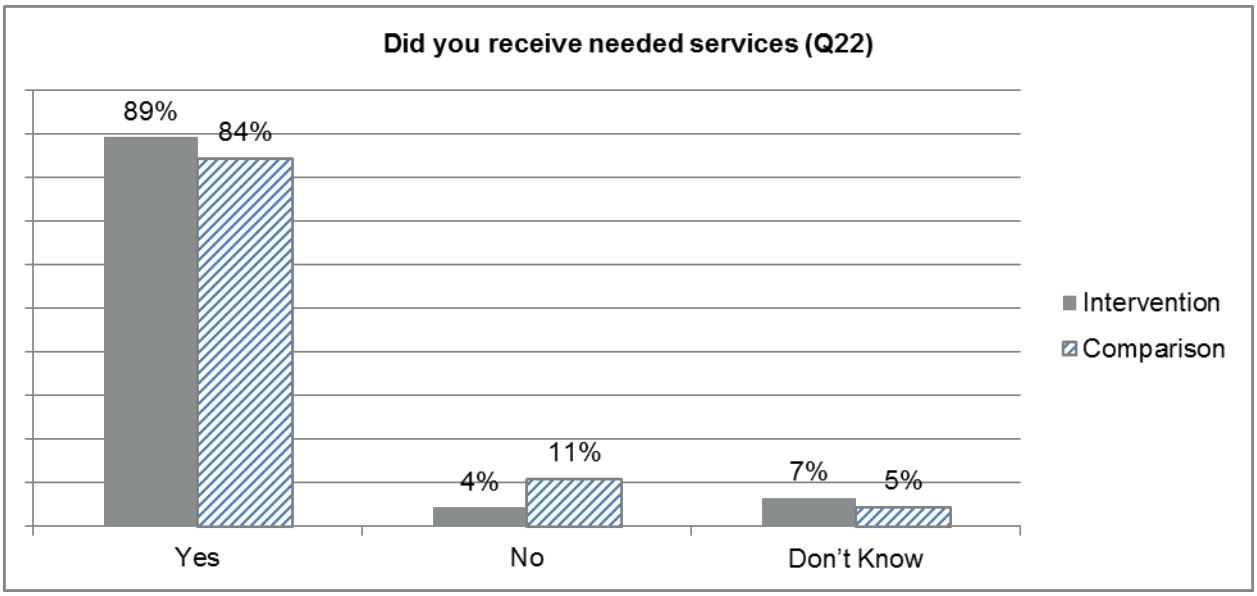
Figures 1.11-1.12 show responses to questions regarding how often staff encouraged patients to ask questions (Q21), and whether respondents received needed services (Q22). The observed differences were statistically significant with higher proportions of respondents in the intervention group having more positive responses to both questions ($p<0.01$).

Figure 1.11. Staff Communication Regarding Questions



Source: Abt Associates HCIA Patient Survey

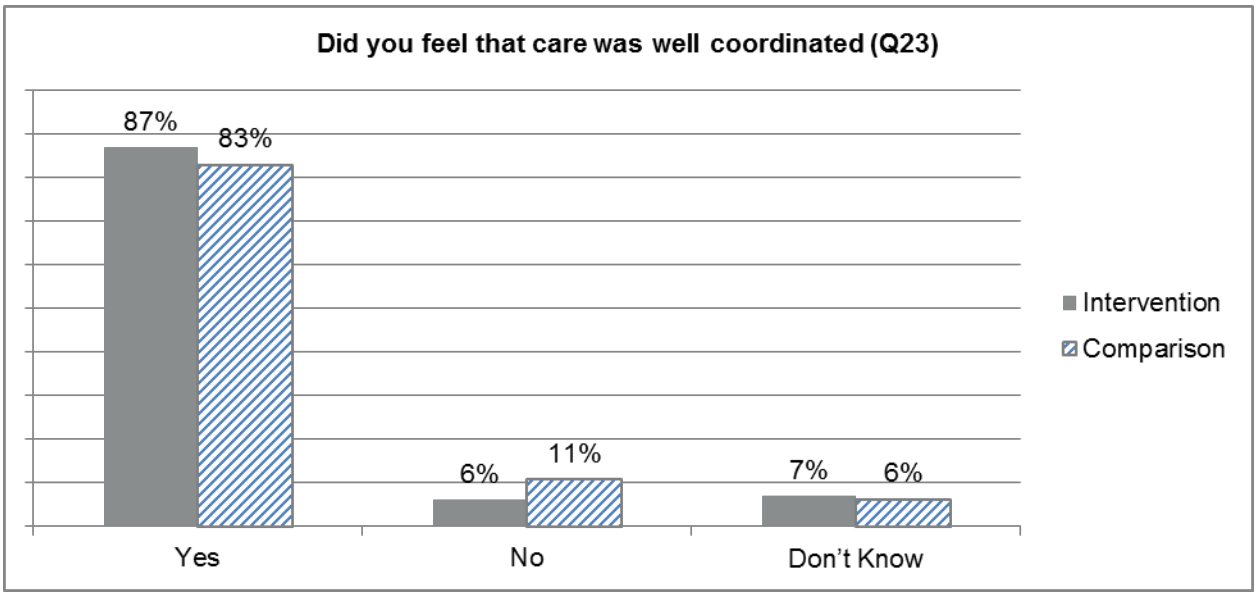
Figure 1.12. Access to Care Services



Source: Abt Associates HCIA Patient Survey

Figure 1.13 shows that 87 percent of respondents in the intervention group and 83 percent in the comparison group reported that they felt the care was well coordinated. Correspondingly, fewer proportion of respondents in the intervention group (6 percent) than in the comparison group (11 percent) felt that the care was not well coordinated ($p<0.10$).

Figure 1.13. Care Coordination



Source: Abt Associates HCIA Patient Survey

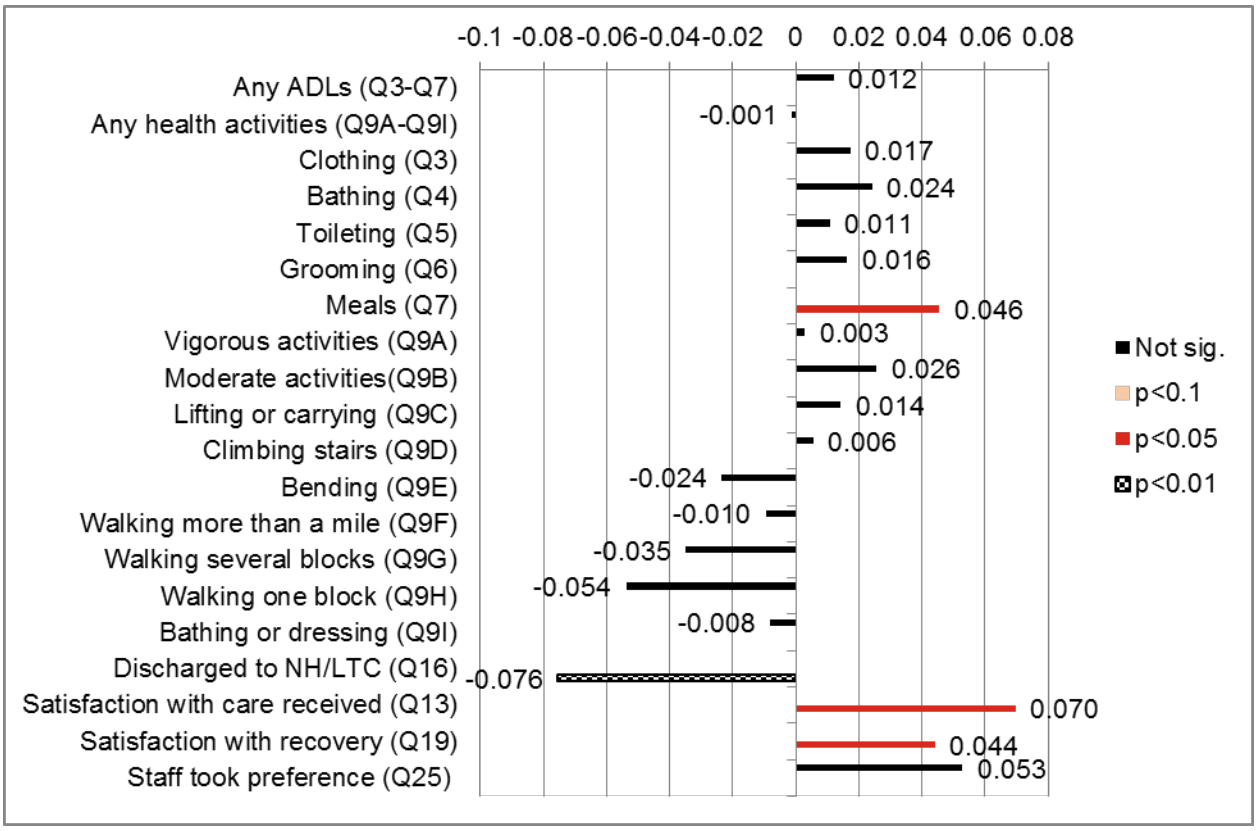
Multivariate Logistic Regression Findings

We estimated multivariate logistic regression models for the functional status questions, discharge setting (or destination), as well as overall satisfaction questions (Q13, Q19, and Q25) as described in the overall Analytic Approach section. Figure 1.14 presents the intervention effects on these outcomes as measured by the average marginal effects. For both index variables combining Q3-Q7 and Q9A-Q9I, regression results indicate no statistically significant differences between intervention and comparison respondents. However, being in the intervention group was associated with a five percent increased probability of having no limitation eating meals ($p<0.05$).

Additionally, respondents in the intervention group relative to those in the comparison group were seven percent more likely to indicate satisfaction with the care that they received ($p<0.05$), and four percent more likely to indicate satisfaction with their recovery post-discharge ($p<0.05$). Intervention respondents were also eight percent more likely to be discharged home rather than to a long-term care facility ($p<0.01$). [63]

[63] See Table 1.B.9 in Attachment 1.B, for more detailed information.

Figure 1.14. Logistic Regression: Average Intervention Effects



Source: Abt Associates HCIA Patient Survey

Conclusions

Overall, we observed few statistically significant differences between intervention and comparison survey respondents relating to health outcomes, health-related quality of life, and satisfaction with care/care experiences. The majority in both groups reported that their physical and mental health were good, and most needed little or no help with activities of daily living. Fewer respondents in the intervention group than the comparison group felt that their health was excellent.

Intervention respondents were much more satisfied with the care received and their recovery post-discharge, than their comparison peers. Findings from the multivariate logistic regression models also indicate more favorable outcomes among the Christus Health program respondents than their counterparts in the comparison group.

These survey results indicate generally positive results for patients served by the Christus Health program, compared with similar patients who received care at comparison hospitals. The survey findings are generally more positive than those from our claims-based analyses, which found only a small decrease in LOS (approximately 0.2 days) in the acute care component.

Attachment 1.A: Unweighted Frequency Distributions of All Survey Questions in their Original Form

Table 1.A.1. Health Outcomes

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Rate your physical health today (Q1)				
Excellent	12	3%	13	3%
Very Good	57	14%	46	11%
Good	131	32%	105	26%
Fair	132	33%	156	39%
Poor	58	14%	58	14%
Don't know	3	1%	6	1%
Missing	12	3%	17	4%
Totals	405	100%	401	100%
Rate your mental health today (Q2)				
Excellent	54	13%	45	11%
Very Good	112	28%	91	23%
Good	129	32%	136	34%
Fair	72	18%	77	19%
Poor	22	5%	30	7%
Don't know	1	0%	1	0%
Missing	15	4%	21	5%
Totals	405	100%	401	100%
How much help do you need putting on clothing?(Q3)				
Total help	21	5%	19	5%
A lot	27	7%	31	8%
A little	83	20%	76	19%
None	259	64%	257	64%
Missing	15	4%	18	4%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much help do you need bathing? (Q4)				
Total help	24	6%	26	6%
A lot	32	8%	32	8%
A little	76	19%	57	14%
None	258	64%	269	67%
Don't know	0	0%	0	0%
Missing	15	4%	17	4%
Totals	405	100%	401	100%
How much help do you need toileting? (Q5)				
Total help	20	5%	19	5%
A lot	14	3%	17	4%
A little	45	11%	43	11%
None	313	77%	306	76%
Don't know	0	0%	0	0%
Missing	13	3%	16	4%
Totals	405	100%	401	100%
How much help do you need in personal grooming? (Q6)				
Total help	14	3%	14	3%
A lot	17	4%	15	4%
A little	27	7%	32	8%
None	333	82%	324	81%
Don't know	0	0%	0	0%
Missing	14	3%	16	4%
Totals	405	100%	401	100%
How much help do you need eating meals? (Q7)				
Total help	13	3%	11	3%
A lot	13	3%	22	5%
A little	38	9%	32	8%
None	329	81%	321	80%
Don't know	0	0%	0	0%
Missing	12	3%	15	4%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much does pain or hurting limit day-to-day activities? (Q8)				
Not at all	56	14%	47	12%
Slightly	88	22%	111	28%
Moderately	87	21%	72	18%
Quite a bit	115	28%	106	26%
Extremely	39	10%	33	8%
Don't know	3	1%	8	2%
Missing	17	4%	24	6%
Totals	405	100%	401	100%

Table 1.A.2. Health-Related Quality of Life

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in vigorous activities? (Q9A)				
Yes, limited a lot	301	74%	294	73%
Yes, limited a little	70	17%	71	18%
No, not limited at all	17	4%	15	4%
Don't know	1	0%	1	0%
Missing	16	4%	20	5%
Totals	405	100%	401	100%
Does health now limit you in moderate activities? (Q9B)				
Yes, limited a lot	210	52%	198	49%
Yes, limited a little	114	28%	128	32%
No, not limited at all	65	16%	55	14%
Don't know	0	0%	1	0%
Missing	16	4%	19	5%
Totals	405	100%	401	100%
Does health now limit you in lifting or carrying groceries? (Q9C)				
Yes, limited a lot	167	41%	151	38%
Yes, limited a little	125	31%	143	36%
No, not limited at all	99	24%	86	21%
Don't know	1	0%	0	0%
Missing	13	3%	21	5%
Totals	405	100%	401	100%
Does health now limit you in climbing several flights of stairs? (Q9D)				
Yes, limited a lot	253	62%	243	61%
Yes, limited a little	88	22%	98	24%
No, not limited at all	44	11%	38	9%
Don't know	2	0%	1	0%
Missing	18	4%	21	5%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in bending, kneeling, or stooping? (Q9E)				
Yes, limited a lot	217	54%	207	52%
Yes, limited a little	136	34%	134	33%
No, not limited at all	36	9%	41	10%
Don't know	0	0%	0	0%
Missing	16	4%	19	5%
Totals	405	100%	401	100%
Does health now limit you in walking more than a mile? (Q9F)				
Yes, limited a lot	280	69%	273	68%
Yes, limited a little	65	16%	67	17%
No, not limited at all	37	9%	39	10%
Don't know	4	1%	2	0%
Missing	19	5%	20	5%
Totals	405	100%	401	100%
Does health now limit you in walking several blocks? (Q9G)				
Yes, limited a lot	249	61%	229	57%
Yes, limited a little	82	20%	94	23%
No, not limited at all	52	13%	56	14%
Don't know	2	0%	0	0%
Missing	20	5%	22	5%
Totals	405	100%	401	100%
Does health now limit you in walking one block? (Q9H)				
Yes, limited a lot	167	41%	162	40%
Yes, limited a little	108	27%	99	25%
No, not limited at all	104	26%	114	28%
Don't know	2	0%	1	0%
Missing	24	6%	25	6%
Totals	405	100%	401	100%
Does health now limit you in bathing or dressing? (Q9I)				
Yes, limited a lot	65	16%	63	16%
Yes, limited a little	114	28%	111	28%
No, not limited at all	213	53%	209	52%
Don't know	0	0%	0	0%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Missing	13	3%	18	4%
Totals	405	100%	401	100%
Extent that physical health OR emotional problems interfered with social activities (Q10)				
Not at all	115	28%	106	26%
Slightly	81	20%	79	20%
Moderately	70	17%	71	18%
Quite a bit	83	20%	74	18%
Extremely	40	10%	40	10%
Don't know	0	0%	2	0%
Missing	16	4%	29	7%
Totals	405	100%	401	100%
Felt full of pep during the past 3 months (Q11A)				
All of the time	7	2%	10	2%
Most of the time	46	11%	49	12%
A good bit of the time	40	10%	33	8%
Some of the time	101	25%	83	21%
A little of the time	90	22%	120	30%
None of the time	108	27%	89	22%
Don't know	1	0%	3	1%
Missing	12	3%	14	3%
Totals	405	100%	401	100%
Have been a very nervous person during the past 3 months (Q11B)				
All of the time	13	3%	23	6%
Most of the time	34	8%	25	6%
A good bit of the time	27	7%	29	7%
Some of the time	90	22%	69	17%
A little of the time	98	24%	93	23%
None of the time	130	32%	141	35%
Don't know	0	0%	1	0%
Missing	13	3%	20	5%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt down in the dumps during the past 3 months (Q11C)				
All of the time	6	1%	9	2%
Most of the time	15	4%	22	5%
A good bit of the time	29	7%	30	7%
Some of the time	57	14%	61	15%
A little of the time	90	22%	61	15%
None of the time	198	49%	206	51%
Don't know	0	0%	0	0%
Missing	10	2%	12	3%
Totals	405	100%	401	100%
Felt calm and peaceful during the past 3 months (Q11D)				
All of the time	32	8%	38	9%
Most of the time	130	32%	132	33%
A good bit of the time	73	18%	46	11%
Some of the time	90	22%	78	19%
A little of the time	47	12%	63	16%
None of the time	20	5%	28	7%
Don't know	1	0%	0	0%
Missing	12	3%	16	4%
Totals	405	100%	401	100%
Had a lot of energy during the past 3 months (Q11E)				
All of the time	6	1%	9	2%
Most of the time	43	11%	41	10%
A good bit of the time	40	10%	38	9%
Some of the time	85	21%	87	22%
A little of the time	117	29%	91	23%
None of the time	102	25%	122	30%
Don't know	0	0%	1	0%
Missing	12	3%	12	3%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt downhearted during the past 3 months (Q11F)				
All of the time	8	2%	16	4%
Most of the time	21	5%	24	6%
A good bit of the time	23	6%	30	7%
Some of the time	89	22%	72	18%
A little of the time	119	29%	101	25%
None of the time	132	33%	139	35%
Don't know	1	0%	0	0%
Missing	12	3%	19	5%
Totals	405	100%	401	100%
Felt worn out during the past 3 months (Q11G)				
All of the time	39	10%	36	9%
Most of the time	60	15%	72	18%
A good bit of the time	68	17%	58	14%
Some of the time	105	26%	91	23%
A little of the time	89	22%	85	21%
None of the time	33	8%	39	10%
Don't know	1	0%	1	0%
Missing	10	2%	19	5%
Totals	405	100%	401	100%
Been happy during the past 3 months (Q11H)				
All of the time	57	14%	60	15%
Most of the time	144	36%	134	33%
A good bit of the time	66	16%	58	14%
Some of the time	77	19%	67	17%
A little of the time	35	9%	46	11%
None of the time	17	4%	18	4%
Don't know	0	0%	2	0%
Missing	9	2%	16	4%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt tired during the past 3 months (Q11I)				
All of the time	54	13%	53	13%
Most of the time	79	20%	71	18%
A good bit of the time	64	16%	74	18%
Some of the time	135	33%	119	30%
A little of the time	53	13%	47	12%
None of the time	11	3%	22	5%
Don't know	1	0%	2	0%
Missing	8	2%	13	3%
Totals	405	100%	401	100%
I get sick easier than other people (Q12A)				
Definitely true	31	8%	27	7%
Mostly true	74	18%	64	16%
Mostly false	111	27%	115	29%
Definitely false	16	4%	9	2%
Don't know	163	40%	169	42%
Missing	10	2%	17	4%
Totals	405	100%	401	100%
I am as healthy as anybody I know (Q12B)				
Definitely true	22	5%	27	7%
Mostly true	106	26%	93	23%
Mostly false	105	26%	103	26%
Definitely false	7	2%	7	2%
Don't know	155	38%	151	38%
Missing	10	2%	20	5%
Totals	405	100%	401	100%
I expect my health to get worse (Q12C)				
Definitely true	51	13%	48	12%
Mostly true	80	20%	72	18%
Mostly false	62	15%	64	16%
Definitely false	5	1%	8	2%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Don't know	199	49%	190	47%
Missing	8	2%	19	5%
Totals	405	100%	401	100%
My health is excellent (Q12D)				
Definitely true	14	3%	18	4%
Mostly true	87	21%	100	25%
Mostly false	145	36%	142	35%
Definitely false	19	5%	11	3%
Don't know	133	33%	112	28%
Missing	7	2%	18	4%
Totals	405	100%	401	100%

Table 1.A.3. Satisfaction with Care

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How satisfied are you with the care you received? (Q13)				
Very dissatisfied	40	10%	52	13%
Moderately dissatisfied	20	5%	27	7%
Neutral	19	5%	22	5%
Moderately satisfied	86	21%	74	18%
Very satisfied	227	56%	204	51%
Don't know	4	1%	8	2%
Missing	9	2%	14	3%
Totals	405	100%	401	100%
How often did you feel like complaining about the care you received? (Q14)				
Never	206	51%	194	48%
Rarely	103	25%	97	24%
Sometimes	75	19%	66	16%
Mostly	10	2%	17	4%
Always	7	2%	17	4%
Don't know	0	0%	3	1%
Missing	4	1%	7	2%
Totals	405	100%	401	100%
How often was your pain well controlled? (Q15)				
Never	3	1%	8	2%
Sometimes	17	4%	22	5%
Usually	51	13%	41	10%
Always	140	35%	134	33%
Did not have pain	168	41%	160	40%
Not applicable	19	5%	24	6%
Don't know	1	0%	2	0%
Missing	6	1%	10	2%
Totals	405	100%	401	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
After leaving the facility, I stayed in: (Q16)				
Own home	336	83%	293	73%
Someone else's home	18	4%	26	6%
Nursing home	42	10%	63	16%
Long-term care hospital	2	0%	3	1%
Other	4	1%	9	2%
Did staff talk about needed help when you left the facility? (Q17)				
Yes	316	78%	295	74%
No	56	14%	75	19%
Don't know	26	6%	20	5%
Missing	7	2%	11	3%
Totals	405	100%	401	100%
Did you get information about what symptoms to look out for? (Q18)				
Yes	287	71%	276	69%
No	72	18%	72	18%
Don't know	41	10%	42	10%
Missing	5	1%	11	3%
Totals	405	100%	401	100%
How satisfied are you with your recovery since you left the facility? (Q19)				
Not at all satisfied	9	2%	27	7%
Slightly satisfied	20	5%	21	5%
Moderately satisfied	94	23%	71	18%
Quite a bit satisfied	111	27%	105	26%
Extremely satisfied	138	34%	133	33%
Don't know	13	3%	11	3%
Missing	20	5%	33	8%
Totals	405	100%	401	100%

Table 1.A.4. Care Experience

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How often did doctors and nurses explain things in a way you could understand? (Q20)				
Never	8	2%	19	5%
Sometimes	44	11%	56	14%
Usually	112	28%	107	27%
Always	226	56%	193	48%
Don't know	2	0%	0	0%
Missing	13	3%	26	6%
Totals	405	100%	401	100%
How often did doctors and nurses encourage you to ask questions? (Q21)				
Never	33	8%	57	14%
Sometimes	57	14%	59	15%
Usually	106	26%	98	24%
Always	187	46%	153	38%
Don't know	2	0%	4	1%
Missing	20	5%	30	7%
Totals	405	100%	401	100%
Did you receive the services you thought that you needed? (Q22)				
Yes	343	85%	318	79%
No	17	4%	40	10%
Don't know	24	6%	18	4%
Missing	21	5%	25	6%
Totals	405	100%	401	100%
Did you feel the care you received was well coordinated? (Q23)				
Yes	336	83%	306	76%
No	24	6%	40	10%
Don't know	25	6%	23	6%
Missing	20	5%	32	8%
Totals	405	100%	401	100%
Did you seem to get conflicting advice from different health care providers? (Q24)				
Yes	73	18%	63	16%
No	288	71%	273	68%
Don't know	27	7%	35	9%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Missing	17	4%	30	7%
Totals	405	100%	401	100%
The facility staff took my preferences into account regarding services after discharge (Q25)				
Strongly disagree	11	3%	20	5%
Disagree	17	4%	18	4%
Agree	184	45%	172	43%
Strongly agree	101	25%	79	20%
Not applicable	26	6%	34	8%
Don't know/don't remember	48	12%	50	12%
Missing	18	4%	28	7%
Totals	405	100%	401	100%
What is your preferred language when speaking? (Q26)				
English	340	84%	316	79%
Other	0	0%	1	0%
Don't know	0	0%	0	0%
Missing	65	16%	84	21%
Totals	405	100%	401	100%
How often did staff speak to you in your preferred language? (Q27)				
Never	0	0%	3	4%
Sometimes	0	0%	1	1%
Always	3	5%	8	9%
Missing	62	95%	73	86%
Totals	65	100%	85	100%
How often did you use an interpreter provided by facility? (Q28)				
Never, did not need one	4	6%	13	15%
Never, was not offered one	0	0%	1	1%
Never, family interpreter	0	0%	0	0%
Sometimes	0	0%	0	0%
Always	0	0%	0	0%
Missing	61	94%	71	84%
Totals	65	100%	85	100%

Table 1.A.5. Demographic Characteristics

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Age (Q29)				
54 or younger	23	6%	22	5%
55 to 64	49	12%	32	8%
65 to 74	141	35%	142	35%
75 or older	166	41%	175	44%
Missing	26	6%	30	7%
Totals	405	100%	401	100%
Gender (Q30)				
Male	164	40%	165	41%
Female	216	53%	210	52%
Missing	25	6%	26	6%
Totals	405	100%	401	100%
Education (Q31)				
8th grade or less	27	7%	25	6%
Some high school, but did not graduate	63	16%	65	16%
High school graduate or GED	156	39%	161	40%
Some college or 2-year degree	99	24%	92	23%
4-year college degree	18	4%	25	6%
More than a 4-year college degree	21	5%	20	5%
Don't know	0	0%	1	0%
Missing	21	5%	12	3%
Totals	405	100%	401	100%
With whom do you live?(Q32)				
Alone	114	28%	116	29%
With spouse or partner	192	47%	183	46%
With other family members	67	17%	76	19%
With non-relatives	4	1%	3	1%
Residential setting	9	2%	12	3%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Hispanic origin: (Q33)				
No	306	76%	306	76%
Yes, Mexican or Chicano	4	1%	4	1%
Yes, Puerto Rican	0	0%	1	0%
Yes, Cuban	0	0%	0	0%
Yes, other Hispanic origin	1	0%	1	0%
Prefer not to answer	26	6%	24	6%
Race: (Q34)				
White	310	77%	317	79%
Black or African American	65	16%	62	15%
American Indian or Alaska Native	20	5%	12	3%
Asian or Asian American	2	0%	1	0%
Native Hawaiian or other Pacific Islander	0	0%	0	0%
Prefer not to answer	7	2%	6	1%

Source: Abt Associates HCIA Patient Survey.

Attachment 1.B: Descriptive Statistics and Multivariate Logistic Regression Results

I.B.1 Respondents' Health and Health-Related Quality of Life

Table 1.B.1. Self-Reported Health and Functional Status (Q1-Q8)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
How would you rate your physical health? (Q1)				
Poor or fair	190	49%	214	57%
Good	131	33%	105	27%
Very good or excellent	69	17%	59	15%
Don't know	3	1%	6	1%
How would you rate your mental health? (Q2)				
Poor or fair	94	25%	107	30%
Good	129	33%	136	35%
Very good or excellent	166	42%	136	35%
Don't know	1	0%	1	0%
How much help do you need to perform any of 5 activities of daily living? (Q3-Q7)				
Dependent on 1+ ADLs	80	22%	76	21%
Not dependent on any ADL	313	78%	310	79%
How much does pain limit activities? (Q8)				
Extreme, quite a bit	154	40%	139	40%
Slight, moderate	175	45%	183	47%
Not at all	56	14%	47	11%
Don't know	3	1%	8	2%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 1.B.2. Performance of Health-Related Quality of Life Activities (Q9-Q10)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Does your health limit you in performing any of 9 health-related quality of life activities? (Q9A-Q9I)				
Limited in 1+ health-related activities	385	98%	378	98%
Not limited in any health-related activities	7	2%	6	2%
To what extent have physical health or emotional problems interfered with social activities? (Q10)				
Extreme, quite a bit	123	32%	114	32%
Slight, moderate	151	39%	150	40%
Not at all	115	29%	106	28%
Don't know	0	0%	2	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table I.B.3. Perception about Own Health (Q11-Q12)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
How have things been during the past 3 months? (Q11A-I)				
1st quartile	55	14%	51	14%
2nd quartile	169	43%	181	47%
3rd quartile	99	25%	92	23%
4th quartile	74	18%	66	16%
I get sick easier than other people (Q12A)				
Definitely, mostly true	105	27%	91	26%
Definitely, mostly false	127	32%	124	31%
Don't know	163	41%	169	43%
I am as healthy as anybody I know (Q12B)				
Definitely, mostly true	128	32%	120	30%
Definitely, mostly false	112	29%	110	30%
Don't know	155	39%	151	40%
I expect my health to get worse (Q12C)				
Definitely, mostly true	131	34%	120	32%
Definitely, mostly false	67	16%	72	19%
Don't know	199	50%	190	49%
My health is excellent (Q12D) *				
Definitely, mostly true	101	24%	118	30%
Definitely, mostly false	164	42%	153	43%
Don't know	133	34%	112	27%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

1.B.2 Satisfaction with Care/Care Experience

Table 1.B.4. Perception about Care Process and Transition (Q13-Q19)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
Overall satisfaction with care received (Q13) *				
Very, moderately dissatisfied	60	15%	79	21%
Neutral	19	5%	22	5%
Very, moderately satisfied	313	79%	278	72%
Don't know	4	1%	8	2%
How often did you feel like complaining about the care received? (Q14)				
Mostly or always	17	4%	34	9%
Sometimes	75	19%	66	17%
Rarely or never	309	77%	291	73%
Don't know	0	0%	3	1%
How often was your pain well controlled? (Q15)				
Rarely or never	3	1%	8	2%
Sometimes	17	5%	22	7%
Mostly or always	191	48%	175	46%
Don't know	1	0%	2	0%
No pain/NA	187	46%	184	45%
Discharge setting (Q16) ***				
Non-institutional	354	88%	316	81%
Nursing home long-term care hospital	48	12%	74	19%
Did staff talk about having help after discharge? (Q17) *				
Yes	316	79%	295	75%
No	56	14%	75	20%
Don't know	26	7%	20	5%
Did you get information on health problems after discharge? (Q18)				
Yes	287	71%	276	71%
No	72	18%	72	19%
Don't know	41	11%	42	10%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Satisfaction with recovery since discharge? (Q19) ***				
Not satisfied	9	2%	27	8%
Moderately satisfied	114	30%	92	26%
Very satisfied	249	64%	238	63%
Don't know	13	4%	11	3%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 1.B.5. Perception about Care Access and Involvement (Q20-Q25)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
How often did staff explain things understandably? (Q20)				
Never	8	2%	19	6%
Sometimes	44	11%	56	15%
Usually or always	338	86%	300	79%
Don't know	2	1%	0	0%
How often did staff encourage questions? (Q21) ***				
Never	33	9%	57	16%
Sometimes	57	15%	59	16%
Usually or always	293	76%	251	67%
Don't know	2	0%	4	1%
Did you receive needed services? (Q22) ***				
Yes	343	89%	318	84%
No	17	4%	40	11%
Don't Know	24	7%	18	5%
Did you feel that care was well coordinated? (Q23) *				
Yes	336	87%	306	83%
No	24	6%	40	11%
Don't Know	25	7%	23	6%
Did you get conflicting advice from providers? (Q24)				
Yes	73	19%	63	19%
No	288	74%	273	72%
Don't Know	27	7%	35	9%
Staff took my preferences into account regarding services after discharge (Q25)				
Disagree	28	7%	38	10%
Agree	285	74%	251	67%
Neutral	26	7%	34	9%
Don't Know	48	12%	50	14%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 1.B.6. Access and Communication (Q27-Q28)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
How often did staff speak to you in your preferred language? (Q27)				
Never	0	0%	3	23%
Sometimes	0	0%	1	9%
Always	3	100%	8	68%
Don't Know	0	0%	0	0%
How often did you use an interpreter provided by the hospital? (Q28)				
Not needed	4	100%	13	92%
Not offered	0	0%	1	8%
Sometimes offered	0	0%	0	0%
Always offered	0	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

1.B.3 Individual Functional Status

Table 1.B.7. Individual Functional Status Items: ADLs (Q3-Q7)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
How much help needed with clothing? (Q3)				
Total or lot of help	48	13%	50	13%
Little or no help	342	87%	333	87%
How much help needed with bathing? (Q4)				
Total or lot of help	56	16%	58	16%
Little or no help	334	84%	326	84%
Don't know	0	0%	0	0%
How much help needed with toileting? (Q5)				
Total or lot of help	34	10%	36	10%
Little or no help	358	90%	349	90%
Don't know	0	0%	0	0%
How much help needed with grooming?(Q6)				
Total or lot of help	31	9%	29	8%
Little or no help	360	91%	356	92%
Don't know	0	0%	0	0%
How much help needed with eating meals? (Q7)				
Total or lot of help	26	7%	33	10%
Little or no help	367	93%	353	90%
Don't know	0	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

1.B.4 Individual Health-Related Quality of Life Activities

Table 1.B.8. Individual Health-Related Quality of Life Activities (Q9A-Q9I)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	405	100%	401	100%
Limited in vigorous activities (Q9A)				
Limited	371	95%	365	95%
Not limited	17	5%	15	5%
Don't know	1	0%	1	0%
Limited in moderate activities (Q9B)				
Limited	324	84%	326	86%
Not limited	65	16%	55	14%
Don't know	0	0%	1	0%
Limited in lifting or carrying (Q9C)				
Limited	292	76%	294	78%
Not limited	99	24%	86	22%
Don't know	1	0%	0	0%
Limited in climbing stairs (Q9D)				
Limited	341	89%	341	90%
Not limited	44	11%	38	10%
Don't know	2	0%	1	0%
Limited in bending (Q9E)				
Limited	353	91%	341	90%
Not limited	36	9%	41	10%
Don't know	0	0%	0	0%
Limited in walking more than a mile (Q9F)				
Limited	345	90%	340	90%
Not limited	37	9%	39	10%
Don't know	4	1%	2	0%
Limited in walking several blocks (Q9G)				
Limited	331	87%	323	85%
Not limited	52	13%	56	15%
Don't know	2	0%	0	0%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Limited in walking one block (Q9H)				
Limited	275	74%	261	71%
Not limited	104	26%	114	29%
Don't know	2	0%	1	0%
Limited in bathing or dressing (Q9I)				
Limited	179	48%	174	47%
Not limited	213	52%	209	53%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

1.B.5 Multivariate Logistic Regression: Intervention Effects

Table 1.B.9. Multivariate Logistic Regression: Intervention Effects

	Sample Size n	Average Marginal Effect	Confidence Limits Lower	Confidence Limits Upper	p-Value
Index/Composite Functional Status					
Needs little or no help performing any ADLs (Q3-Q7)	700	0.012	-0.047	0.071	0.688
Needs little or no help performing any health-related quality of life activities (Q9A-Q9I)	653	-0.001	-0.021	0.018	0.906
Individual Functional Status					
Needs little or no help with clothing (Q3)	680	0.017	-0.032	0.067	0.493
Needs little or no help with bathing (Q4)	696	0.024	-0.030	0.079	0.386
Needs little or no help with toileting (Q5)	682	0.011	-0.032	0.054	0.624
Needs little or no help with grooming (Q6)	682	0.016	-0.024	0.057	0.428
Needs little or no help with eating meals (Q7)	684	0.046 **	0.003	0.088	0.034
Not limited in vigorous activities (Q9A)	647	0.003	-0.031	0.037	0.867
Not limited in moderate activities(Q9B)	670	0.026	-0.028	0.079	0.347
Not limited in lifting or carrying (Q9C)	671	0.014	-0.048	0.076	0.652
Not limited in climbing stairs (Q9D)	663	0.006	-0.041	0.052	0.814
Not limited in bending (Q9E)	671	-0.024	-0.068	0.020	0.290
Not limited in walking more than a mile (Q9F)	653	-0.010	-0.052	0.033	0.662
Not limited in walking several blocks (Q9G)	661	-0.035	-0.086	0.016	0.181
Not limited in walking one block (Q9H)	654	-0.054	-0.118	0.010	0.100
Not limited in bathing or dressing (Q9I)	699	-0.008	-0.079	0.063	0.822
Discharge Destination					
Discharged to nursing home/long-term care hospital (Q16)	684	-0.076 ***	-0.127	-0.024	0.004
Overall Satisfaction Rating					
Satisfaction with care received (Q13)	693	0.070 **	0.005	0.134	0.035
Satisfaction with recovery since discharge (Q19)	679	0.044 **	0.003	0.086	0.038
Staff took patient's preference into account (Q25)	683	0.053	-0.016	0.121	0.132

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Emory University Hospital

Overview

We surveyed patients served by the Emory University Hospital Rapid Development and Deployment of Non-Physician Providers in Critical Care (hereinafter Emory) and a matched comparison group. The Emory University Hospital's HCIA cooperative agreement expanded a critical care residency program for Physicians' Assistants (PAs) and Nurse Practitioners (NPs), and implemented an electronic intensive care unit (eICU) to support ICU clinicians. The Emory program staff expected that the addition of critical care trained Affiliate Providers, continuous monitoring of ICU patients, and intensivist physician access at night via the eICU, would shorten ICU length of stay (LOS) and possibly overall hospital LOS. They also expected that patients would eventually be discharged in a better state of recovery due to this program. Most importantly, their goal was to bring clinicians with critical care training to ICUs, particularly those that had no physicians working in the ICU on off shifts.

Methods

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. The criteria for defining index stays for each Awardee surveyed are as follows:

- The claim included the correct ICU or CCU revenue codes
- The first two ICD-9 codes from the claim were among those that appeared in the Emory patient registry.

To create a comparison group, we first matched hospitals in the Atlanta HRR that resemble the three large hospitals in the Emory eICU program, based on size and teaching status. Within selected hospitals we then defined intervention and comparison populations using identical inclusion and exclusion rules. Abt's Third Annual Report and Technical Appendix B detail more information about the creation of intervention and comparison groups.

In addition to the claims-based inclusion/exclusion rules, stays during which the patient expired in the hospital were excluded. In order to minimize recall bias, the sampling frame was limited to index stays that began between July 1 and September 30, 2014, which was the most recent quarter of claims data available at the time that we constructed the survey sample. Duplicate index stays for a given beneficiary were removed from the sampling frame so that each individual would only be surveyed once.

Within the intervention and comparison groups the sampling frame was stratified by age (<65, 65-74, 75-84, 85+) and gender, yielding eight strata for each intervention and comparison group. We then selected a probability sample of 800 intervention and 800 comparison group beneficiaries. The survey sample was allocated to the gender and age group strata in proportion to the number in the intervention group population in that stratum, using an equal probability sample.

Beneficiaries who expired during the period covered by our data were included in the sampling frame but not included in the survey sample. Using beneficiary identification numbers in the Medicare claims data set that was originally used to select the sample, we applied the survey field date of April 7 as the cut-off date to identify and remove all such deaths that occurred prior to the start of survey administration.

After the removal of decedents, a total of 1,448 beneficiaries (the intervention and comparison groups combined) remained for the survey. Of these beneficiaries, 751 completed at least one survey question, representing an overall response rate of 52 percent (55 percent and 49 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer) we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The table below presents the demographics of beneficiaries selected for the survey, and the respondents.

Table 2.1. Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	192	26%	178	25%	79	20%	41%	66	19%	37%
65-74	275	38%	266	37%	161	40%	59%	137	39%	52%
75-84	190	26%	192	27%	114	28%	60%	110	32%	57%
85+	76	10%	79	11%	48	12%	63%	36	10%	46%
Race										
White	465	63%	516	72%	299	74%	64%	272	78%	53%
Non-White	258	35%	193	27%	99	25%	38%	73	21%	38%
Unknown	10	1%	6	1%	4	1%	40%	4	1%	67%
Gender										
Male	395	54%	382	53%	216	54%	55%	185	53%	48%
Female	338	46%	333	47%	186	46%	55%	164	47%	49%
Total	733	-	715	-	402	-	55%	349	-	49%

Source: Abt Associates HCIA Patient Survey

Analytic Approach

As noted above, we assessed response rates for every survey item to identify any differential item nonresponse between the intervention and comparison groups. The coefficients of reliability (Cronbach's alpha) for the three sets of question for the Emory sample were at least 0.89 as shown in Table 2.2 below.

Table 2.2. Reliability Statistics

Question Set	Number of Survey Items	Cronbach's Alpha
Q3 through Q7	5	0.93
Q9A through Q9I	9	0.92
Q11A through Q11I	9	0.89

Source: Abt Associates HCIA Patient Survey

Results

This section presents results showing weighted frequency distributions, and other analyses discussed above, by respondents in the intervention and comparison groups.[64]

General Profile of Respondents

Table 2.3 shows that respondents in the intervention group tended to have higher educational attainment than those in the comparison group: almost twice the proportion of respondents in the intervention group had a college degree or higher (32 percent vs. 17 percent). The difference in the distribution with respect to educational attainment was statistically significant ($p<0.01$), while the difference for ethnicity was weakly significant ($p<0.10$). There were no significant differences between intervention and comparison groups in terms of living arrangement, race, or Medicaid/dual-eligibility.[65]

Table 2.3. Demographic Profile of Respondents

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total respondents	402	100%	349	100%
Highest Grade Level Completed (Q31)				
Not high school grad	54	15%	55	17%
High school grad	89	23%	102	32%
Some college	113	30%	107	34%
College graduate	129	32%	62	17%
With Whom Do You Live (Q32)				
Alone	79	20%	64	21%
With spouse	214	54%	171	47%
With family	77	22%	78	26%
With friends	5	1%	10	3%
Other residents	10	3%	7	3%
Ethnicity (Q33)				
Hispanic	5	2%	12	4%
Non-Hispanic	320	93%	273	92%
Not answered	17	5%	11	4%

[64] Unweighted frequency distributions of responses to all survey questions in their original form are presented in Attachment 2.A. All estimates presented in the result section of this report have been weighted to reflect the intervention and comparison populations.

[65] Note: Medicaid/dual eligibility was obtained from Medicare administrative data.

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Reported Race (Q34)				
White	287	72%	258	78%
Non-White	86	24%	68	20%
Preferred not answering	13	4%	8	2%
Medicaid-Eligible *				
No	271	65%	236	68%
Yes	131	35%	113	32%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

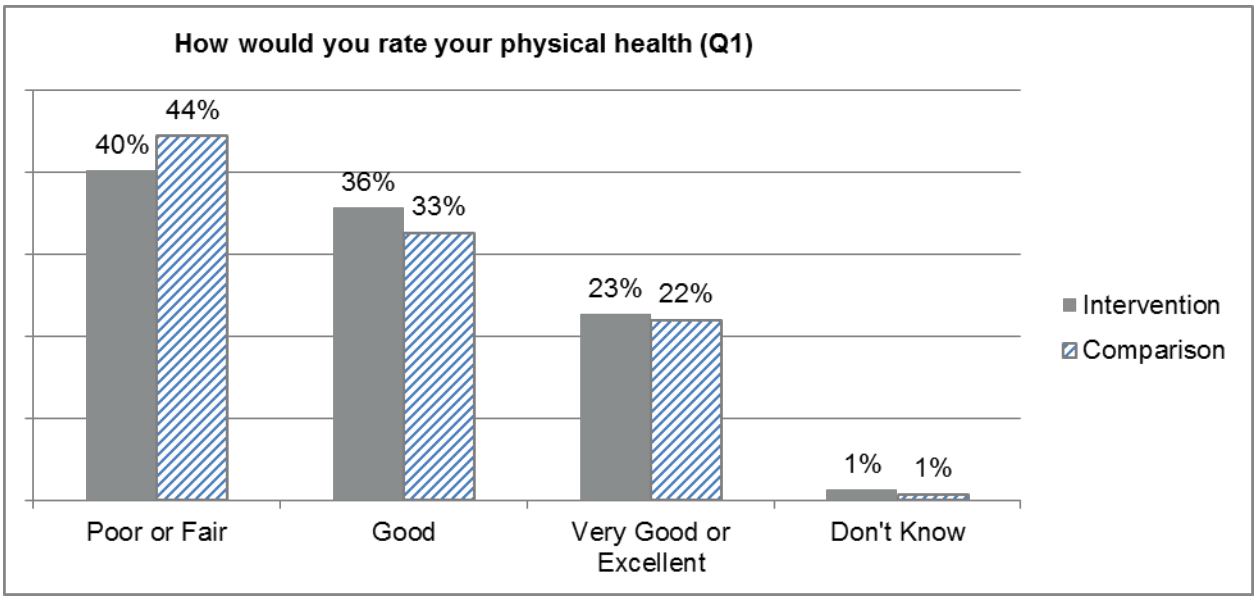
Respondents who indicated that English was not their preferred language were asked whether the facility staff spoke to them in their preferred language (Q27) and how often the respondents used an interpreter provided by the facility (Q28). Only four respondents, representing less than one percent of the all respondents, indicated that English was not their preferred language.[66]

Respondents' Health and Health-Related Quality of Life (Q3-Q12)

Just over half the respondents in both intervention and comparison groups reported that their physical health was good to excellent (Figure 2.1). More than three-quarters of respondents in both the intervention and comparison groups reported that their mental health was good to excellent (Figure 2.2). These differences in physical and mental health status were not statistically significant.

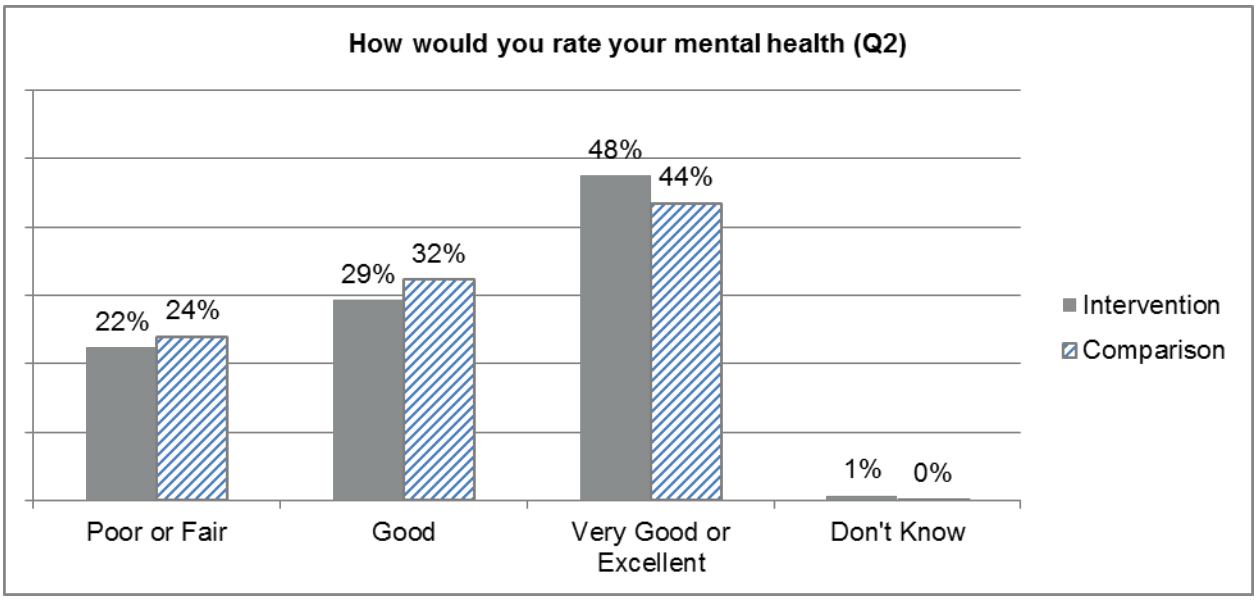
[66] For the two questions (Q27 and Q28) on preferred language of communication, we did not conduct tests of statistically significant differences in responses across the two analytic groups due to very small sample sizes.

Figure 2.1. Respondents' Self-Reported Physical Health Status



Source: Abt Associates HCIA Patient Survey

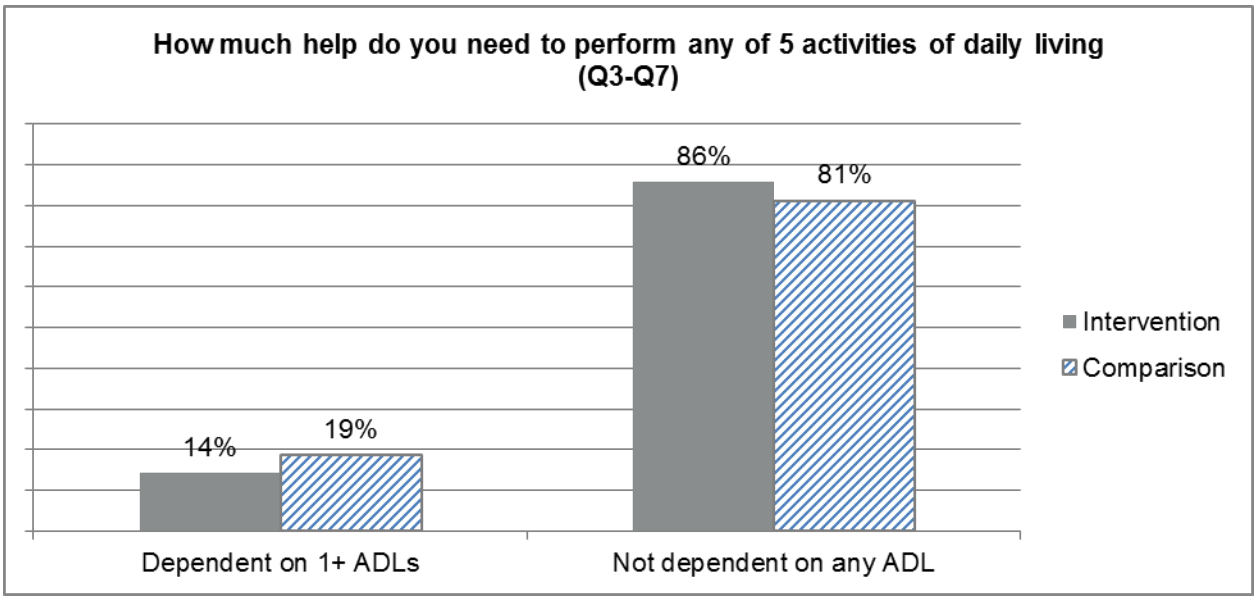
Figure 2.2. Respondents' Self-Reported Mental Health Status



Source: Abt Associates HCIA Patient Survey

To assess functional status, respondents were asked how much help they needed in performing five activities such as putting on and taking clothing off clothing, bathing, toileting, etc. (Q3-Q7). As described in the overall Analytic Approach section, these five items were combined into one index variable to compare overall functional status with respect to all five questions combined. More than three-quarters of respondents in both intervention and comparison groups needed little or no help to perform any of the five activities (Figure 2.3). There were no statistically significant differences between the intervention and comparison groups for the combined index variables or any of the five individual items.

Figure 2.3. Respondents' Index/Composite Functional Status

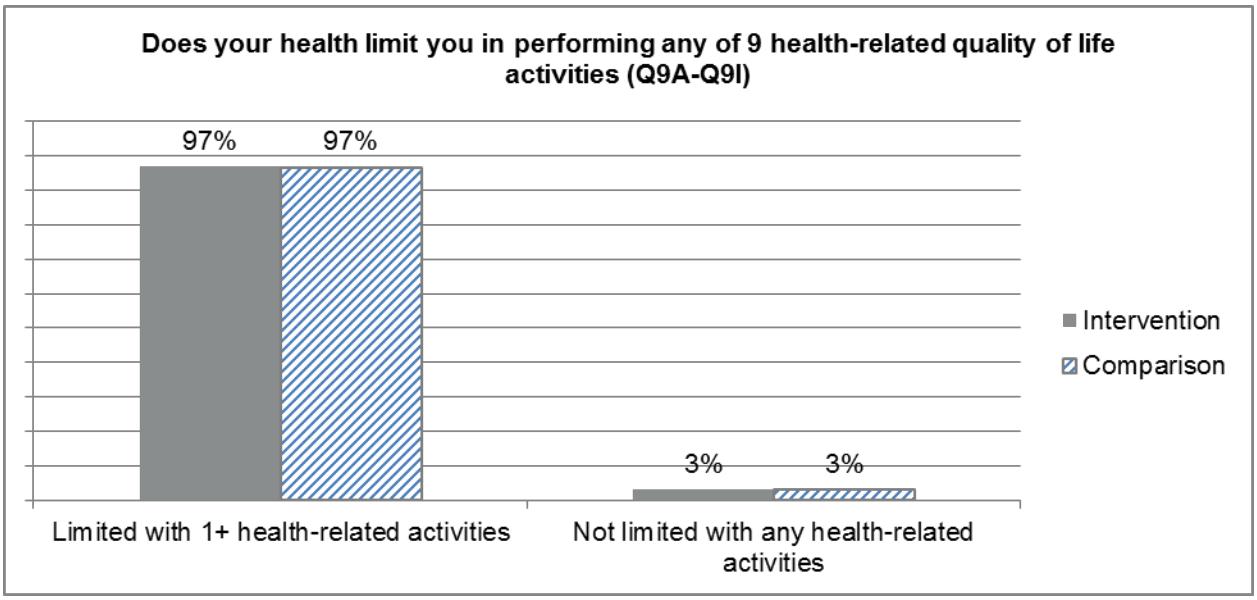


Source: Abt Associates HCIA Patient Survey

Nine questions (Q9A-Q9I) asked respondents whether their health limited their performance of certain activities like moving or pushing objects, climbing, walking, and so on. These nine items were combined into a single index variable to examine overall differences. As Figure 2.4 displays, there were no significant differences between the intervention and comparison groups as almost all respondents, in both groups, reported that they were limited in performing at least one of the nine activities.[67]

[67] We also created multiple categories indicating the number of activities in which respondents had limitations and considered alternative cut-off points for the categories, for example 1-2, 3-5, 6+. The results of this robustness check were substantially similar to the results presented in this report.

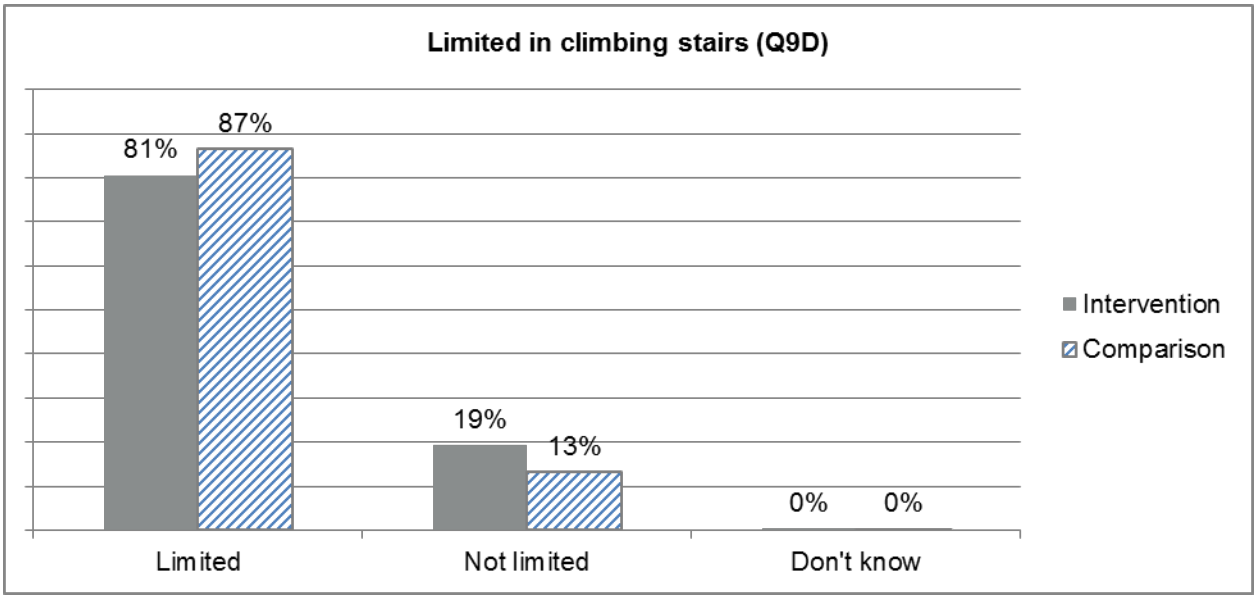
Figure 2.4. Respondents' Performance of Health-Related Quality of Life Activities



Source: Abt Associates HCIA Patient Survey

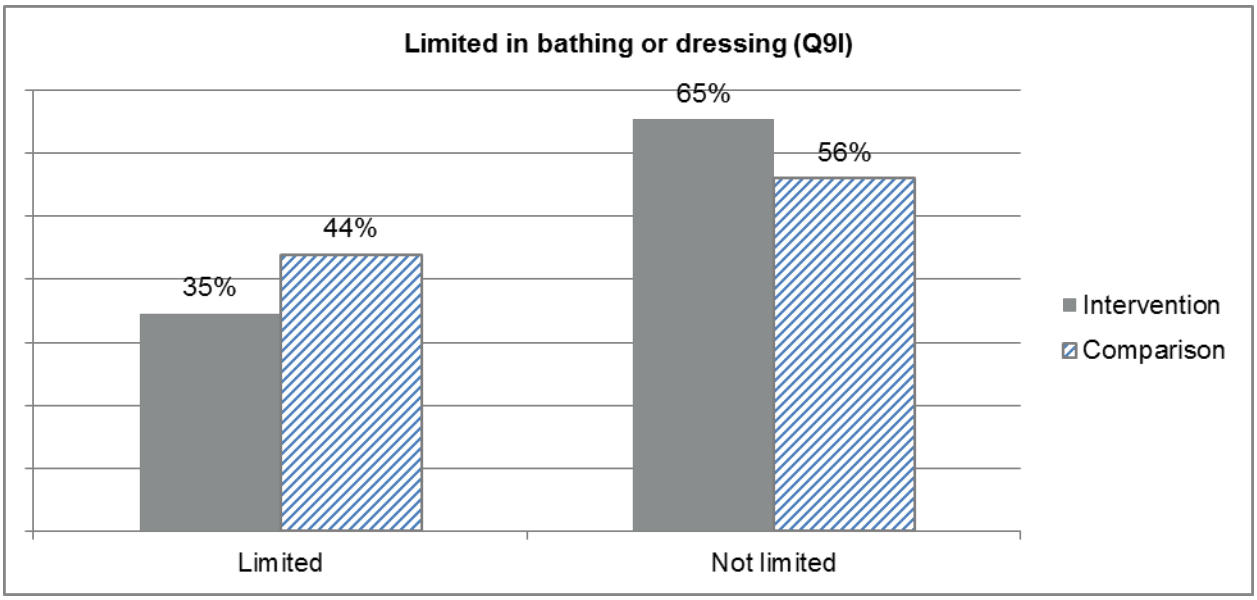
Intervention respondents reported fewer limitations in some activities than did comparison respondents. Figure 2.5 shows that 81 percent of intervention respondents and 87 percent of comparison respondents reported some limitation in climbing several flights of stairs ($p<0.10$). Also, as shown in Figure 2.6, intervention respondents were less likely to be limited in bathing or dressing ($p<0.01$) than were comparison respondents (35 percent vs. 44 percent).

Figure 2.5. Respondents' Ability to Climb Stairs



Source: Abt Associates HCIA Patient Survey

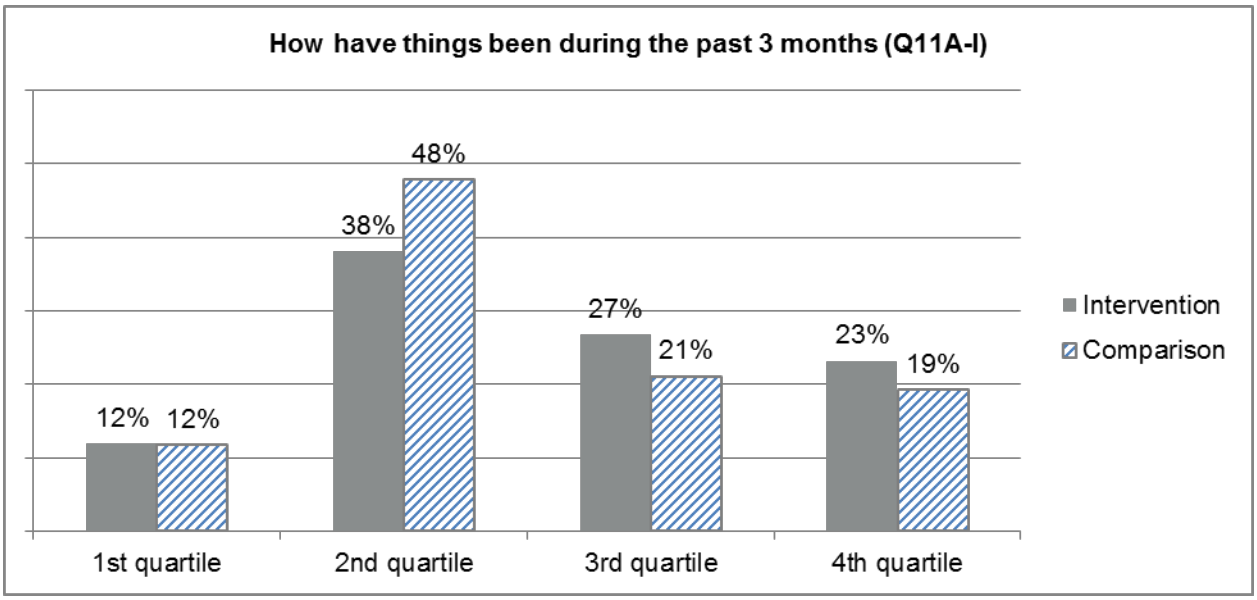
Figure 2.6. Respondents' Ability to Bathe/Dress



Source: Abt Associates HCIA Patient Survey

Figure 2.7 displays the perception of respondents regarding their overall mood as measured by the index/composite variable combining Q11_A through Q11_I. The majority (60 percent) of comparison group respondents indicated a poor mood (in the 1st or 2nd quartile), compared to 40 percent of intervention respondents ($p<0.10$).

Figure 2.7. Respondents' Mood Index

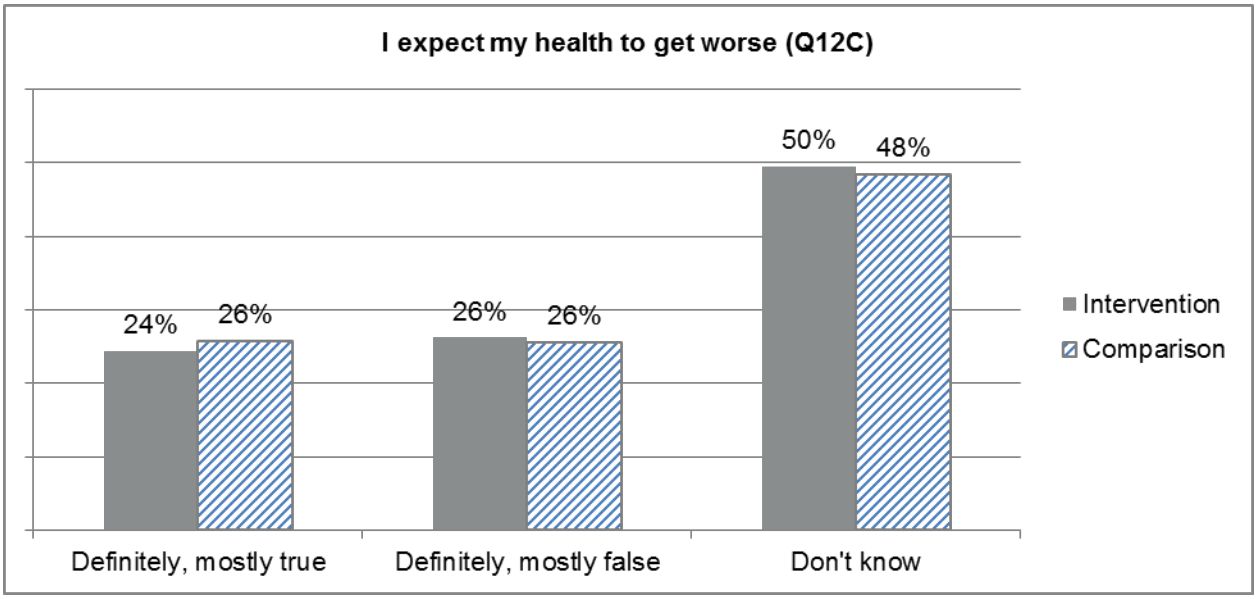


Source: Abt Associates HCIA Patient Survey

Regarding respondents' outlook (or expectation) about their health (Q12_A-Q12D), respondents in both groups seemed unsure of their health outlook for all four questions, and there was no significant

difference between intervention and comparison respondents. For example, Figure 2.8 shows that about half in each group were uncertain about whether they expected their health to get worse (detailed results of other variables are presented in Table 2.B.3, Attachment 2.B).

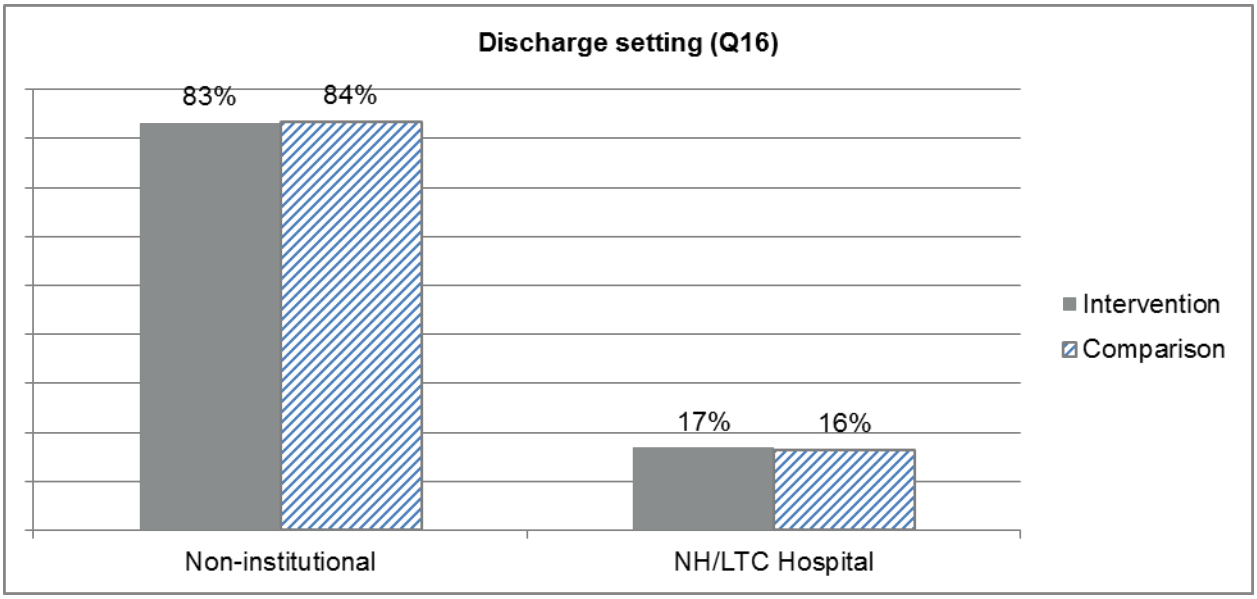
Figure 2.8. Respondents' Expectation of Own Health



Source: Abt Associates HCIA Patient Survey

Intervention and comparison respondents were also similar in the settings they transitioned to upon discharge from the hospital: The vast majority of intervention respondents returned home after leaving the hospital, and the same was true for comparison respondents (Figure 2.9).

Figure 2.9. Post-Discharge Destination

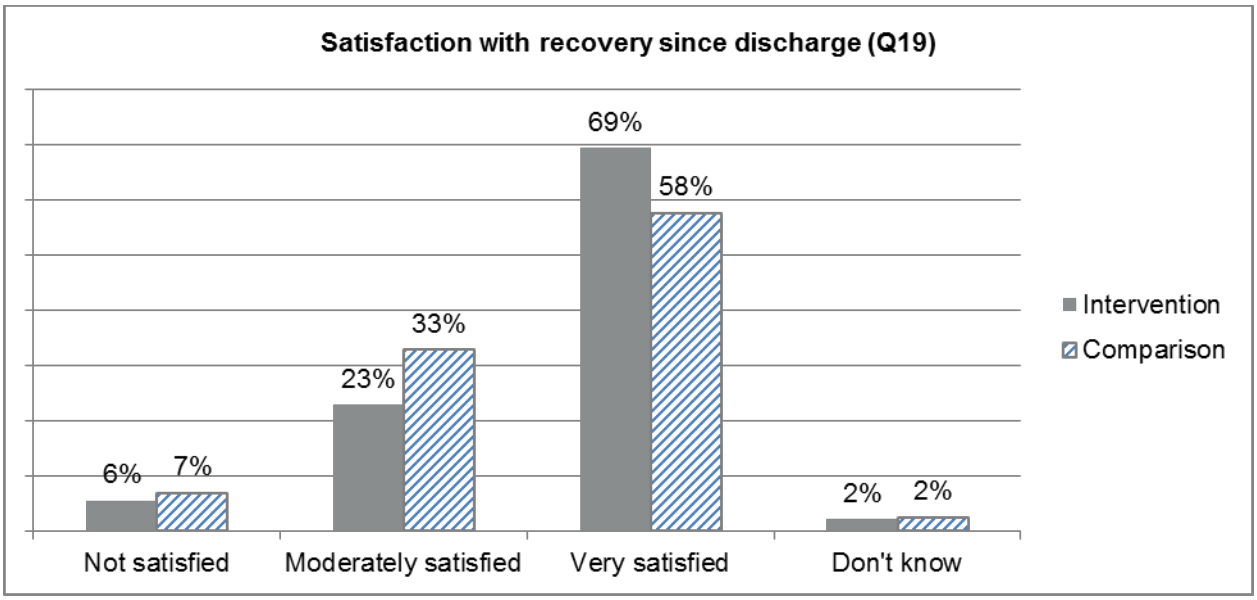


Source: Abt Associates HCIA Patient Survey

Satisfaction with Care/Care Experience (Q13-Q28)

As Figure 2.10 displays, over two-thirds of respondents in the intervention group and less than 60 percent in the comparison group reported being very satisfied with their recovery since discharge. There was a statistically significant difference between the two groups regarding the level of satisfaction with the care they received ($p<0.01$) with intervention respondents being more satisfied than their comparison counterparts

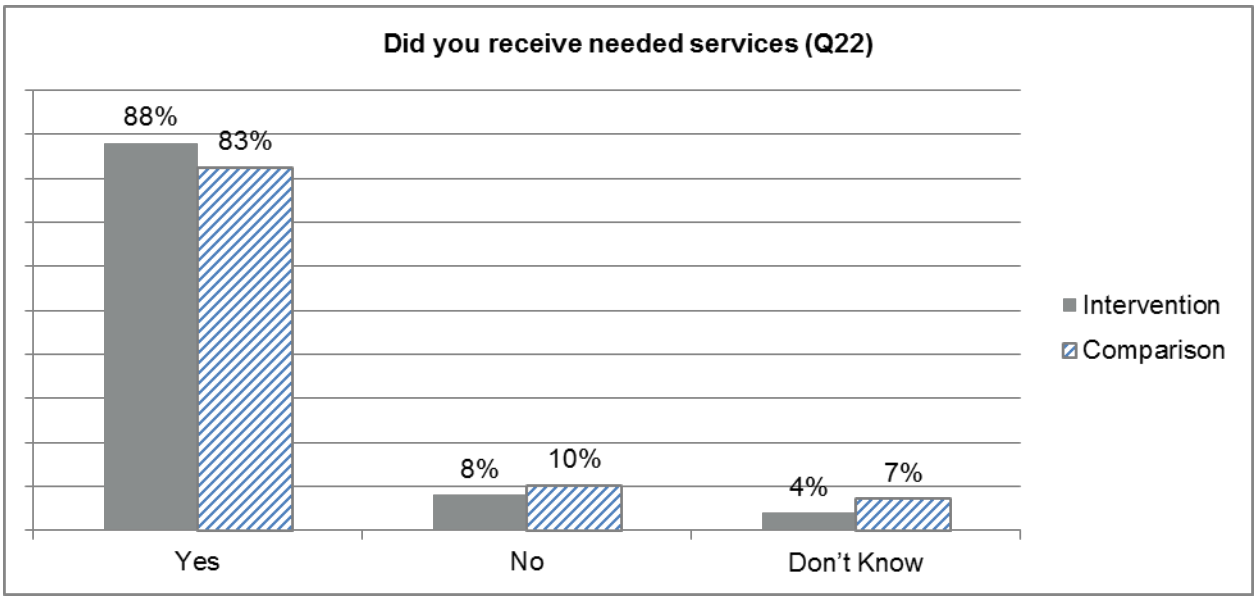
Figure 2.10. Satisfaction with Recovery Post-Discharge



Source: Abt Associates HCIA Patient Survey

Figure 2.11 shows that the vast majority of both intervention and comparison respondents reported that they received services which they felt they needed. However, the proportion of respondents with positive responses was slightly higher, at 88 percent, in the intervention group ($p<0.1$).

Figure 2.11. Access to Needed Care



Source: Abt Associates HCIA Patient Survey

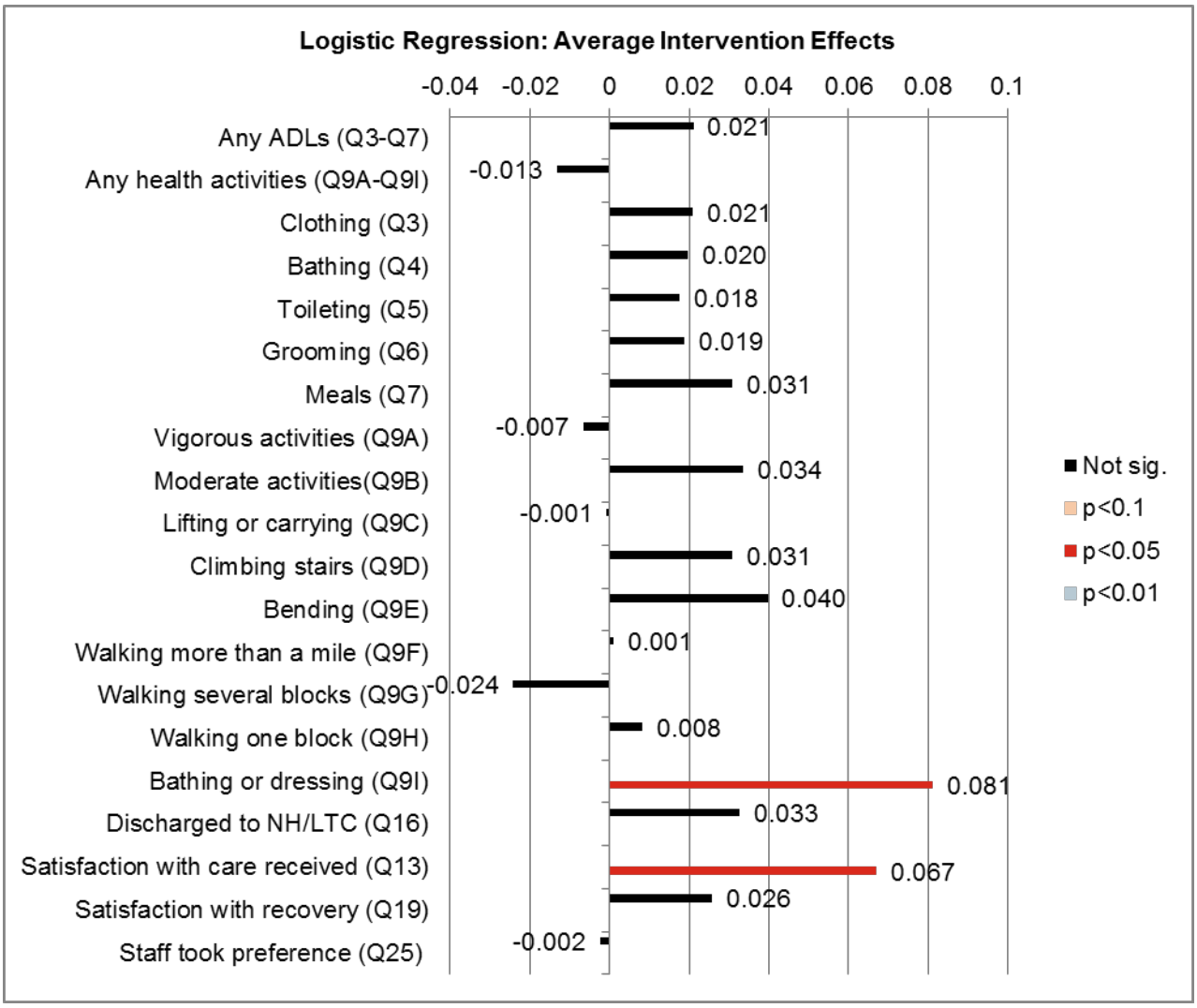
With respect to other questions relating to satisfaction with care and care experience, intervention and comparison respondents generally reported similar responses (see detailed results in Tables 2.A.4 –2.A.6, Attachment 2.A).

Multivariate Logistic Regression Findings

We estimated multivariate logistic regression models for the functional status questions, discharge setting (or destination), as well as for overall satisfaction questions (Q13, Q19, and Q25) as described in the overall Analytic Approach section. Figure 2.12 presents the intervention effects, as measured by the average marginal effects, on these outcomes. For both index variables combining Q3-Q7 and Q9A-Q9I, regression results indicate no statistically significant differences between intervention and comparison respondents. However, being in the intervention group was associated with an eight percent increased probability of having no limitation bathing or dressing ($p<0.05$). Also, respondents in the intervention group, relative to those in the comparison group, were roughly seven percent more likely to be generally satisfied with the care they received ($p<0.05$).[68]

[68] See Table 2.B.9 in Attachment 2.B, for more detailed information.

Figure 2.12. Logistic Regression: Average Intervention Effects



Source: Abt Associates HCIA Patient Survey

Conclusions

Overall, we observed few statistically significant differences between intervention and comparison survey respondents. The majority in both groups reported that their physical and mental health was good, and most need little help with activities of daily living. Intervention respondents reported less limitation in activities such as climbing flights of stairs and in bathing or dressing. Findings from multivariate logistic regression models also indicate that being in the intervention group was associated with having less limitation in bathing or dressing. Intervention respondents were more likely to be satisfied, than their comparison peers, with the care they received in the hospital. Respondents in both groups seemed uncertain regarding their health outlook for the future. Overall, despite the mostly insignificant intervention effects, there seemed to be more favorable outcomes among the Emory program respondents than their counterparts in the comparison group.

Attachment 2.A: Unweighted Frequency Distributions of all Survey Questions in their Original Form

Table 2.A.1. Health Outcomes

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Rate your physical health today (Q1)				
Excellent	23	6%	18	5%
Very Good	69	17%	58	17%
Good	142	35%	114	33%
Fair	107	27%	97	28%
Poor	45	11%	52	15%
Don't Know	5	1%	2	1%
Missing	11	3%	8	2%
Totals	402	100%	349	100%
Rate your mental health today (Q2)				
Excellent	82	20%	55	16%
Very Good	108	27%	98	28%
Good	117	29%	110	32%
Fair	65	16%	52	15%
Poor	18	4%	25	7%
Don't Know	3	1%	1	0%
Missing	9	2%	8	2%
Totals	402	100%	349	100%
How much help do you need putting on clothing (Q3)				
Total help	20	5%	18	5%
A lot	18	4%	24	7%
A little	66	16%	62	18%
None	286	71%	236	68%
Missing	12	3%	9	3%
Totals	402	100%	349	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How much help do you need bathing (Q4)				
Total help	23	6%	27	8%
A lot	22	5%	21	6%
A little	38	9%	45	13%
None	308	77%	249	71%
Don't Know	0	0%	0	0%
Missing	11	3%	7	2%
Totals	402	100%	349	100%
How much help do you need toileting (Q5)				
Total help	17	4%	20	6%
A lot	11	3%	12	3%
A little	21	5%	35	10%
None	344	86%	274	79%
Don't Know	0	0%	0	0%
Missing	9	2%	8	2%
Totals	402	100%	349	100%
How much help do you need in personal grooming (Q6)				
Total help	9	2%	15	4%
A lot	12	3%	9	3%
A little	14	3%	22	6%
None	356	89%	295	85%
Don't Know	0	0%	0	0%
Missing	11	3%	8	2%
Totals	402	100%	349	100%
How much help do you need eating meals (Q7)				
Total help	5	1%	10	3%
A lot	11	3%	11	3%
A little	19	5%	37	11%
None	355	88%	284	81%
Don't Know	1	0%	0	0%
Missing	11	3%	7	2%
Totals	402	100%	349	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How much does pain or hurting limit day-to-day activities (Q8)				
Not at all	93	23%	65	19%
Slightly	102	25%	79	23%
Moderately	81	20%	92	26%
Quite a bit	84	21%	68	19%
Extremely	21	5%	32	9%
Don't Know	6	1%	3	1%
Missing	15	4%	10	3%
Totals	402	100%	349	100%

Table 2.A.2. Health-Related Quality of Life

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Does health now limit you in vigorous activities (Q9A)				
Yes, limited a lot	277	69%	256	73%
Yes, limited a little	82	20%	61	17%
No, not limited at all	26	6%	21	6%
Don't Know	2	0%	0	0%
Missing	15	4%	11	3%
Totals	402	100%	349	100%
Does health now limit you in moderate activities (Q9B)				
Yes, limited a lot	181	45%	158	45%
Yes, limited a little	118	29%	114	33%
No, not limited at all	87	22%	68	19%
Don't Know	1	0%	0	0%
Missing	15	4%	9	3%
Totals	402	100%	349	100%
Does health now limit you in lifting or carrying groceries (Q9C)				
Yes, limited a lot	126	31%	129	37%
Yes, limited a little	142	35%	107	31%
No, not limited at all	122	30%	101	29%
Don't Know	0	0%	1	0%
Missing	12	3%	11	3%
Totals	402	100%	349	100%
Does health now limit you in climbing several flights of stairs (Q9D)				
Yes, limited a lot	181	45%	172	49%
Yes, limited a little	130	32%	115	33%
No, not limited at all	76	19%	49	14%
Don't Know	1	0%	1	0%
Missing	14	3%	12	3%
Totals	402	100%	349	100%
Does health now limit you in bending, kneeling, or stooping (Q9E)				
Yes, limited a lot	134	33%	153	44%
Yes, limited a little	173	43%	129	37%
No, not limited at all	81	20%	57	16%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Don't Know	1	0%	0	0%
Missing	13	3%	10	3%
Totals	402	100%	349	100%
Does health now limit you in walking more than a mile (Q9F)				
Yes, limited a lot	230	57%	222	64%
Yes, limited a little	96	24%	66	19%
No, not limited at all	62	15%	47	13%
Don't Know	1	0%	4	1%
Missing	13	3%	10	3%
Totals	402	100%	349	100%
Does health now limit you in walking several blocks (Q9G)				
Yes, limited a lot	199	50%	196	56%
Yes, limited a little	104	26%	74	21%
No, not limited at all	86	21%	69	20%
Don't Know	1	0%	1	0%
Missing	12	3%	9	3%
Totals	402	100%	349	100%
Does health now limit you in walking one block (Q9H)				
Yes, limited a lot	128	32%	129	37%
Yes, limited a little	110	27%	88	25%
No, not limited at all	149	37%	118	34%
Don't Know	2	0%	2	1%
Missing	13	3%	12	3%
Totals	402	100%	349	100%
Does health now limit you in bathing or dressing (Q9I)				
Yes, limited a lot	35	9%	52	15%
Yes, limited a little	95	24%	90	26%
No, not limited at all	261	65%	195	56%
Don't Know	0	0%	0	0%
Missing	11	3%	12	3%
Totals	402	100%	349	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Extent that physical health OR emotional problems interfered with social activities (Q10)				
Not at all	115	29%	88	25%
Slightly	92	23%	76	22%
Moderately	75	19%	64	18%
Quite a bit	69	17%	65	19%
Extremely	37	9%	42	12%
Don't Know	0	0%	3	1%
Missing	14	3%	11	3%
Totals	402	100%	349	100%
Felt full of pep during the past 3 months (Q11A)				
All of the time	10	2%	4	1%
Most of the time	50	12%	43	12%
A good bit of the time	55	14%	47	13%
Some of the time	107	27%	78	22%
A little of the time	92	23%	98	28%
None of the time	80	20%	70	20%
Don't Know	0	0%	3	1%
Missing	8	2%	6	2%
Totals	402	100%	349	100%
Have been a very nervous person during the past 3 months (Q11B)				
All of the time	15	4%	10	3%
Most of the time	12	3%	27	8%
A good bit of the time	15	4%	20	6%
Some of the time	81	20%	73	21%
A little of the time	81	20%	75	21%
None of the time	192	48%	140	40%
Don't Know	0	0%	0	0%
Missing	6	1%	4	1%
Totals	402	100%	349	100%
Felt down in the dumps during the past 3 months (Q11C)				
All of the time	8	2%	9	3%
Most of the time	13	3%	18	5%
A good bit of the time	15	4%	18	5%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Some of the time	54	13%	49	14%
A little of the time	76	19%	81	23%
None of the time	230	57%	170	49%
Don't Know	0	0%	0	0%
Missing	6	1%	4	1%
Totals	402	100%	349	100%
Felt calm and peaceful during the past 3 months (Q11D)				
All of the time	50	12%	30	9%
Most of the time	134	33%	98	28%
A good bit of the time	61	15%	52	15%
Some of the time	81	20%	93	27%
A little of the time	45	11%	51	15%
None of the time	27	7%	19	5%
Don't Know	0	0%	0	0%
Missing	4	1%	6	2%
Totals	402	100%	349	100%
Had a lot of energy during the past 3 months (Q11E)				
All of the time	12	3%	6	2%
Most of the time	44	11%	32	9%
A good bit of the time	60	15%	32	9%
Some of the time	91	23%	85	24%
A little of the time	92	23%	99	28%
None of the time	97	24%	91	26%
Don't Know	0	0%	0	0%
Missing	6	1%	4	1%
Totals	402	100%	349	100%
Felt downhearted during the past 3 months (Q11F)				
All of the time	9	2%	10	3%
Most of the time	10	2%	17	5%
A good bit of the time	24	6%	20	6%
Some of the time	82	20%	74	21%
A little of the time	121	30%	106	30%
None of the time	149	37%	116	33%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Don't Know	2	0%	0	0%
Missing	5	1%	6	2%
Totals	402	100%	349	100%
Felt worn out during the past 3 months (Q11G)				
All of the time	38	9%	27	8%
Most of the time	32	8%	48	14%
A good bit of the time	65	16%	59	17%
Some of the time	110	27%	88	25%
A little of the time	97	24%	88	25%
None of the time	53	13%	33	9%
Don't Know	0	0%	1	0%
Missing	7	2%	5	1%
Totals	402	100%	349	100%
Been happy during the past 3 months (Q11H)				
All of the time	54	13%	44	13%
Most of the time	136	34%	122	35%
A good bit of the time	78	19%	59	17%
Some of the time	72	18%	68	19%
A little of the time	40	10%	38	11%
None of the time	11	3%	13	4%
Don't Know	1	0%	0	0%
Missing	10	2%	5	1%
Totals	402	100%	349	100%
Felt tired during the past 3 months (Q11I)				
All of the time	42	10%	34	10%
Most of the time	61	15%	69	20%
A good bit of the time	79	20%	65	19%
Some of the time	126	31%	114	33%
A little of the time	61	15%	55	16%
None of the time	27	7%	9	3%
Don't Know	0	0%	0	0%
Missing	6	1%	3	1%
Totals	402	100%	349	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
I get sick easier than other people (Q12A)				
Definitely true	36	9%	26	7%
Mostly true	51	13%	53	15%
Mostly false	126	31%	100	29%
Definitely false	12	3%	14	4%
Don't Know	171	43%	150	43%
Missing	6	1%	6	2%
Totals	402	100%	349	100%
I am as healthy as anybody I know (Q12B)				
Definitely true	34	8%	28	8%
Mostly true	113	28%	93	27%
Mostly false	92	23%	92	26%
Definitely false	12	3%	13	4%
Don't Know	137	34%	116	33%
Missing	14	3%	7	2%
Totals	402	100%	349	100%
I expect my health to get worse (Q12C)				
Definitely true	39	10%	35	10%
Mostly true	54	13%	52	15%
Mostly false	95	24%	82	23%
Definitely false	8	2%	6	2%
Don't Know	196	49%	165	47%
Missing	10	2%	9	3%
Totals	402	100%	349	100%
My health is excellent (Q12D)				
Definitely true	22	5%	12	3%
Mostly true	109	27%	97	28%
Mostly false	119	30%	116	33%
Definitely false	13	3%	19	5%
Don't Know	130	32%	101	29%
Missing	9	2%	4	1%
Totals	402	100%	349	100%

Table 2.A.3. Satisfaction with Care

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How satisfied are you with the care you received (Q13)				
Very dissatisfied	41	10%	33	9%
Moderately dissatisfied	16	4%	26	7%
Neutral	14	3%	20	6%
Moderately satisfied	60	15%	67	19%
Very satisfied	262	65%	191	55%
Don't Know	3	1%	4	1%
Missing	6	1%	8	2%
Totals	402	100%	349	100%
How often did you feel like complaining about the care you received (Q14)				
Never	190	47%	178	51%
Rarely	120	30%	86	25%
Sometimes	65	16%	58	17%
Mostly	14	3%	15	4%
Always	10	2%	10	3%
Don't Know	0	0%	1	0%
Missing	3	1%	1	0%
Totals	402	100%	349	100%
How often was your pain well controlled (Q15)				
Never	6	1%	8	2%
Sometimes	23	6%	11	3%
Usually	33	8%	35	10%
Always	115	29%	119	34%
Did not have pain	189	47%	141	40%
Not applicable	30	7%	31	9%
Don't Know	1	0%	2	1%
Missing	5	1%	2	1%
Totals	402	100%	349	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
After leaving the facility, I stayed in: (Q16)				
Own home	289	72%	258	74%
Someone else's home	42	10%	37	11%
Nursing home	54	13%	43	12%
Long-term care hospital	5	1%	0	0%
Other	11	3%	8	2%
Did staff talk about needed help when you left the facility (Q17)				
Yes	319	79%	267	77%
No	50	12%	48	14%
Don't Know	28	7%	31	9%
Missing	5	1%	3	1%
Totals	402	100%	349	100%
Did you get information about what symptoms to look out for (Q18)				
Yes	305	76%	254	73%
No	54	13%	52	15%
Don't Know	37	9%	41	12%
Missing	6	1%	2	1%
Totals	402	100%	349	100%
How satisfied are you with your recovery since you left the facility (Q19)				
Not at all satisfied	21	5%	22	6%
Slightly satisfied	27	7%	30	9%
Moderately satisfied	63	16%	75	21%
Quite a bit satisfied	116	29%	94	27%
Extremely satisfied	154	38%	105	30%
Don't Know	8	2%	9	3%
Missing	13	3%	14	4%
Totals	402	100%	349	100%

Table 2.A.4. Care Experience

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How often did doctors and nurses explain things in a way you could understand (Q20)				
Never	9	2%	10	3%
Sometimes	42	10%	37	11%
Usually	95	24%	116	33%
Always	248	62%	175	50%
Don't Know	1	0%	3	1%
Missing	7	2%	8	2%
Totals	402	100%	349	100%
How often did doctors and nurses encourage you to ask questions (Q21)				
Never	33	8%	30	9%
Sometimes	63	16%	63	18%
Usually	90	22%	89	26%
Always	201	50%	157	45%
Don't Know	5	1%	1	0%
Missing	10	2%	9	3%
Totals	402	100%	349	100%
Did you receive the services you thought that you needed (Q22)				
Yes	346	86%	279	80%
No	31	8%	35	10%
Don't Know	15	4%	24	7%
Missing	10	2%	11	3%
Totals	402	100%	349	100%
Did you feel the care you received was well coordinated (Q23)				
Yes	333	83%	276	79%
No	33	8%	36	10%
Don't Know	22	5%	26	7%
Missing	14	3%	11	3%
Totals	402	100%	349	100%
Did you seem to get conflicting advice from different health care providers (Q24)				
Yes	53	13%	69	20%
No	309	77%	244	70%
Don't Know	30	7%	28	8%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Missing	10	2%	8	2%
Totals	402	100%	349	100%
The facility staff took my preferences into account regarding services after discharge (Q25)				
Strongly disagree	12	3%	17	5%
Disagree	20	5%	18	5%
Agree	137	34%	163	47%
Strongly agree	134	33%	75	21%
Not applicable	44	11%	32	9%
Don't Know/Don't Remember	42	10%	33	9%
Missing	13	3%	11	3%
Totals	402	100%	349	100%
What is your preferred language when speaking (Q26)				
English	332	83%	292	84%
Other	2	0%	2	1%
Don't Know	0	0%	0	0%
Missing	68	17%	55	16%
Totals	402	100%	349	100%
How often did staff speak to you in your preferred language (Q27)				
Never	1	1%	0	0%
Sometimes	0	0%	1	2%
Always	4	6%	3	5%
Missing	65	93%	52	91%
Totals	70	100%	56	98%
How often did you use an interpreter provided by facility (Q28)				
Never, did not need one	7	10%	4	7%
Never, was not offered one	0	0%	0	0%
Never, family interpreter	1	1%	0	0%
Sometimes	0	0%	1	2%
Always	1	1%	0	0%
Missing	61	87%	52	91%
Totals	70	100%	57	100%

Table 2.A.5. Demographic Characteristics

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Age (Q29)				
54 or younger	37	9%	29	8%
55 to 64	40	10%	39	11%
65 to 74	153	38%	120	34%
75 or older	150	37%	141	40%
Missing	22	5%	20	6%
Totals	402	100%	349	100%
Gender (Q30)				
Male	204	51%	172	49%
Female	177	44%	160	46%
Missing	21	5%	17	5%
Totals	402	100%	349	100%
Education (Q31)				
8th grade or less	20	5%	22	6%
Some high school, but did not graduate	34	8%	33	9%
High school graduate or GED	89	22%	102	29%
Some college or 2-year degree	113	28%	107	31%
4-year college degree	63	16%	30	9%
More than a 4-year college degree	66	16%	32	9%
Don't Know	0	0%	2	1%
Missing	17	4%	21	6%
Totals	402	100%	349	100%
With whom do you live: (Q32)				
Alone	79	20%	64	18%
With spouse or partner	214	53%	171	49%
With other family members	77	19%	78	22%
With non-relatives	5	1%	10	3%
Residential setting	10	2%	8	2%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Hispanic origin: (Q33)				
No	321	80%	273	78%
Yes, Mexican or Chicano	1	0%	6	2%
Yes, Puerto Rican	2	0%	4	1%
Yes, Cuban	1	0%	0	0%
Yes, another Hispanic origin	4	1%	2	1%
Prefer not to answer	19	5%	11	3%
Race: (Q34)				
White	289	72%	261	75%
Black or African American	82	20%	59	17%
American Indian or Alaska Native	4	1%	7	2%
Asian or Asian American	1	0%	4	1%
Native Hawaiian or Other Pacific Islander	0	0%	1	0%
Prefer not to answer	13	3%	8	2%

Source: Abt Associates HCIA Patient Survey.

Attachment 2.B: Descriptive Statistics and Multivariate Logistic Regression Results

2.B.1 Respondents' Health and Health-Related Quality of Life

Table 2.B.1. Self-Reported Health and Functional Status (Q1-Q8)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
How would you rate your physical health (Q1)				
Poor or Fair	152	40%	149	44%
Good	142	36%	114	33%
Very Good or Excellent	92	23%	76	22%
Don't Know	5	1%	2	1%
How would you rate your mental health (Q2)				
Poor or Fair	83	22%	77	24%
Good	117	29%	110	32%
Very Good or Excellent	190	48%	153	44%
Don't Know	3	1%	1	0%
How much help do you need to perform any of 5 activities of daily living (Q3-Q7)				
Dependent on 1+ ADLs	55	14%	61	19%
Not dependent on any ADL	338	86%	281	81%
How much does pain limit activities (Q8)				
Extreme, quite a bit	105	29%	100	31%
Slight, moderate	183	46%	171	50%
Not at all	93	23%	65	18%
Don't know	6	2%	3	1%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 2.B.2. Performance of Health-Related Quality of Life Activities (Q9-Q10)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Does your health limit you in performing any of 9 health-related quality of life activities (Q9A-Q9I)?				
Limited with 1+ health-related activities	380	97%	328	97%
Not limited with any health-related activities	13	3%	13	3%
To what extent have physical health or emotional problems interfered with social activities (Q10)				
Extreme, quite a bit	106	29%	107	33%
Slight, moderate	167	43%	140	42%
Not at all	115	28%	88	24%
Don't know	0	0%	3	1%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 2.B.3. Perception about Own Health (Q11-Q12)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
How have things been during the past 3 months (Q11A-I)				
1st quartile	44	12%	40	12%
2nd quartile	149	38%	160	48%
3rd quartile	109	27%	74	21%
4th quartile	97	23%	72	19%
I get sick easier than other people (Q12A)				
Definitely, mostly true	87	24%	79	23%
Definitely, mostly false	138	33%	114	33%
Don't know	171	43%	150	44%
I am as healthy as anybody I know (Q12B)				
Definitely, mostly true	147	36%	121	35%
Definitely, mostly false	104	29%	105	32%
Don't know	137	35%	116	33%
I expect my health to get worse (Q12C)				
Definitely, mostly true	93	24%	87	26%
Definitely, mostly false	103	26%	88	26%
Don't know	196	50%	165	48%
My health is excellent (Q12D)				
Definitely, mostly true	131	32%	109	30%
Definitely, mostly false	132	35%	135	40%
Don't know	130	33%	101	30%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

2.B.2 Satisfaction with Care/Care Experience

Table 2.B.4. Perception about Care Process and Transition (Q13-Q19)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
Overall satisfaction with care received (Q13) *				
Very, moderately dissatisfied	57	14%	59	17%
Neutral	14	3%	20	6%
Very, moderately satisfied	322	82%	258	76%
Don't know	3	1%	4	1%
How often did you feel like complaining about the care received (Q14)				
Mostly or always	24	7%	25	8%
Sometimes	65	16%	58	17%
Rarely or never	310	77%	264	75%
Don't know	0	0%	1	0%
How often was your pain well controlled (Q15)				
Rarely or never	6	2%	8	3%
Sometimes	23	6%	11	3%
Mostly or always	148	38%	154	45%
Don't know	1	0%	2	1%
No pain/NA	219	54%	172	48%
Discharge setting (Q16) ***				
Non-institutional	328	83%	294	84%
NH/LTC Hospital	69	17%	51	16%
Did staff talk about having help after discharge (Q17) *				
Yes	319	81%	267	77%
No	50	12%	48	14%
Don't Know	28	7%	31	9%
Did you get information on health problems after discharge (Q18)				
Yes	305	78%	254	71%
No	54	13%	52	16%
Don't Know	37	9%	41	13%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Satisfaction with recovery since discharge (Q19) ***				
Not satisfied	21	6%	22	7%
Moderately satisfied	90	23%	105	33%
Very satisfied	270	69%	199	58%
Don't know	8	2%	9	2%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 2.B.5. Perception about Care Access and Involvement (Q20-Q25)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
How often did staff explain things understandably (Q20)				
Never	9	2%	10	3%
Sometimes	42	11%	37	11%
Usually or always	343	87%	291	85%
Don't know	1	0%	3	1%
How often did staff encourage questions (Q21) ***				
Never	33	9%	30	10%
Sometimes	63	16%	63	19%
Usually or always	291	74%	246	71%
Don't know	5	1%	1	0%
Did you receive needed services (Q22) ***				
Yes	346	88%	279	83%
No	31	8%	35	10%
Don't Know	15	4%	24	7%
Did you feel that care was well coordinated (Q23) *				
Yes	333	86%	276	82%
No	33	9%	36	10%
Don't Know	22	5%	26	8%
Did you get conflicting advice from providers (Q24)				
Yes	53	14%	69	20%
No	309	78%	244	71%
Don't Know	30	8%	28	9%
Staff took my preferences into account regarding services after discharge (Q25)				
Disagree	32	8%	35	10%
Agree	271	70%	238	71%
Neutral	44	11%	32	9%
Don't Know	42	11%	33	10%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 2.B.6. Access and Communication (Q27-Q28)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
How often did staff speak to you in your preferred language (Q27)				
Never	1	20%	0	0%
Sometimes	0	0%	1	25%
Always	4	80%	3	56%
Don't Know	0	0%	1	19%
How often did you use an interpreter provided by the hospital (Q28)				
Not needed	8	85%	4	74%
Not offered	0	0%	0	0%
Sometimes offered	0	0%	1	26%
Always offered	1	15%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

2.B.3 Individual Functional Status

Table 2.B.7. Individual Functional Status Items: ADLs (Q3-Q7)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
How much help needed with clothing (Q3)				
Total or lot of help	38	10%	42	13%
Little or no help	352	90%	298	87%
How much help needed with bathing (Q4)				
Total or lot of help	45	12%	48	15%
Little or no help	346	88%	294	85%
Don't know	0	0%	0	0%
How much help needed with toileting (Q5)				
Total or lot of help	28	7%	32	9%
Little or no help	365	93%	309	91%
Don't know	0	0%	0	0%
How much help needed with grooming (Q6)				
Total or lot of help	21	6%	24	7%
Little or no help	370	94%	317	93%
Don't know	0	0%	0	0%
How much help needed with eating meals (Q7)				
Total or lot of help	16	4%	21	7%
Little or no help	374	96%	321	93%
Don't know	1	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

2.B.4 Individual Health-Related Quality of Life Activities

Table 2.B.8. Individual Health-Related Quality of Life Activities (Q9A-Q9I)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	402	100%	349	100%
Limited in vigorous activities (Q9A)				
Limited	359	93%	317	94%
Not limited	26	7%	21	6%
Don't know	2	0%	0	0%
Limited in moderate activities (Q9B)				
Limited	299	78%	272	82%
Not limited	87	22%	68	18%
Don't know	1	0%	0	0%
Limited in lifting or carrying (Q9C)				
Limited	268	70%	236	72%
Not limited	122	30%	101	28%
Don't know	0	0%	1	0%
Limited in climbing stairs (Q9D)				
Limited	311	81%	287	87%
Not limited	76	19%	49	13%
Don't know	1	0%	1	0%
Limited in bending (Q9E)				
Limited	307	80%	282	84%
Not limited	81	20%	57	16%
Don't know	1	0%	0	0%
Limited in walking more than a mile (Q9F)				
Limited	326	84%	288	86%
Not limited	62	16%	47	13%
Don't know	1	0%	4	1%
Limited in walking several blocks (Q9G)				
Limited	303	78%	270	81%
Not limited	86	22%	69	19%
Don't know	1	0%	1	0%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Limited in walking one block (Q9H)				
Limited	238	62%	217	67%
Not limited	149	37%	118	32%
Don't know	2	1%	2	1%
Limited in bathing or dressing (Q9I)				
Limited	130	35%	142	44%
Not limited	261	65%	195	56%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

2.B.5 Multivariate Logistic Regression: Intervention Effects

Table 2.B.9. Multivariate Logistic Regression: Intervention Effects

	Sample Size n	Average Marginal Effect	Confidence Limits Lower	Confidence Limits Upper	p-Value
Index/Composite Functional Status					
Needs little or no help performing any ADLs (Q3-Q7)	641	0.021	-0.036	0.078	0.470
Needs little or no help performing any health-related quality of life activities (Q9A-Q9I)	605	-0.013	-0.042	0.015	0.360
Individual Functional Status					
Needs little or no help with clothing (Q3)	636	0.021	-0.027	0.069	0.394
Needs little or no help with bathing (Q4)	639	0.020	-0.032	0.071	0.451
Needs little or no help with toileting (Q5)	632	0.018	-0.024	0.060	0.410
Needs little or no help with grooming (Q6)	618	0.019	-0.018	0.055	0.315
Needs little or no help with eating meals (Q7)	629	0.031	-0.006	0.068	0.105
Not limited in vigorous activities (Q9A)	620	-0.007	-0.045	0.032	0.733
Not limited in moderate activities(Q9B)	633	0.034	-0.026	0.094	0.272
Not limited in lifting or carrying (Q9C)	633	-0.001	-0.070	0.068	0.985
Not limited in climbing stairs (Q9D)	620	0.031	-0.027	0.089	0.298
Not limited in bending (Q9E)	633	0.040	-0.021	0.100	0.198
Not limited in walking more than a mile (Q9F)	620	0.001	-0.053	0.055	0.968
Not limited in walking several blocks (Q9G)	634	-0.024	-0.084	0.035	0.426
Not limited in walking one block (Q9H)	628	0.008	-0.064	0.081	0.821
Not limited in bathing or dressing (Q9I)	634	0.081 **	0.005	0.158	0.038
Discharge Destination					
Discharged to NH/LTC Hospital (Q16)	645	0.033	-0.025	0.090	0.268
Overall Satisfaction Rating					
Satisfaction with care received (Q13)	639	0.067 **	0.002	0.131	0.042
Satisfaction with recovery since discharge (Q19)	633	0.026	-0.019	0.071	0.262
Staff took patient's preference into account (Q25)	632	-0.002	-0.076	0.072	0.951

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Mayo Clinic

Overview

We surveyed patients served by the Mayo Clinic Patient Centered Cloud-Based Electronic System: Ambient Warning and Response Evaluation (ProCCESs AWARE) (hereinafter Mayo Clinic) and a matched comparison group. The Mayo Clinic's Hospital-Setting Health Care Innovation Award (HCIA) grant was aimed at to developing *ProCCeSs AWARE*, or the *Patient Centered Cloud-based Electronic System: Ambient Warning and Response Evaluation* (hereafter referred to as "AWARE"). AWARE is an electronic interface used in intensive care units (ICUs) that displays dynamic, real-time data for all patients in the unit. The layout and presentation of data in AWARE was designed to improve clinicians' ability to prioritize and respond to patients' needs within the unit. The goals of the AWARE program were to reduce physician cognitive overload and resulting errors, improve communication between nurses at shift hand-offs, and improve patient health outcomes.

Methods

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. The criteria for defining index stays for each Awardee surveyed are as follows:

- The claim included the correct ICU
- The first two ICD-9 codes from the claim were among those that appeared in the Mayo Clinic patient registry.

To create a comparison group, we first matched hospitals in the Minneapolis HRR that resemble the three large hospitals in the Mayo Clinic eICU program, based on size and teaching status. Within selected hospitals we then defined intervention and comparison populations using identical inclusion and exclusion rules. Abt's Third Annual Report and Technical Appendix B detail more information about the creation of intervention and comparison groups.

In addition to the claims-based inclusion/exclusion rules, stays during which the patient expired in the hospital were excluded. In order to minimize recall bias, the sampling frame was limited to index stays that began between July 1 and September 30, 2014, which was the most recent quarter of claims data available at the time that we constructed the survey sample. Duplicate index stays for a given beneficiary were removed from the sampling frame so that each individual would only be surveyed once.

Within the intervention and comparison groups, the sampling frame was stratified by age (<65, 65-74, 75-84, 85+) and gender, yielding eight strata for each intervention and comparison group. We then selected a probability sample of 800 intervention and 800 comparison group beneficiaries. The survey sample was allocated to the gender and age group strata in proportion to the number in the intervention group population in that stratum, using an equal probability sample.

Beneficiaries who expired during the period covered by our data were included in the sampling frame but not included in the survey sample. Using beneficiary identification numbers in the Medicare claims data set that was originally used to select the sample, we applied the survey field date of April 7 as the cut-off date to identify and remove all such deaths that occurred prior to the start of survey administration.

After the removal of decedents, a total of 1,419 beneficiaries (the intervention and comparison groups combined) remained for the survey. Of these beneficiaries, 869 completed at least one survey question, representing an overall response rate of 61 percent (67 percent and 55 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer) we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The table below presents the demographics of beneficiaries selected for the survey, and the respondents.

Table 3.1. Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	105	14%	104	15%	44	9%	42%	36	10%	35%
65-74	301	41%	288	42%	217	44%	72%	165	44%	57%
75-84	223	30%	202	30%	167	34%	75%	118	32%	58%
85+	106	14%	90	13%	68	14%	64%	54	14%	60%
Race										
White	701	95%	541	79%	480	97%	68%	312	84%	58%
Non-White	31	4%	136	20%	14	3%	45%	54	14%	40%
Unknown	3	0%	7	1%	2	0%	67%	7	2%	100%
Gender										
Male	416	57%	382	56%	283	57%	68%	209	56%	55%
Female	319	43%	302	44%	213	43%	67%	164	44%	54%
Total	735		684		496		67%	373		55%

Source: Abt Associates HCIA Patient Survey

Analytic Approach

As noted earlier, we assessed response rates for every survey item by Awardee sample to identify any differential item nonresponse between the intervention and comparison groups. The coefficients of reliability (Cronbach's alpha) for the three sets of questions for the Mayo sample were at least 0.89 as shown in Table 3.2 below.

Table 3.2. Reliability Statistics

Question Set	Number of Survey Items	Cronbach's Alpha
Q3 through Q7	5	0.94
Q9A through Q9I	9	0.93
Q11A through Q11I	9	0.89

Source: Abt Associates HCIA Patient Survey

Results

This section presents results showing weighted frequency distributions, and other analyses discussed above, by respondents in the intervention and comparison groups.[69]

General Profile of Respondents

Almost two-thirds of respondents in the intervention group had a college degree or higher, compared to about half in the comparison group (Table 3.3). In terms of living arrangement, about two-thirds of respondents in the intervention program also reported that they lived with a spouse, while only half of those in the comparison group lived with a spouse. There were also differences between the intervention and comparison groups in term of racial and ethnic composition, as well as proportion of respondents having Medicaid/Medicare dual eligibility. These observed differences in the two groups were all statistically significant ($p<0.01$). For example, a higher proportion of respondents in the intervention group were white compared to those in the comparison group, and a higher proportion of respondents in the comparison group had dual eligibility. These attributes of respondents were controlled for in estimated regression models presented in section 3.3.4. [70]

Table 3.3. Demographic Profile of Respondents

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total respondents	496	100%	373	100%
Highest Grade Level Completed (Q31)				
Not high school grad	38	9%	49	15%
High school grad	129	29%	116	33%
Some college	127	27%	109	29%
College graduate	164	35%	86	23%
With Whom Do You Live (Q32)				
Alone	96	21%	84	24%
With spouse	316	67%	196	51%
With family	29	8%	69	21%
With friends	5	1%	2	1%
Other residents	12	3%	9	3%

[69] Unweighted frequency distributions of responses to all survey questions in their original form are presented in Attachment 3.A. All estimates presented in the result section of this report have been weighted to reflect the intervention and comparison populations.

[70] Note: Medicaid/dual eligibility was obtained from Medicare administrative data.

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Ethnicity (Q33)				
Hispanic	6	2%	13	5%
Non-Hispanic	385	93%	309	91%
Not answered	22	5%	13	4%
Reported Race (Q34)				
White	428	93%	299	83%
Non-White	18	4%	46	14%
Preferred not answering	13	3%	13	3%
Medicaid-Eligible *				
No	383	75%	250	63%
Yes	113	25%	123	37%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

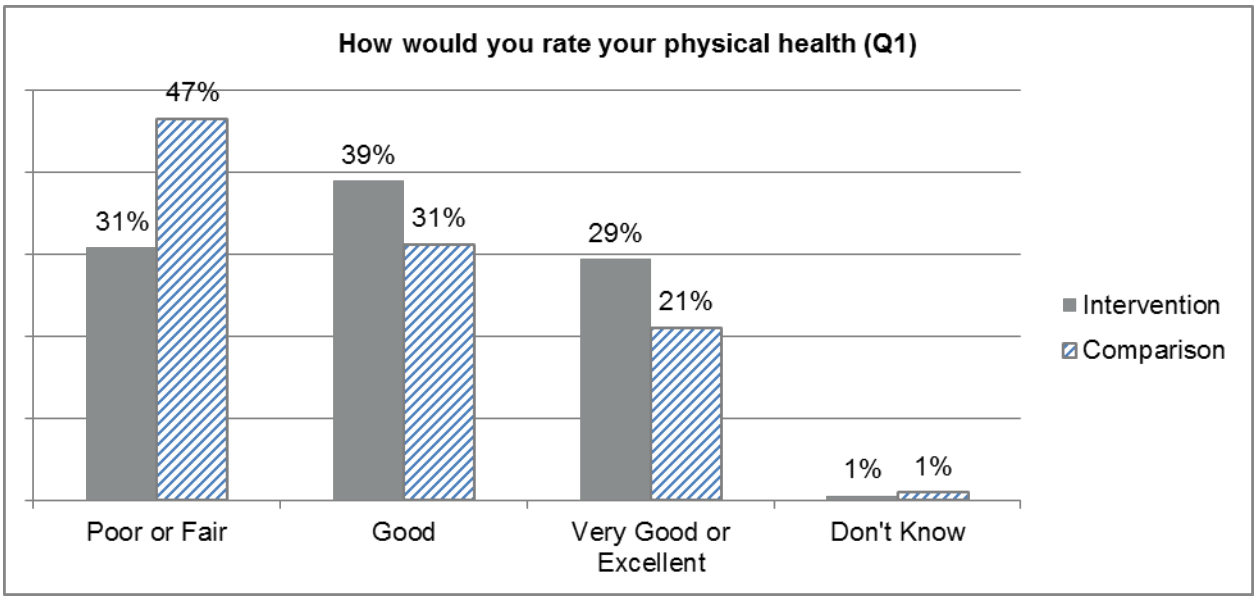
Respondents who indicated that English was not their preferred language were asked whether the facility staff spoke to them in their preferred language (Q27) and how often the respondents used an interpreter provided by the facility (Q28). Only 11 respondents, representing just one percent of the all respondents, indicated that English was not their preferred language.[71]

Respondents' Health and Health-Related Quality of Life (Q3-Q12)

A little more than two-thirds of respondents in the intervention and just about half in the comparison group reported that their physical health was good to excellent (Figure 3.1). The observed difference between the intervention and comparison groups was statistically significant ($p<0.01$). More than three-quarters of respondents in both the intervention and comparison groups reported that their mental health was good to excellent (Figure 3.2). The difference in mental health status was not statistically significant.

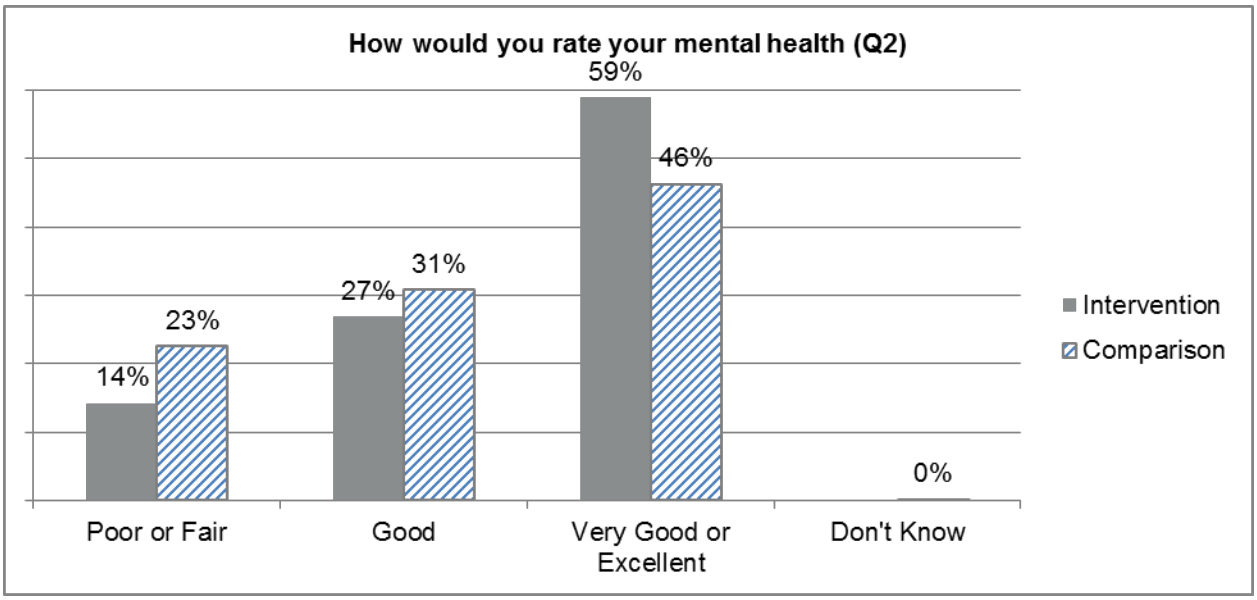
[71] For the two questions (Q27 and Q28) on preferred language of communication, we did not conduct tests of statistically significant differences in responses across the two analytic groups due to very small sample sizes.

Figure 3.1. Respondents' Self-Reported Physical Health Status



Source: Abt Associates HCIA Survey

Figure 3.2. Respondents' Self-Reported Mental Health Status

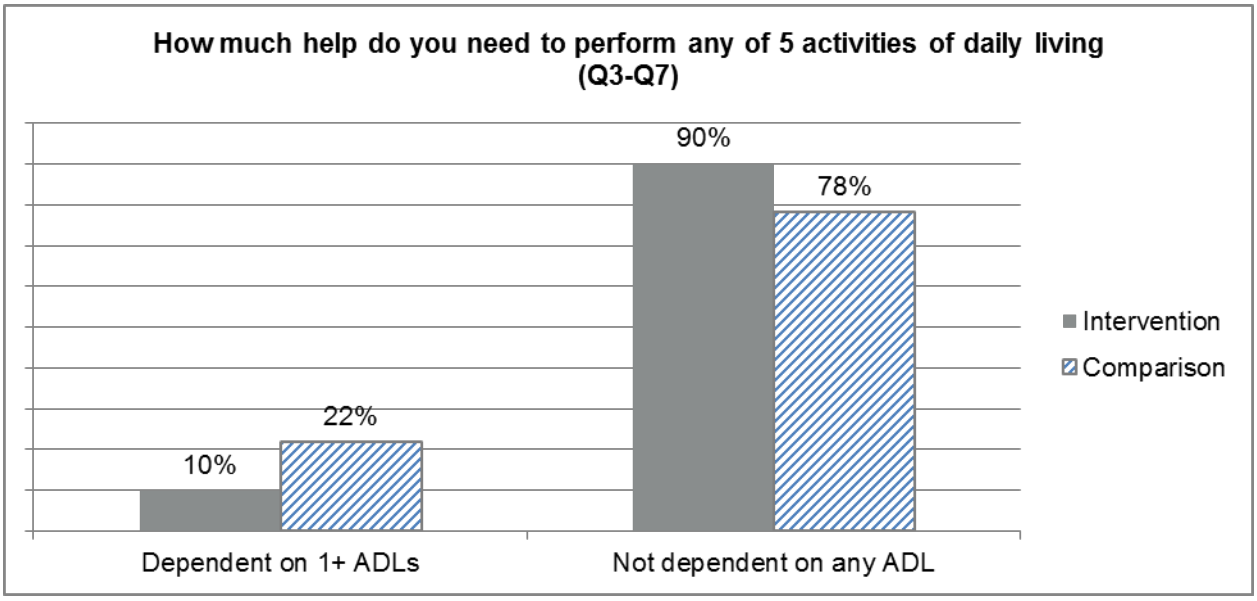


Source: Abt Associates HCIA Survey

To assess functional status, respondents were asked how much help they needed in performing five activities such as putting on and taking clothing off clothing, bathing, toileting, etc. (Q3-Q7). As described in the overall Analytic Approach section, these five items were combined into one index variable to compare overall functional status with respect to all five questions combined. Figure 3.3 shows that the vast majority of respondents in the intervention and comparison groups needed little or no help from another person to perform any of the five activities. The observed difference between the

intervention and comparison groups was statistically significant ($p<0.01$) with the intervention group having better functional status than their comparison counterparts.

Figure 3.3. Respondents' Index/Composite Functional Status

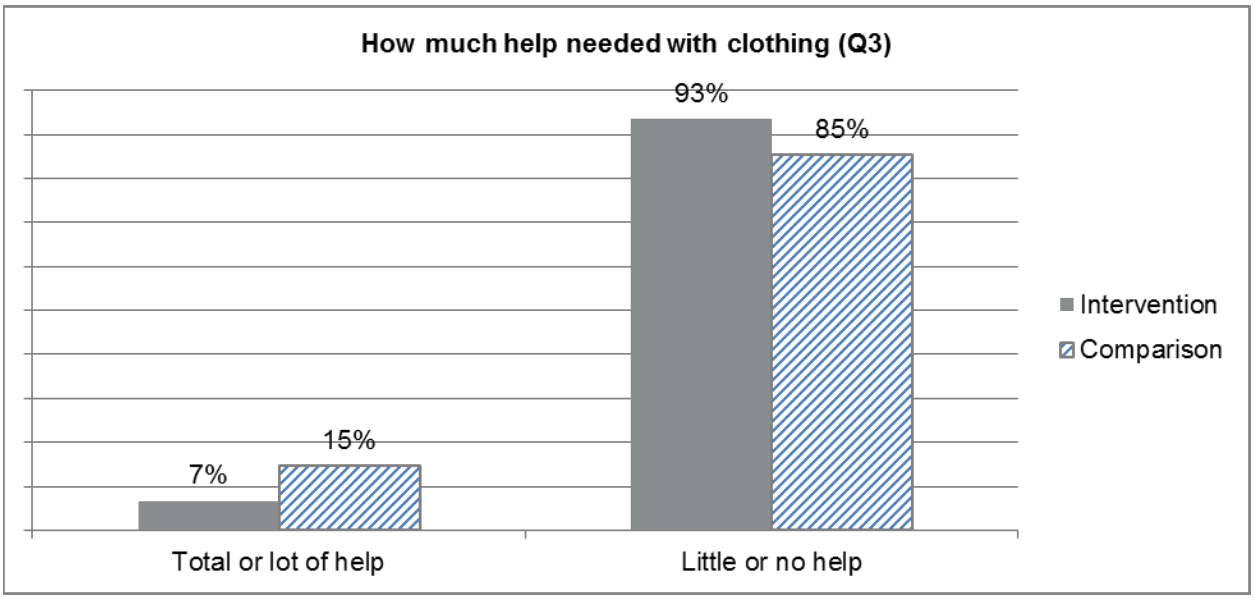


Source: Abt Associates HCIA Survey

When examined individually, these statistically significant differences ($p<0.01$) persist in favor of respondents in the intervention group, with respect to ability performing activities like clothing, bathing, and toileting with little or no help (Figures 3.4, 3.5, and 3.6). [72]

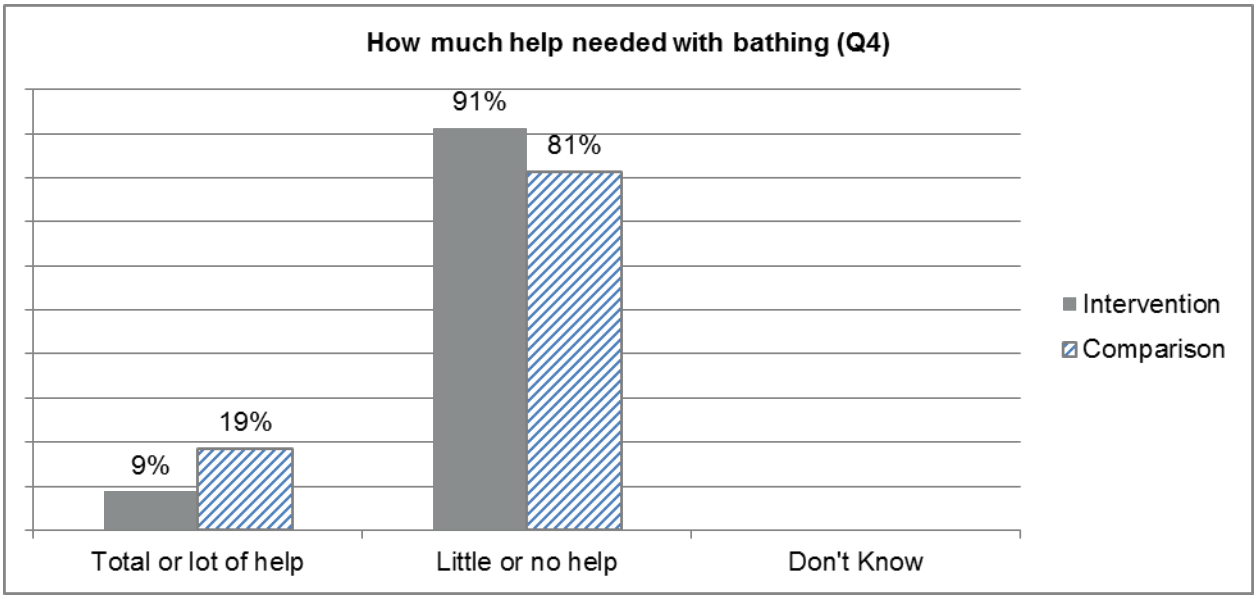
[72] Table 3.B.7 in Attachment 3.B presents detailed results of individual distributions of the five activities

Figure 3.4. Functional Status, Clothing



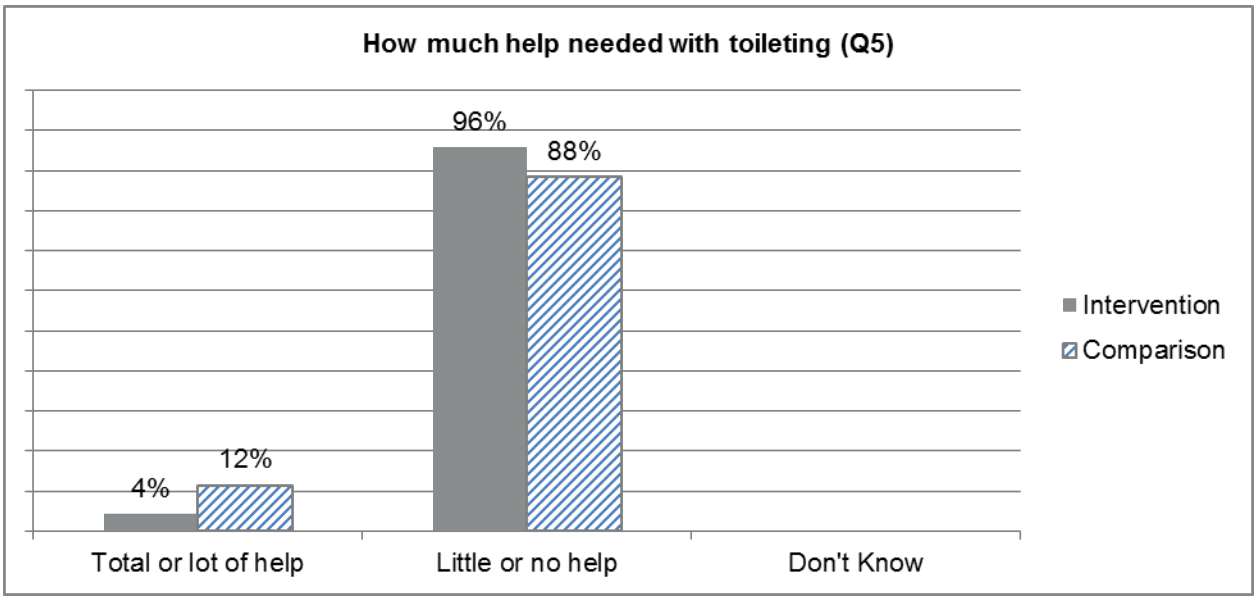
Source: Abt Associates HCIA Survey

Figure 3.5. Functional Status, Bathing



Source: Abt Associates HCIA Survey

Figure 3.6. Functional Status, Toileting



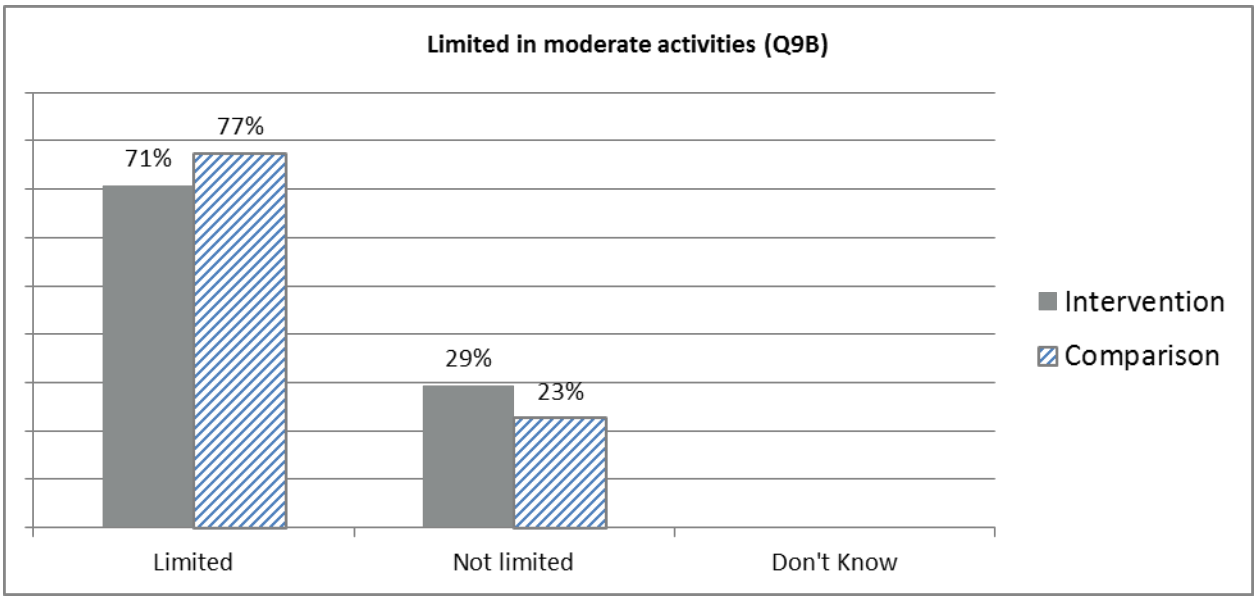
Source: Abt Associates HCIA Survey

Nine questions (Q9A-Q9I) asked respondents whether their health limited their performance of certain activities like moving or pushing objects, climbing, walking, and so on. These nine items were combined into a single index variable to examine overall differences. There was no statistically significant difference between the intervention and comparison groups with respect to this index and almost all respondents (96%) in both groups reported that they were limited in performing at least one of the nine activities (detailed results are presented in Table 3.B.2, Attachment 3.B). However, analysis of the each of the nine individual questions revealed that respondents in the Mayo Clinic program were significantly better able than comparison respondents to perform activities such as moving a table or pushing a vacuum cleaner (Q9B), bending (Q9E), walking several blocks (Q9G), and bathing or dressing (Q9I) with any limitation (Figures 3.7 through 3.10). The observed differences regarding these four activities were statistically significant at the 5% level or better. [73, 74]

[73] Table 3.B.8 in Attachment 3.B provides detailed results of individual health-related quality of life activities questions, Q9A-Q9I.

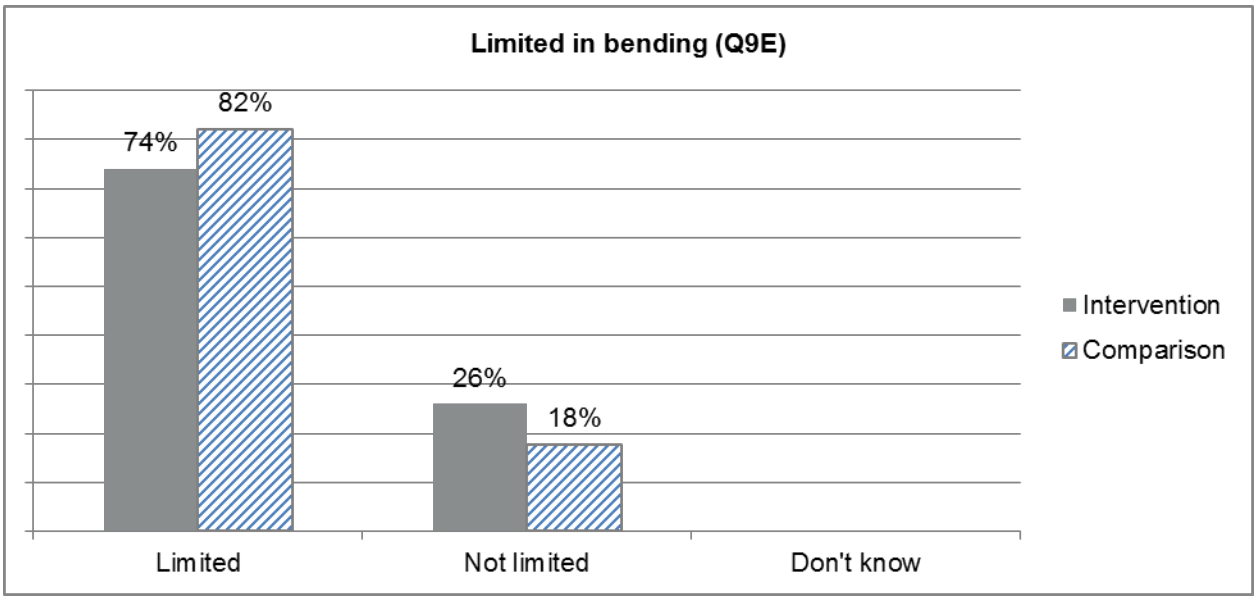
[74] We also created multiple categories indicating the number of activities in which respondents had limitations and considered alternative cut-off points for the categories, for example 1-2, 3-5, 6+. The results of this robustness check were substantially similar to the results presented in this report.

Figure 3.7. Respondents' Ability to Perform Moderate Activities



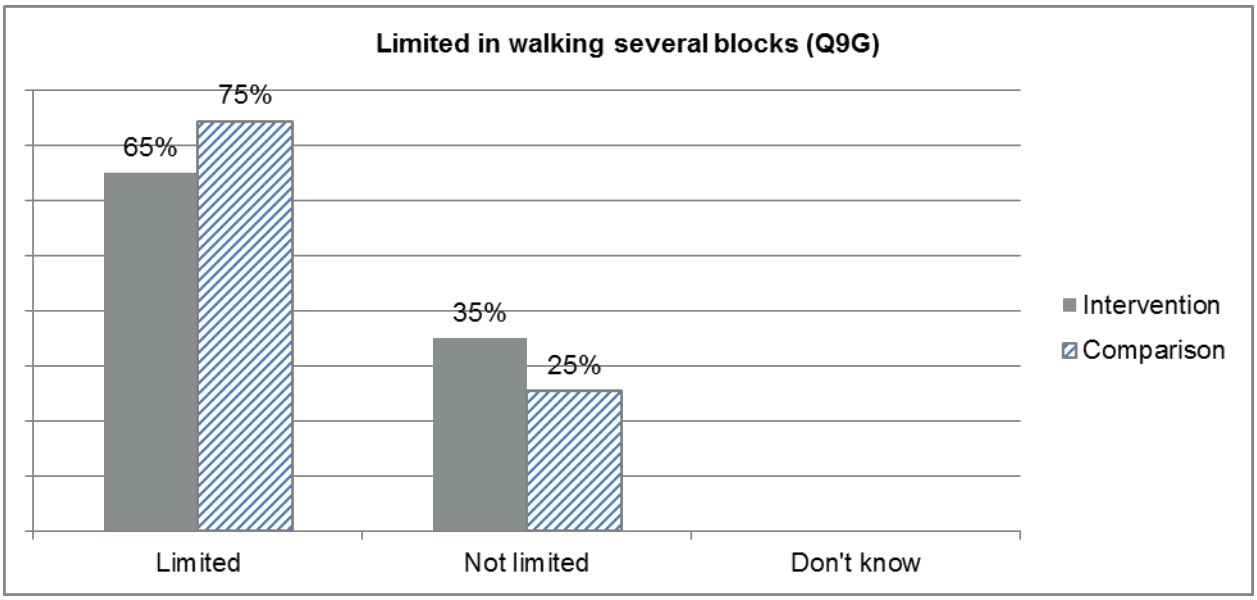
Source: Abt Associates HCIA Survey

Figure 3.8. Respondents' Ability to Bend, Kneel, or Stoop



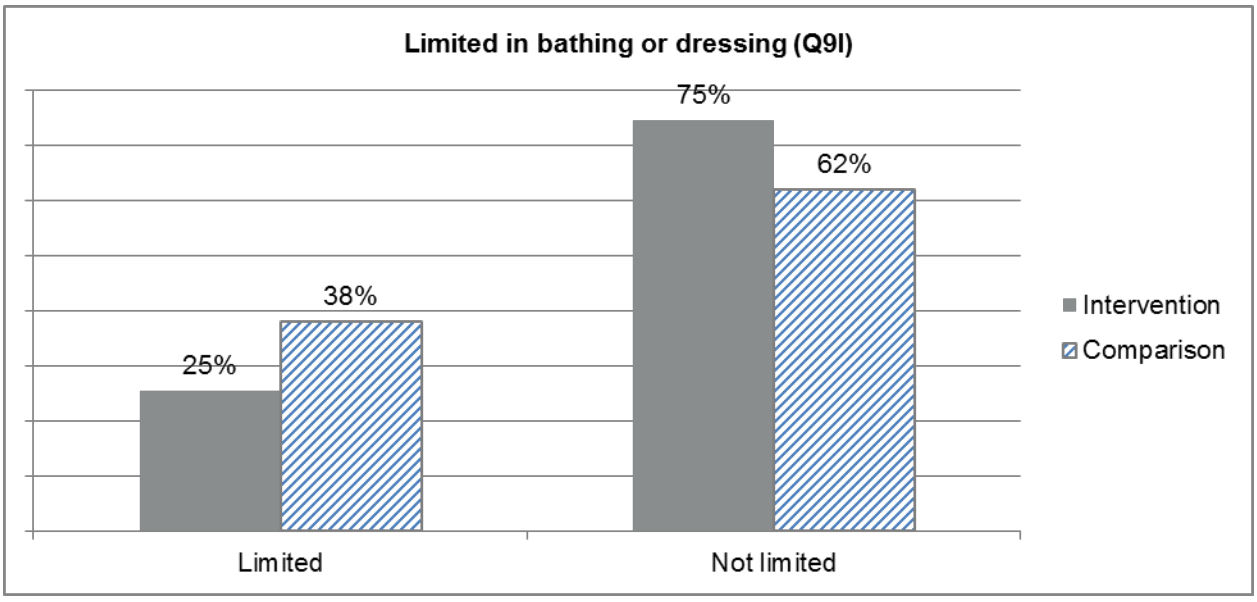
Source: Abt Associates HCIA Survey

Figure 3.9. Respondents' Ability to Walk Several Blocks



Source: Abt Associates HCIA Survey

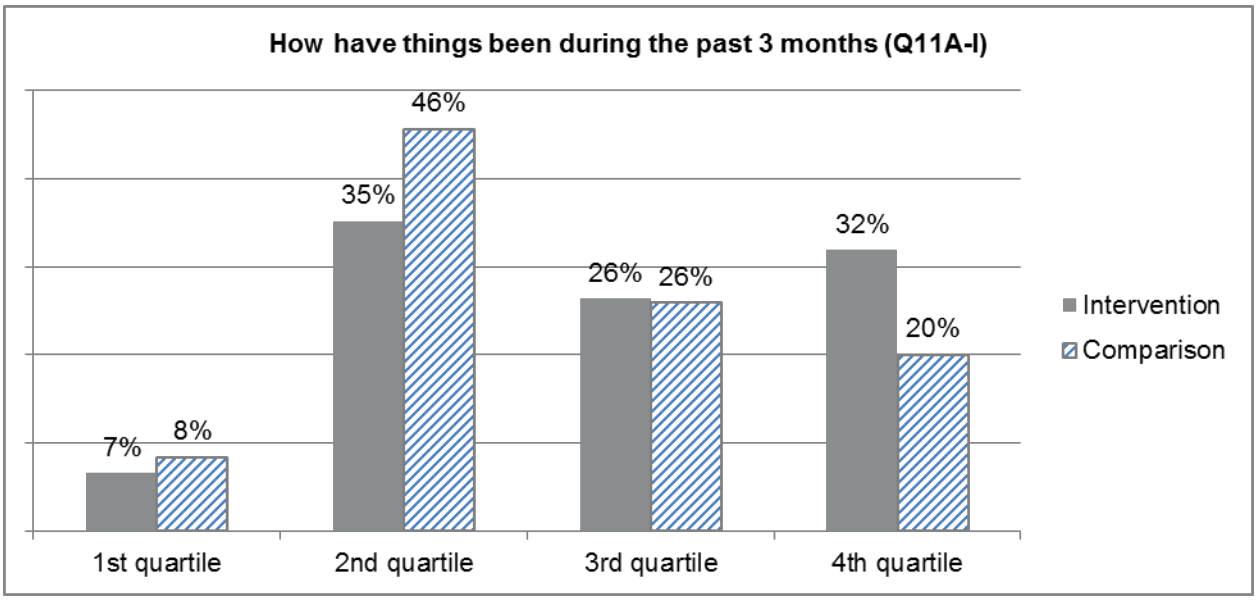
Figure 3.10. Respondents' Ability to Bathe or Dress



Source: Abt Associates HCIA Survey

Figure 3.11 displays the perception of respondents regarding their overall mood as measured by the index/composite variable combining Q11_A through Q11_I. More than half of respondents in the intervention group indicated a more positive mood (in the 3rd and 4th quartiles), compared to less than half of those in the comparison group ($p<0.10$).

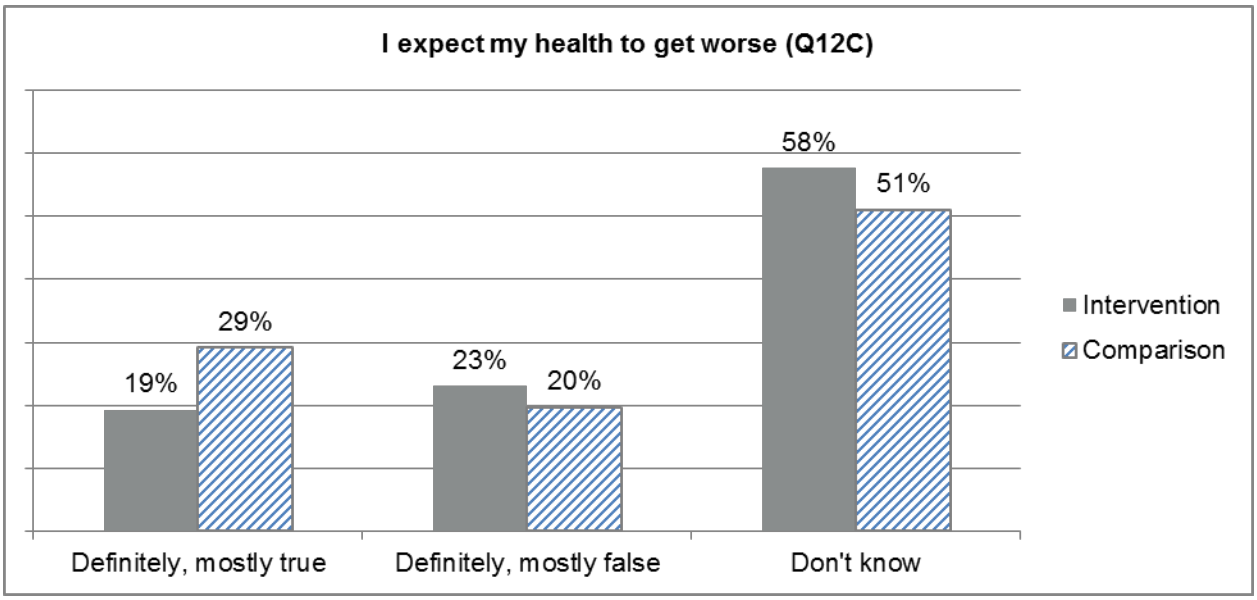
Figure 3.11. Respondents' Mood Index



Source: Abt Associates HCIA Survey

Regarding respondents' outlook (or expectation) about their health (Q12_A-Q12D), although respondents in both groups seemed unsure of their health outlook on all four questions, those in the intervention group generally indicated a more positive expectation ($p<0.01$ for all four questions). For example, Figure 3.12 shows that over half of respondents in both the intervention and comparison groups were uncertain about whether they expected their health to get worse (detailed results of all four variables are presented in Table 3.B.3, Attachment 3.B).

Figure 3.12. Respondents' Expectation of Own Health

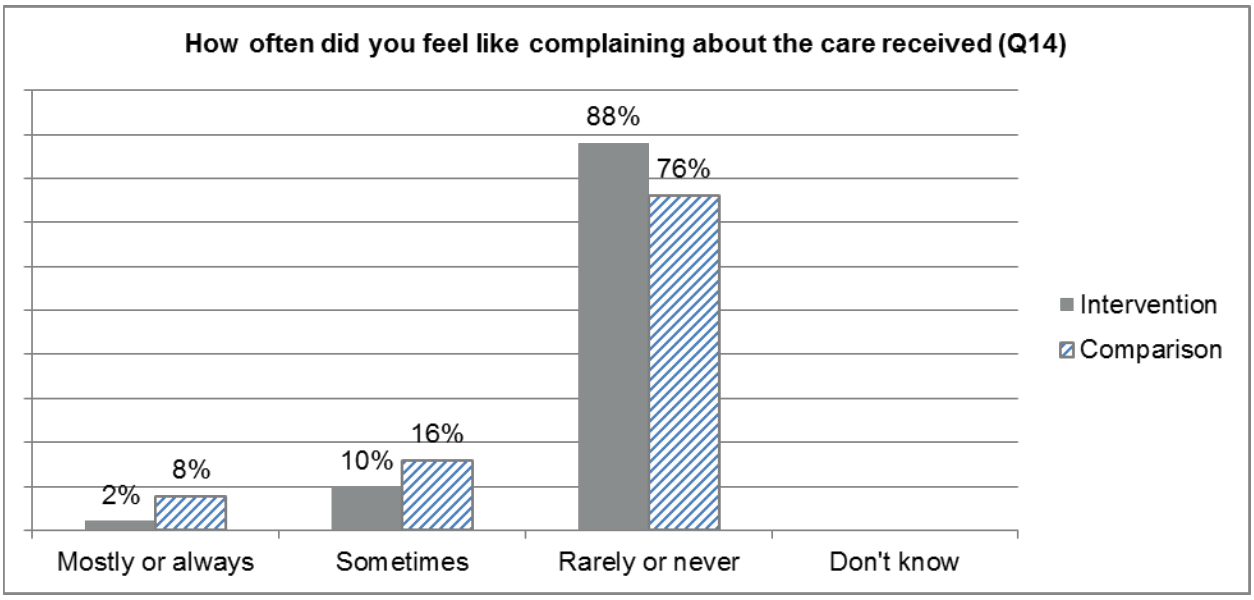


Source: Abt Associates HCIA Survey

Respondents' Satisfaction with Care and Care experience

With respect to overall satisfaction with care (Q13-Q19) and care experiences (Q20-Q28), participants in the intervention group gave significantly more favorable responses regarding the care and services they received than did respondents in the comparison group. Specifically, in terms of respondents' satisfaction with the process of care (e.g. Q14) and transition care management services received, including communication with facility staff (e.g. Q17 and Q18), respondents in the intervention group had significantly higher satisfaction than respondents in the comparison group. For example, while Figure 3.13 shows that the vast majority of respondents in both groups reported that they rarely or never felt like complaining about the care they received (Q14), the observed difference in the proportions was statistically significant ($p<0.01$).

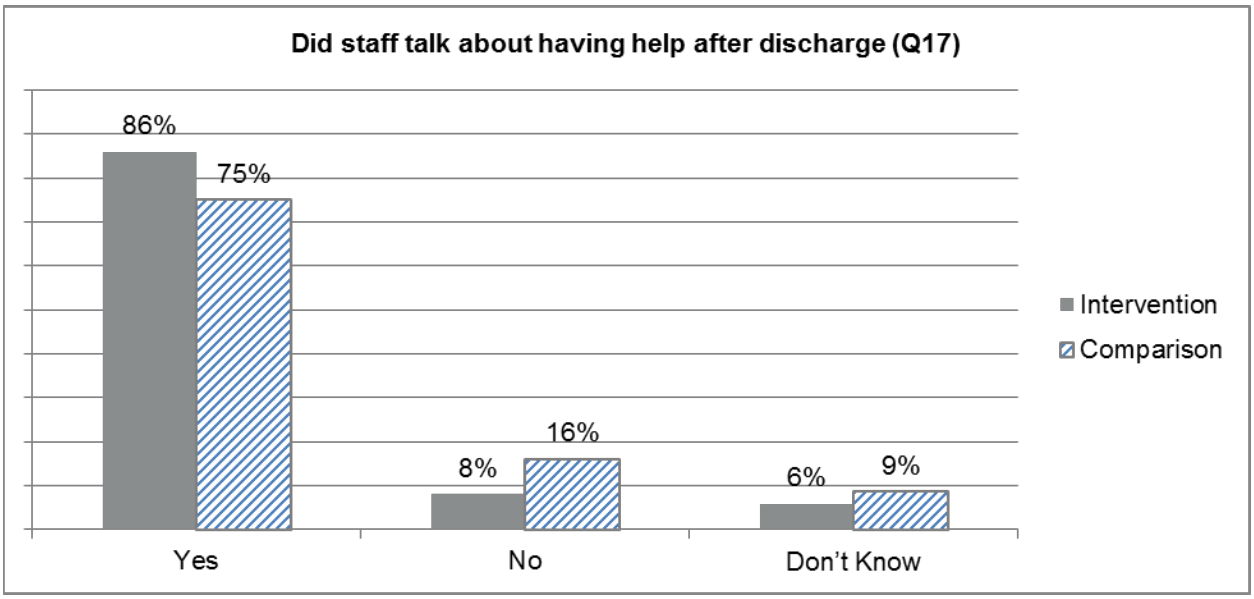
Figure 3.13. Feelings about Care Received



Source: Abt Associates HCIA Survey

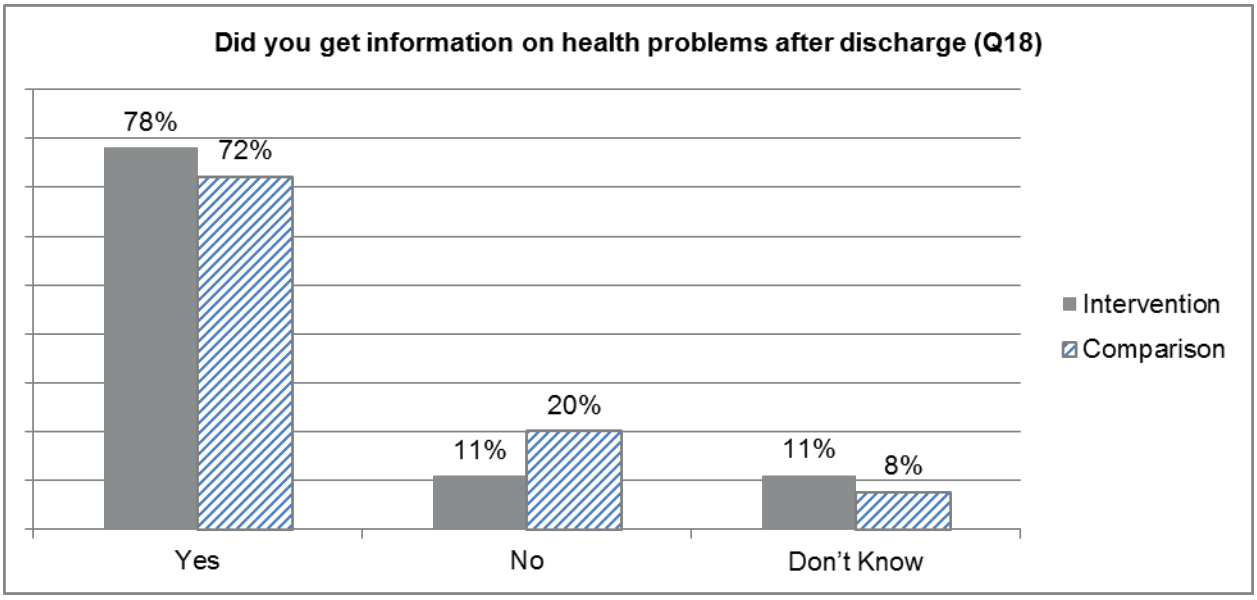
Figure 3.14 and Figure 3.15 respectively show that higher proportions of respondents in the intervention group, than in the comparison group, said that hospital staff talked to them about post-discharge issues and that they received written information about health issues and symptoms to watch out for after discharge from the hospital ($p<0.01$).

Figure 3.14. Staff Communication regarding Help after Discharge



Source: Abt Associates HCIA Survey

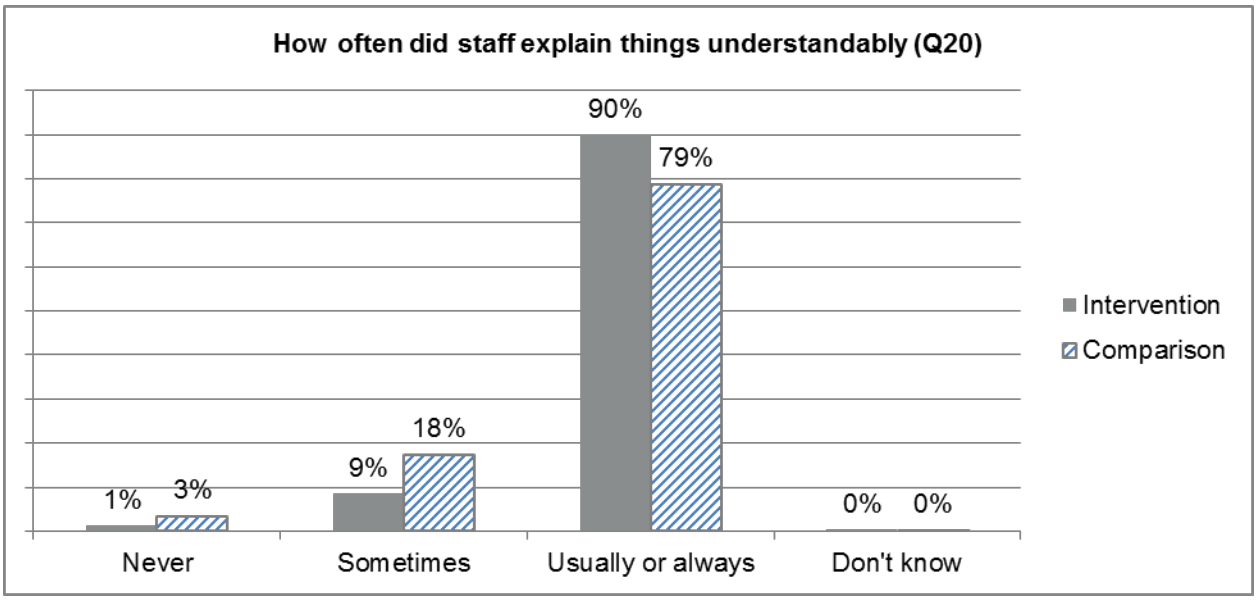
Figure 3.15. Availability of Post-Discharge Information



Source: Abt Associates HCIA Survey

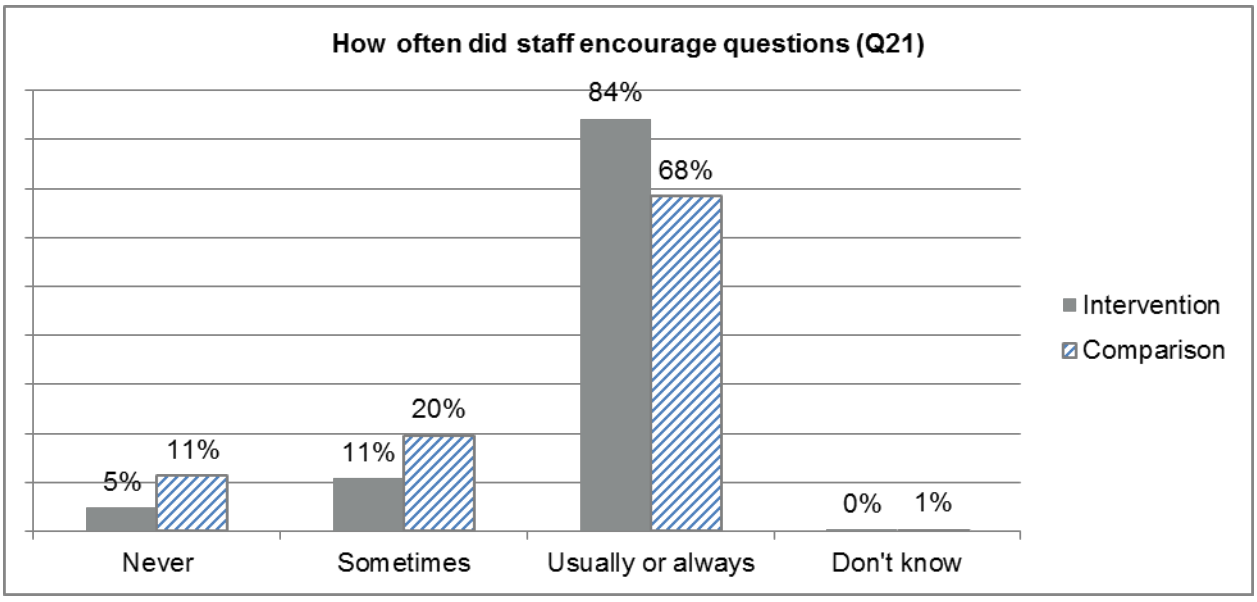
Figures 3.16 through 3.19 indicated that responses to questions regarding how often hospital staff explained things clearly (Q20); how often staff encouraged respondents to ask questions (Q21); whether respondents received needed services (Q22); and whether respondents felt they received well-coordinated care (Q23) were all significantly different with higher proportions of respondents in the intervention group having more positive responses on all four questions ($p<0.01$).

Figure 3.16. Doctor/Nurse Communication: Explanation



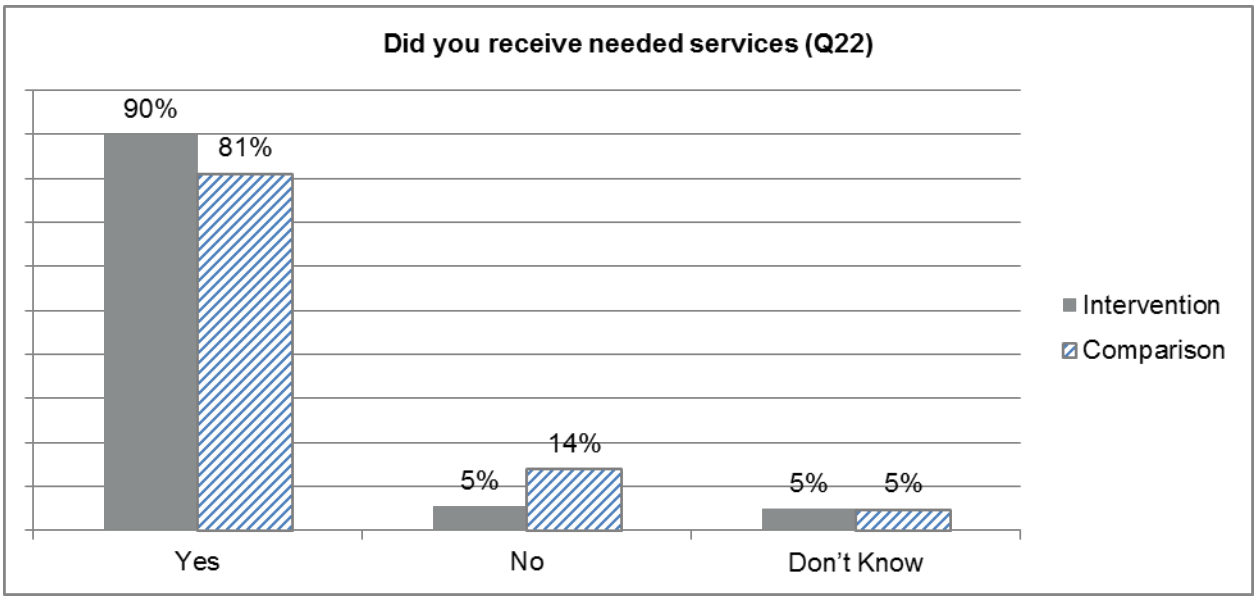
Source: Abt Associates HCIA Survey

Figure 3.17. Doctor/Nurse Communication: Questions



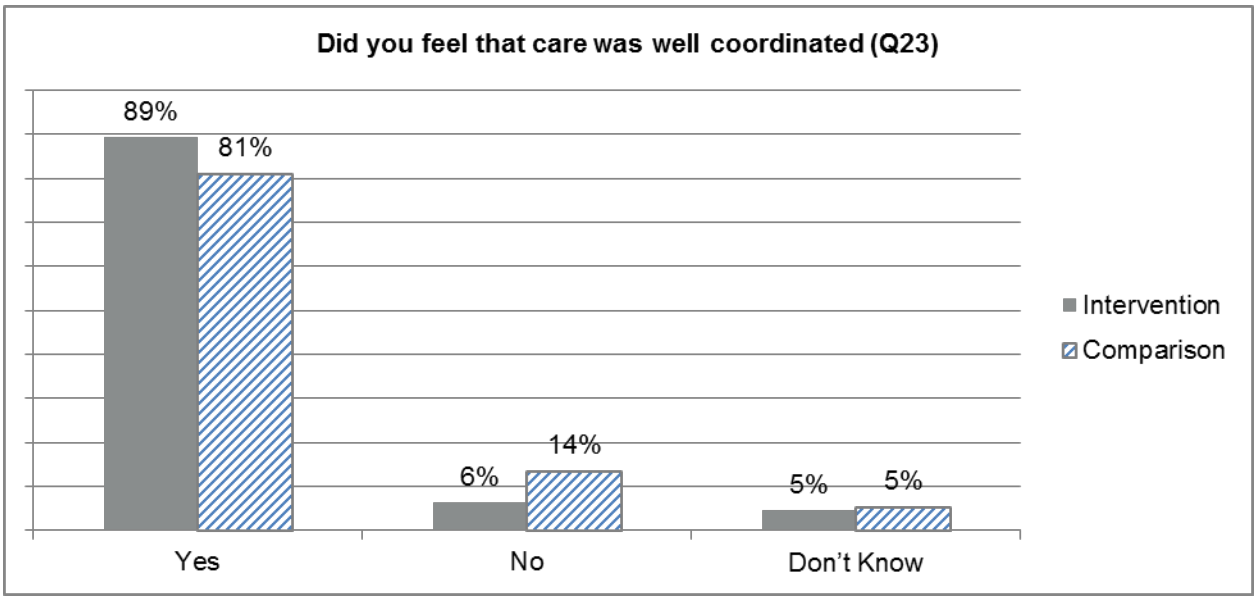
Source: Abt Associates HCIA Survey

Figure 3.18. Access to Needed Care



Source: Abt Associates HCIA Survey

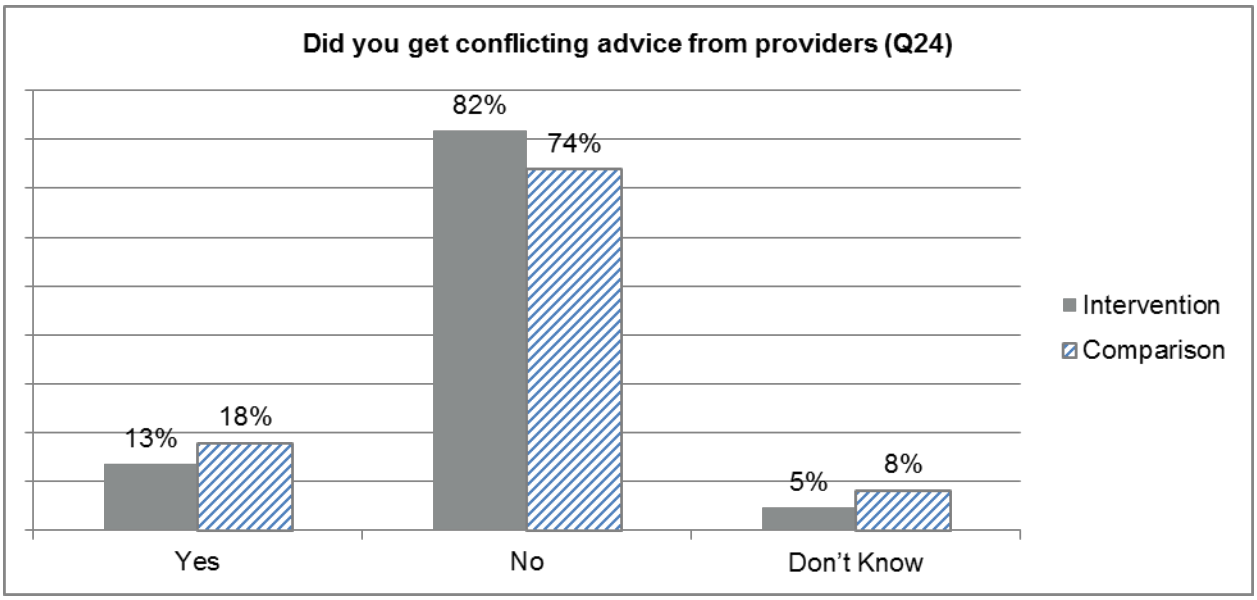
Figure 3.19. Care Coordination



Source: Abt Associates HCIA Survey

Figure 3.20 also shows that a greater proportion of respondents in the intervention group, than in the comparison group, indicated that they didn't receive conflicting advice from their care providers ($p<0.05$).

Figure 3.20. Advice Received from Care Providers



Source: Abt Associates HCIA Survey

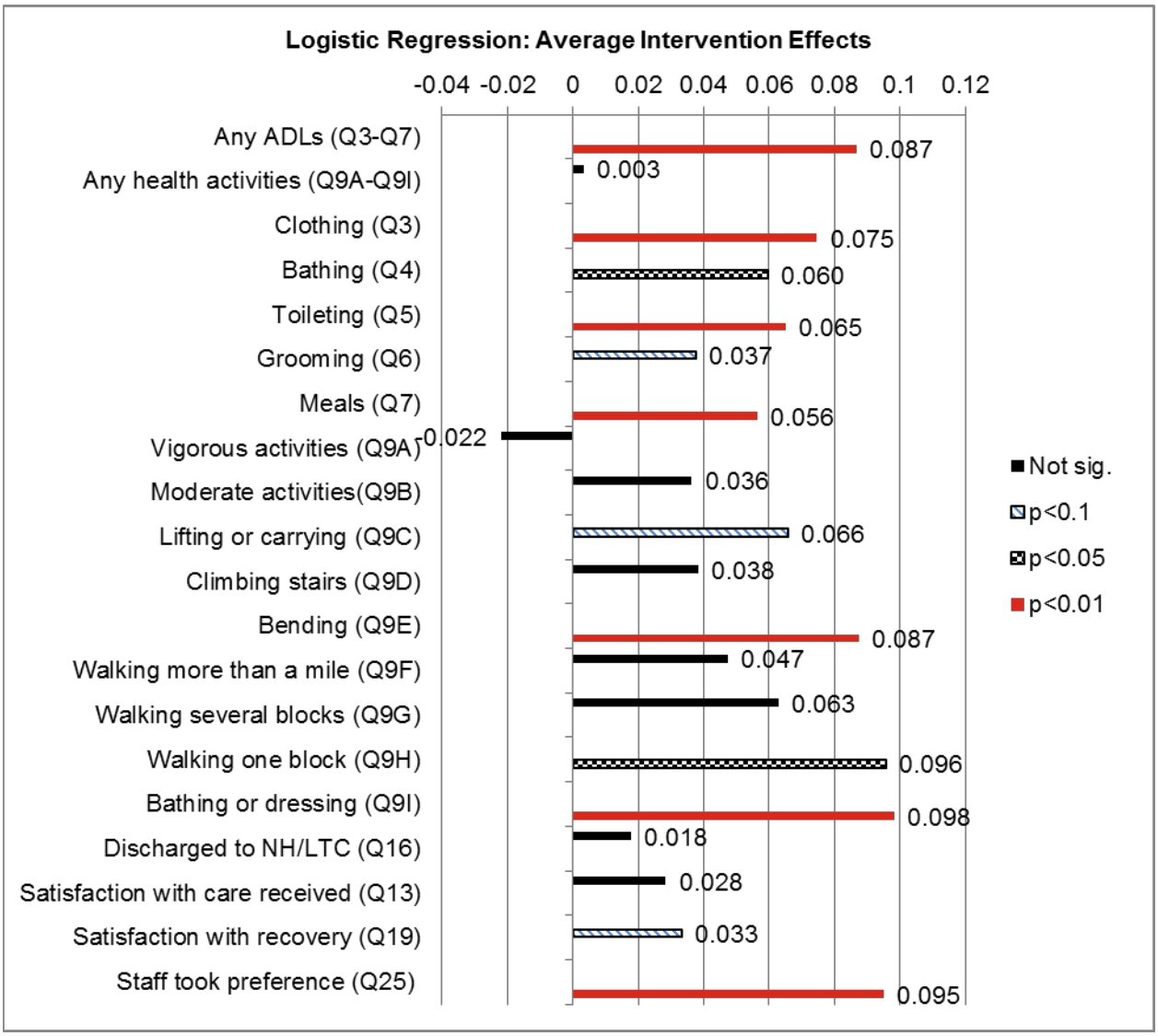
Multivariate Logistic Regression Findings

We estimated multivariate logistic regression models for the functional status questions, discharge setting (or destination), as well as for overall satisfaction questions (Q13, Q19, and Q25) as described in the overall Analytic Approach section. Figure 3.21 presents the intervention effects, as measured by the average marginal effects, on these outcomes. For the index variable combining Q3-Q7, the intervention group had approximately a nine percent advantage over the comparison group in having no limitation performing any of the five activities ($p<0.01$). Examined individually, results show that respondents in the intervention, compared with those in the comparison group, were roughly eight percentage points more likely to have no limitation putting on or taking off clothing ($p<0.01$); six percentage points more likely to have no limitation bathing ($p<0.05$); seven percentage points more likely to have no limitation toileting ($p<0.01$); and six percentage points more likely to have no limitation eating meals ($p<0.01$).

With respect to the index variable combining Q9A-Q9I, there was no statistically significant difference between intervention and comparison respondents. However, individual analysis of the nine questions indicate that respondents in the intervention group were less likely to experience limitations in bending, kneeling, or stooping ($p<0.01$), walking one block ($p<0.05$), and bathing or dressing ($p<0.01$). Also, respondents in the intervention group, relative to those in the comparison group, were about 10 percent more likely to indicate that facility staff took their preferences into account in deciding what post-discharge health care services the respondents would receive ($p<0.01$).[75]

[75] See Table 3.B.9 in Attachment 3.B, for more detailed information.

Figure 3.21. Logistic Regression: Average Intervention Effects



Source: Abt Associates HCIA Survey

Conclusions

There were differences between the intervention and comparison group demographics, indicating that the comparison group was not well-matched to the intervention group (see the Third Annual Report and Appendix B for matching techniques). We controlled for observable differences, but have some concern that the two groups may not have been well matched on other unobservable traits.

Bearing this concern in mind, there were a number of statistically significant differences between intervention and comparison survey respondents. The majority in both groups reported that their physical and mental health were good, and most needed little or no help with activities of daily living. Intervention respondents also reported fewer limitations in incremental activities of daily living such as moving a table or pushing a vacuum cleaner, bending, walking several blocks, bathing or dressing. Findings from multivariate logistic regression models also indicate that being in the intervention group was associated with having fewer limitations in putting on or taking off clothing, toileting, eating meals, bending, kneeling or stooping, walking one block, bathing, or dressing.

Mayo Clinic intervention respondents were more likely than comparison respondents to be satisfied with the care they received in the hospital. Intervention respondents were also more likely to indicate positive communication with hospital staff. Although respondents in both groups seemed uncertain regarding their health outlook for the future, those in the intervention group appeared to be more optimistic.

These survey results show generally positive results for patients served by this program compared with similar patients whose ICU care was received at comparison hospitals. Qualitative research indicates enthusiasm among ICU staff for the new IT tools implemented under this HCIA Award, especially at the Mayo Clinic in Minnesota. The claims-based analyses, however, show little impact of the Mayo Clinic program on hospital utilization or Medicare spending.

Attachment 3.A: Unweighted Frequency Distributions of all Survey Questions in their Original Form

Table 3.A.1. Health Outcomes

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Rate your physical health today (Q1)				
Excellent	30	6%	24	6%
Very Good	118	24%	62	17%
Good	186	38%	119	32%
Fair	108	22%	102	27%
Poor	29	6%	49	13%
Don't Know	3	1%	4	1%
Missing	22	4%	13	3%
Totals	496	100%	373	100%
Rate your mental health today (Q2)				
Excellent	106	21%	88	24%
Very Good	180	36%	94	25%
Good	127	26%	102	27%
Fair	48	10%	49	13%
Poor	14	3%	26	7%
Don't Know	0	0%	1	0%
Missing	21	4%	13	3%
Totals	496	100%	373	100%
How much help do you need putting on clothing (Q3)				
Total help	8	2%	25	7%
A lot	21	4%	25	7%
A little	60	12%	56	15%
None	384	77%	257	69%
Missing	23	5%	10	3%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How much help do you need bathing (Q4)				
Total help	12	2%	33	9%
A lot	25	5%	31	8%
A little	38	8%	33	9%
None	401	81%	264	71%
Don't Know	0	0%	0	0%
Missing	20	4%	12	3%
Totals	496	100%	373	100%
How much help do you need toileting (Q5)				
Total help	10	2%	23	6%
A lot	8	2%	17	5%
A little	28	6%	30	8%
None	430	87%	291	78%
Don't Know	0	0%	0	0%
Missing	20	4%	12	3%
Totals	496	100%	373	100%
How much help do you need in personal grooming (Q6)				
Total help	6	1%	18	5%
A lot	6	1%	7	2%
A little	22	4%	25	7%
None	442	89%	311	83%
Don't Know	0	0%	0	0%
Missing	20	4%	12	3%
Totals	496	100%	373	100%
How much help do you need eating meals (Q7)				
Total help	3	1%	11	3%
A lot	5	1%	12	3%
A little	31	6%	33	9%
None	436	88%	306	82%
Don't Know	1	0%	0	0%
Missing	20	4%	11	3%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How much does pain or hurting limit day-to-day activities (Q8)				
Not at all	117	24%	81	22%
Slightly	177	36%	101	27%
Moderately	90	18%	72	19%
Quite a bit	71	14%	71	19%
Extremely	17	3%	27	7%
Don't Know	0	0%	3	1%
Missing	24	5%	18	5%
Totals	496	100%	373	100%

Table 3.A.2. Health-Related Quality of Life

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Does health now limit you in vigorous activities (Q9A)				
Yes, limited a lot	311	63%	255	68%
Yes, limited a little	132	27%	74	20%
No, not limited at all	29	6%	32	9%
Don't Know	0	0%	0	0%
Missing	24	5%	12	3%
Totals	496	100%	373	100%
Does health now limit you in moderate activities (Q9B)				
Yes, limited a lot	161	32%	164	44%
Yes, limited a little	166	33%	110	29%
No, not limited at all	146	29%	87	23%
Don't Know	0	0%	0	0%
Missing	23	5%	12	3%
Totals	496	100%	373	100%
Does health now limit you in lifting or carrying groceries (Q9C)				
Yes, limited a lot	96	19%	125	34%
Yes, limited a little	166	33%	108	29%
No, not limited at all	208	42%	129	35%
Don't Know	0	0%	1	0%
Missing	26	5%	10	3%
Totals	496	100%	373	100%
Does health now limit you in climbing several flights of stairs (Q9D)				
Yes, limited a lot	178	36%	188	50%
Yes, limited a little	169	34%	95	25%
No, not limited at all	123	25%	74	20%
Don't Know	0	0%	2	1%
Missing	26	5%	14	4%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Does health now limit you in bending, kneeling, or stooping (Q9E)				
Yes, limited a lot	147	30%	142	38%
Yes, limited a little	195	39%	144	39%
No, not limited at all	130	26%	75	20%
Don't Know	0	0%	0	0%
Missing	24	5%	12	3%
Totals	496	100%	373	100%
Does health now limit you in walking more than a mile (Q9F)				
Yes, limited a lot	232	47%	220	59%
Yes, limited a little	136	27%	67	18%
No, not limited at all	108	22%	71	19%
Don't Know	0	0%	4	1%
Missing	20	4%	11	3%
Totals	496	100%	373	100%
Does health now limit you in walking several blocks (Q9G)				
Yes, limited a lot	184	37%	179	48%
Yes, limited a little	118	24%	79	21%
No, not limited at all	171	34%	100	27%
Don't Know	0	0%	0	0%
Missing	23	5%	15	4%
Totals	496	100%	373	100%
Does health now limit you in walking one block (Q9H)				
Yes, limited a lot	91	18%	118	32%
Yes, limited a little	127	26%	95	25%
No, not limited at all	255	51%	147	39%
Don't Know	0	0%	1	0%
Missing	23	5%	12	3%
Totals	496	100%	373	100%
Does health now limit you in bathing or dressing (Q9I)				
Yes, limited a lot	37	7%	46	12%
Yes, limited a little	76	15%	81	22%
No, not limited at all	362	73%	236	63%
Don't Know	0	0%	0	0%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Missing	21	4%	10	3%
Totals	496	100%	373	100%
Extent that physical health OR emotional problems interfered with social activities (Q10)				
Not at all	196	40%	112	30%
Slightly	113	23%	81	22%
Moderately	76	15%	64	17%
Quite a bit	55	11%	60	16%
Extremely	23	5%	37	10%
Don't Know	0	0%	0	0%
Missing	33	7%	19	5%
Totals	496	100%	373	100%
Felt full of pep during the past 3 months (Q11A)				
All of the time	10	2%	15	4%
Most of the time	89	18%	51	14%
A good bit of the time	96	19%	61	16%
Some of the time	151	30%	101	27%
A little of the time	81	16%	77	21%
None of the time	54	11%	64	17%
Don't Know	0	0%	1	0%
Missing	15	3%	3	1%
Totals	496	100%	373	100%
Have been a very nervous person during the past 3 months (Q11B)				
All of the time	4	1%	3	1%
Most of the time	8	2%	14	4%
A good bit of the time	20	4%	20	5%
Some of the time	68	14%	69	18%
A little of the time	158	32%	87	23%
None of the time	221	45%	176	47%
Don't Know	0	0%	0	0%
Missing	17	3%	4	1%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Felt down in the dumps during the past 3 months (Q11C)				
All of the time	1	0%	4	1%
Most of the time	7	1%	16	4%
A good bit of the time	17	3%	19	5%
Some of the time	54	11%	61	16%
A little of the time	94	19%	69	18%
None of the time	310	63%	201	54%
Don't Know	0	0%	2	1%
Missing	13	3%	1	0%
Totals	496	100%	373	100%
Felt calm and peaceful during the past 3 months (Q11D)				
All of the time	63	13%	44	12%
Most of the time	195	39%	125	34%
A good bit of the time	88	18%	60	16%
Some of the time	79	16%	82	22%
A little of the time	40	8%	39	10%
None of the time	17	3%	17	5%
Don't Know	0	0%	1	0%
Missing	14	3%	5	1%
Totals	496	100%	373	100%
Had a lot of energy during the past 3 months (Q11E)				
All of the time	11	2%	13	3%
Most of the time	80	16%	54	14%
A good bit of the time	93	19%	42	11%
Some of the time	127	26%	93	25%
A little of the time	109	22%	83	22%
None of the time	64	13%	86	23%
Don't Know	0	0%	0	0%
Missing	12	2%	2	1%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Felt downhearted during the past 3 months (Q11F)				
All of the time	1	0%	11	3%
Most of the time	10	2%	14	4%
A good bit of the time	21	4%	19	5%
Some of the time	91	18%	75	20%
A little of the time	155	31%	106	28%
None of the time	201	41%	144	39%
Don't Know	0	0%	1	0%
Missing	17	3%	3	1%
Totals	496	100%	373	100%
Felt worn out during the past 3 months (Q11G)				
All of the time	23	5%	30	8%
Most of the time	37	7%	57	15%
A good bit of the time	68	14%	41	11%
Some of the time	146	29%	107	29%
A little of the time	150	30%	100	27%
None of the time	59	12%	36	10%
Don't Know	0	0%	0	0%
Missing	13	3%	2	1%
Totals	496	100%	373	100%
Been happy during the past 3 months (Q11H)				
All of the time	61	12%	57	15%
Most of the time	221	45%	126	34%
A good bit of the time	92	19%	72	19%
Some of the time	72	15%	67	18%
A little of the time	25	5%	30	8%
None of the time	12	2%	17	5%
Don't Know	0	0%	0	0%
Missing	13	3%	4	1%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Felt tired during the past 3 months (Q11I)				
All of the time	30	6%	53	14%
Most of the time	62	13%	58	16%
A good bit of the time	74	15%	63	17%
Some of the time	171	34%	121	32%
A little of the time	125	25%	53	14%
None of the time	20	4%	22	6%
Don't Know	0	0%	0	0%
Missing	14	3%	3	1%
Totals	496	100%	373	100%
I get sick easier than other people (Q12A)				
Definitely true	21	4%	31	8%
Mostly true	50	10%	43	12%
Mostly false	162	33%	124	33%
Definitely false	1	0%	13	3%
Don't Know	250	50%	157	42%
Missing	12	2%	5	1%
Totals	496	100%	373	100%
I am as healthy as anybody I know (Q12B)				
Definitely true	47	9%	38	10%
Mostly true	166	33%	112	30%
Mostly false	70	14%	80	21%
Definitely false	1	0%	9	2%
Don't Know	197	40%	130	35%
Missing	15	3%	4	1%
Totals	496	100%	373	100%
I expect my health to get worse (Q12C)				
Definitely true	24	5%	35	9%
Mostly true	67	14%	69	18%
Mostly false	114	23%	72	19%
Definitely false	1	0%	5	1%
Don't Know	278	56%	187	50%
Missing	12	2%	5	1%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
My health is excellent (Q12D)				
Definitely true	33	7%	28	8%
Mostly true	172	35%	106	28%
Mostly false	97	20%	117	31%
Definitely false	1	0%	14	4%
Don't Know	181	36%	107	29%
Missing	12	2%	1	0%
Totals	496	100%	373	100%

Table 3.A.3. Satisfaction with Care

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How satisfied are you with the care you received (Q13)				
Very dissatisfied	60	12%	36	10%
Moderately dissatisfied	7	1%	21	6%
Neutral	16	3%	21	6%
Moderately satisfied	61	12%	68	18%
Very satisfied	334	67%	218	58%
Don't Know	5	1%	2	1%
Missing	13	3%	7	2%
Totals	496	100%	373	100%
How often did you feel like complaining about the care you received (Q14)				
Never	300	60%	176	47%
Rarely	132	27%	107	29%
Sometimes	47	9%	60	16%
Mostly	7	1%	17	5%
Always	3	1%	9	2%
Don't Know	0	0%	0	0%
Missing	7	1%	4	1%
Totals	496	100%	373	100%
How often was your pain well controlled (Q15)				
Never	1	0%	5	1%
Sometimes	2	0%	18	5%
Usually	26	5%	34	9%
Always	127	26%	116	31%
Did not have pain	300	60%	160	43%
Not applicable	33	7%	37	10%
Don't Know	0	0%	0	0%
Missing	7	1%	3	1%
Totals	496	100%	373	100%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
After leaving the facility, I stayed in: (Q16)				
Own home	340	69%	258	69%
Someone else's home	24	5%	22	6%
Nursing home	104	21%	75	20%
Long-term care hospital	4	1%	4	1%
Other	23	5%	12	3%
Did staff talk about needed help when you left the facility (Q17)				
Yes	427	86%	287	77%
No	37	7%	55	15%
Don't Know	27	5%	27	7%
Missing	5	1%	4	1%
Totals	496	100%	373	100%
Did you get information about what symptoms to look out for (Q18)				
Yes	383	77%	266	71%
No	53	11%	73	20%
Don't Know	52	10%	30	8%
Missing	8	2%	4	1%
Totals	496	100%	373	100%
How satisfied are you with your recovery since you left the facility (Q19)				
Not at all satisfied	7	1%	19	5%
Slightly satisfied	26	5%	23	6%
Moderately satisfied	72	15%	70	19%
Quite a bit satisfied	162	33%	114	31%
Extremely satisfied	195	39%	124	33%
Don't Know	9	2%	6	2%
Missing	25	5%	17	5%
Totals	496	100%	373	100%

Table 3.A.4. Care Experience

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
How often did doctors and nurses explain things in a way you could understand (Q20)				
Never	6	1%	11	3%
Sometimes	37	7%	57	15%
Usually	129	26%	111	30%
Always	307	62%	182	49%
Don't Know	1	0%	1	0%
Missing	16	3%	11	3%
Totals	496	100%	373	100%
How often did doctors and nurses encourage you to ask questions (Q21)				
Never	22	4%	34	9%
Sometimes	51	10%	72	19%
Usually	137	28%	105	28%
Always	268	54%	147	39%
Don't Know	1	0%	2	1%
Missing	17	3%	13	3%
Totals	496	100%	373	100%
Did you receive the services you thought that you needed (Q22)				
Yes	432	87%	296	79%
No	25	5%	46	12%
Don't Know	20	4%	20	5%
Missing	19	4%	11	3%
Totals	496	100%	373	100%
Did you feel the care you received was well coordinated (Q23)				
Yes	424	85%	296	79%
No	30	6%	43	12%
Don't Know	20	4%	22	6%
Missing	22	4%	12	3%
Totals	496	100%	373	100%
Did you seem to get conflicting advice from different health care providers (Q24)				
Yes	63	13%	60	16%
No	394	79%	274	73%
Don't Know	22	4%	28	8%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Missing	17	3%	11	3%
Totals	496	100%	373	100%
The facility staff took my preferences into account regarding services after discharge (Q25)				
Strongly disagree	13	3%	20	5%
Disagree	21	4%	18	5%
Agree	180	36%	153	41%
Strongly agree	202	41%	103	28%
Not applicable	34	7%	35	9%
Don't Know/Don't Remember	28	6%	34	9%
Missing	18	4%	10	3%
Totals	496	100%	373	100%
What is your preferred language when speaking (Q26)				
English	366	74%	292	78%
Other	3	1%	8	2%
Don't Know	0	0%	0	0%
Missing	127	26%	73	20%
Totals	496	100%	373	100%
How often did staff speak to you in your preferred language (Q27)				
Never	0	0%	4	5%
Sometimes	2	2%	2	2%
Always	5	4%	6	7%
Missing	123	95%	68	84%
Totals	130	100%	80	99%
How often did you use an interpreter provided by facility (Q28)				
Never, did not need one	9	7%	8	10%
Never, was not offered one	0	0%	1	1%
Never, family interpreter	0	0%	0	0%
Sometimes	1	1%	4	5%
Always	0	0%	1	1%
Missing	120	92%	67	83%
Totals	130	100%	81	100%

Table 3.A.5. Demographic Characteristics

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Age (Q29)				
54 or younger	11	2%	12	3%
55 to 64	30	6%	28	8%
65 to 74	197	40%	149	40%
75 or older	214	43%	162	43%
Missing	44	9%	22	6%
Totals	496	100%	373	100%
Gender (Q30)				
Male	257	52%	193	52%
Female	198	40%	157	42%
Missing	41	8%	23	6%
Totals	496	100%	373	100%
Education (Q31)				
8th grade or less	16	3%	18	5%
Some high school, but did not graduate	22	4%	31	8%
High school graduate or GED	129	26%	116	31%
Some college or 2-year degree	127	26%	109	29%
4-year college degree	65	13%	39	10%
More than a 4-year college degree	99	20%	47	13%
Don't Know	0	0%	0	0%
Missing	38	8%	13	3%
Totals	496	100%	373	100%
With whom do you live: (Q32)				
Alone	96	19%	84	23%
With spouse or partner	316	64%	196	53%
With other family members	32	6%	75	20%
With non-relatives	5	1%	2	1%
Residential setting	12	2%	9	2%

	Intervention Group Unweighted N	Intervention Group %	Comparison Group Unweighted N	Comparison Group %
Hispanic origin: (Q33)				
No	386	78%	309	83%
Yes, Mexican or Chicano	2	0%	7	2%
Yes, Puerto Rican	1	0%	0	0%
Yes, Cuban	1	0%	0	0%
Yes, another Hispanic origin	2	0%	6	2%
Prefer not to answer	22	4%	14	4%
Race: (Q34)				
White	433	87%	302	81%
Black or African American	7	1%	25	7%
American Indian or Alaska Native	6	1%	18	5%
Asian or Asian American	4	1%	4	1%
Native Hawaiian or Other Pacific Islander	1	0%	0	0%
Prefer not to answer	13	3%	13	3%

Source: Abt Associates HCIA Patient Survey.

Attachment 3.B: Descriptive Statistics and Multivariate Logistic Regression Results

3.B.1 Respondents' Health and Health-Related Quality of Life

Table 3.B.1. Self-Reported Health and Functional Status (Q1-Q8)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
How would you rate your physical health (Q1)				
Poor or Fair	137	31%	151	47%
Good	186	39%	119	31%
Very Good or Excellent	148	29%	86	21%
Don't Know	3	1%	4	1%
How would you rate your mental health (Q2)				
Poor or Fair	62	14%	75	23%
Good	127	27%	102	31%
Very Good or Excellent	286	59%	182	46%
Don't Know	0	0%	1	0%
How much help do you need to perform any of 5 activities of daily living (Q3-Q7)				
Dependent on 1+ ADLs	40	10%	75	22%
Not dependent on any ADL	436	90%	288	78%
How much does pain limit activities (Q8)				
Extreme, quite a bit	88	20%	98	30%
Slight, moderate	267	56%	173	47%
Not at all	117	24%	81	22%
Don't know	0	0%	3	1%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 3.B.2. Performance of Health-Related Quality of Life Activities (Q9-Q10)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Does your health limit you in performing any of 9 health-related quality of life activities (Q9A-Q9I)?				
Limited with 1+ health-related activities	454	96%	343	96%
Not limited with any health-related activities	22	4%	20	4%
To what extent have physical health or emotional problems interfered with social activities (Q10)				
Extreme, quite a bit	78	19%	97	30%
Slight, moderate	189	41%	145	41%
Not at all	196	40%	112	29%
Don't know	0	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 3.B.3. Perception about Own Health (Q11-Q12)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
How have things been during the past 3 months (Q11A-I)				
1st quartile	27	7%	28	8%
2nd quartile	165	35%	163	46%
3rd quartile	131	26%	95	26%
4th quartile	163	32%	86	20%
I get sick easier than other people (Q12A)				
Definitely, mostly true	71	17%	74	24%
Definitely, mostly false	163	32%	137	34%
Don't know	250	51%	157	42%
I am as healthy as anybody I know (Q12B)				
Definitely, mostly true	213	43%	150	37%
Definitely, mostly false	71	17%	89	30%
Don't know	197	40%	130	33%
I expect my health to get worse (Q12C)				
Definitely, mostly true	91	19%	104	29%
Definitely, mostly false	115	23%	77	20%
Don't know	278	58%	187	51%
My health is excellent (Q12D) *				
Definitely, mostly true	205	41%	134	32%
Definitely, mostly false	98	21%	131	41%
Don't know	181	38%	107	27%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

3.B.2 Satisfaction with Care/Care Experience

Table 3.B.4. Perception about Care Process and Transition (Q13-Q19)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
Overall satisfaction with care received (Q13)				
Very, moderately dissatisfied	67	13%	57	16%
Neutral	16	4%	21	6%
Very, moderately satisfied	395	82%	286	78%
Don't know	5	1%	2	0%
How often did you feel like complaining about the care received (Q14)				
Mostly or always	10	2%	26	8%
Sometimes	47	10%	60	16%
Rarely or never	432	88%	283	76%
Don't know	0	0%	0	0%
How often was your pain well controlled (Q15)				
Rarely or never	1	0%	5	2%
Sometimes	2	0%	18	5%
Mostly or always	153	32%	150	42%
Don't know	0	0%	0	0%
No pain/NA	333	68%	197	51%
Discharge setting (Q16) ***				
Non-institutional	363	73%	279	74%
NH/LTC Hospital	130	27%	91	26%
Did staff talk about having help after discharge (Q17) *				
Yes	427	86%	287	75%
No	37	8%	55	16%
Don’t Know	27	6%	27	9%
Did you get information on health problems after discharge (Q18)				
Yes	383	78%	266	72%
No	53	11%	73	20%
Don’t Know	52	11%	30	8%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Satisfaction with recovery since discharge (Q19) ***				
Not satisfied	7	2%	19	6%
Moderately satisfied	98	21%	93	27%
Very satisfied	357	75%	238	65%
Don't know	9	2%	6	2%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 3.B.5. Perception about Care Access and Involvement (Q20-Q25)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
How often did staff explain things understandably (Q20)				
Never	6	1%	11	3%
Sometimes	37	9%	57	18%
Usually or always	436	90%	293	79%
Don't know	1	0%	1	0%
How often did staff encourage questions (Q21) ***				
Never	22	5%	34	11%
Sometimes	51	11%	72	20%
Usually or always	405	84%	252	68%
Don't know	1	0%	2	1%
Did you receive needed services (Q22) ***				
Yes	432	90%	296	81%
No	25	5%	46	14%
Don't Know	20	5%	20	5%
Did you feel that care was well coordinated (Q23)				
Yes	424	89%	296	81%
No	30	6%	43	14%
Don't Know	20	5%	22	5%
Did you get conflicting advice from providers (Q24)				
Yes	63	13%	60	18%
No	394	82%	274	74%
Don't Know	22	5%	28	8%
Staff took my preferences into account regarding services after discharge (Q25)				
Disagree	34	7%	38	11%
Agree	382	79%	256	71%
Neutral	34	8%	35	9%
Don't Know	28	6%	34	9%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 3.B.6. Access and Communication (Q27-Q28)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
How often did staff speak to you in your preferred language (Q27)				
Never	0	0%	4	27%
Sometimes	2	26%	2	16%
Always	5	74%	6	50%
Don't Know	0	0%	1	7%
How often did you use an interpreter provided by the hospital (Q28)				
Not needed	9	79%	8	59%
Not offered	0	0%	1	6%
Sometimes offered	1	21%	4	30%
Always offered	0	0%	1	5%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

3.B.3 Individual Functional Status

Table 3.B.7. Individual Functional Status Items: ADLs (Q3-Q7)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
How much help needed with clothing (Q3)				
Total or lot of help	29	7%	50	15%
Little or no help	444	93%	313	85%
How much help needed with bathing (Q4)				
Total or lot of help	37	9%	64	19%
Little or no help	439	91%	297	81%
Don't know	0	0%	0	0%
How much help needed with toileting (Q5)				
Total or lot of help	18	4%	40	12%
Little or no help	458	96%	321	88%
Don't know	0	0%	0	0%
How much help needed with grooming (Q6)				
Total or lot of help	12	4%	25	7%
Little or no help	464	96%	336	93%
Don't know	0	0%	0	0%
How much help needed with eating meals (Q7)				
Total or lot of help	8	2%	23	8%
Little or no help	467	98%	339	92%
Don't know	1	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

3.B.4 Individual Health-Related Quality of Life Activities

Table 3.B.8. Individual Health-Related Quality of Life Activities (Q9A-Q9I)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	496	100%	373	100%
Limited in vigorous activities (Q9A)				
Limited	443	94%	329	92%
Not limited	29	6%	32	8%
Don't know	0	0%	0	0%
Limited in moderate activities (Q9B)				
Limited	327	71%	274	77%
Not limited	146	29%	87	23%
Don't know	0	0%	0	0%
Limited in lifting or carrying (Q9C)				
Limited	262	57%	233	67%
Not limited	208	43%	129	33%
Don't know	0	0%	1	0%
Limited in climbing stairs (Q9D)				
Limited	347	75%	283	81%
Not limited	123	25%	74	18%
Don't know	0	0%	2	1%
Limited in bending (Q9E)				
Limited	342	74%	286	82%
Not limited	130	26%	75	18%
Don't know	0	0%	0	0%
Limited in walking more than a mile (Q9F)				
Limited	368	77%	287	82%
Not limited	108	23%	71	17%
Don't know	0	0%	4	1%
Limited in walking several blocks (Q9G)				
Limited	302	65%	258	75%
Not limited	171	35%	100	25%
Don't know	0	0%	0	0%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Limited in walking one block (Q9H)				
Limited	218	47%	213	62%
Not limited	255	53%	147	38%
Don't know	0	0%	1	0%
Limited in bathing or dressing (Q9I)				
Limited	113	25%	127	38%
Not limited	362	75%	236	62%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

3.B.5 Multivariate Logistic Regression: Intervention Effects

Table 3.B.9. Multivariate Logistic Regression: Intervention Effects

	Sample Size n	Average Marginal Effect	Confidence Limits Lower	Confidence Limits Upper	p-Value
Index/Composite Functional Status					
Needs little or no help performing any ADLs (Q3-Q7)	649	0.087 ***	0.029	0.144	0.003
Needs little or no help performing any health-related quality of life activities (Q9A-Q9I)	631	0.003	-0.026	0.032	0.826
Individual Functional Status					
Needs little or no help with clothing (Q3)	647	0.075 ***	0.025	0.124	0.003
Needs little or no help with bathing (Q4)	647	0.060 **	0.004	0.115	0.034
Needs little or no help with toileting (Q5)	647	0.065 ***	0.019	0.112	0.006
Needs little or no help with grooming (Q6)	647	0.037 *	-0.002	0.077	0.064
Needs little or no help with eating meals (Q7)	648	0.056 ***	0.018	0.094	0.004
Not limited in vigorous activities (Q9A)	625	-0.022	-0.062	0.018	0.282
Not limited in moderate activities(Q9B)	644	0.036	-0.036	0.108	0.322
Not limited in lifting or carrying (Q9C)	642	0.066 *	-0.010	0.141	0.088
Not limited in climbing stairs (Q9D)	622	0.038	-0.026	0.103	0.245
Not limited in bending (Q9E)	643	0.087 ***	0.020	0.154	0.011
Not limited in walking more than a mile (Q9F)	627	0.047	-0.021	0.116	0.172
Not limited in walking several blocks (Q9G)	626	0.063	-0.014	0.140	0.111
Not limited in walking one block (Q9H)	644	0.096 **	0.015	0.177	0.021
Not limited in bathing or dressing (Q9I)	654	0.098 ***	0.025	0.171	0.008
Discharge Destination					
Discharged to NH/LTC Hospital (Q16)	675	0.018	-0.049	0.085	0.600
Overall Satisfaction Rating					
Satisfaction with care received (Q13)	666	0.028	-0.036	0.093	0.390
Satisfaction with recovery since discharge (Q19)	636	0.033 *	-0.006	0.072	0.098
Staff took patient's preference into account (Q25)	651	0.095 ***	0.024	0.165	0.008

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Methodist Delirium

Overview

We surveyed patients served by the Methodist Delirium Detection and Prevention program (hereinafter Methodist Delirium) and a matched comparison group. The Methodist Delirium program included a nurse-administered Delirium Screening Tool and an algorithm-based automated calculation of a Delirium Risk Assessment that was to be applied twice-daily for all patients in the hospital aged 70 and older (excluding the ICU). Patients who were screened to be at risk for delirium received staged interventions depending on their risk level. The highest risk patients receive a nurse's aide home visit after discharge to complete a thorough safety check and medication reconciliation. In addition, all hospital pharmacy order sets were revised to remove deliriogenic medications, especially when ordered for older patients. Pharmacists work with prescribers to suggest safer medications. The Methodist Delirium program aimed to identify and prevent delirium in hospitalized patients, reduce 30-day readmissions, and reduce overall costs. The program might also be expected to reduce length of stay (LOS), and decrease the need for post-discharge visits to the Emergency Department (ED).

Methods

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. The criteria for defining index stays for each Awardee surveyed are as follows:

- Patient at least 70 years of age during stay
- The claim was flagged as one of a select list of revenue center codes provided by the Methodist program

To create a comparison group, we first matched hospitals in the Houston HRR that resemble Houston Methodist Hospital and its partner hospital, based on size (50-150 beds or > 300 beds). Within selected hospitals we then defined intervention and comparison populations using identical inclusion and exclusion rules. Abt's Third Annual Report and Technical Appendix B detail more information about the creation of intervention and comparison groups.

In addition to the claims-based inclusion/exclusion rules, stays during which the patient expired in the hospital were excluded. In order to minimize recall bias, the sampling frame was limited to index stays that began between July 1 and September 30, 2014, which was the most recent quarter of claims data available at the time that we constructed the survey sample. Duplicate index stays for a given beneficiary were removed from the sampling frame so that each individual would only be surveyed once.

Within the intervention and comparison groups, the sampling frame was stratified by age (70-74, 75-84, 85+) and gender, yielding eight strata for each intervention and comparison group. We then selected a probability sample of 800 intervention and 800 comparison group beneficiaries. The survey sample was allocated to the gender and age group strata in proportion to the number in the intervention group population in that stratum, using an equal probability sample.

Beneficiaries who expired during the period covered by our data were included in the sampling frame but not included in the survey sample. Using beneficiary identification numbers in the Medicare claims data

set that was originally used to select the sample, we applied April 7 (the earliest survey field date for administering patient surveys for all five Awardees) as the cut-off date to identify and remove all such deaths that occurred prior to the start of survey administration.

After the removal of decedents, a total of 1,513 beneficiaries (the intervention and comparison groups combined) remained for the survey. Overall, 801 of these beneficiaries completed at least one survey question, representing an overall response rate of 53 percent (54 percent and 52 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer) we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The table below presents the demographics of beneficiaries selected for the survey, and the respondents.

Table 4.1. Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	0	0%	0	0%	0	0%	-	0	0%	-
65-74	192	25%	188	25%	95	23%	49%	97	25%	52%
75-84	364	48%	354	47%	217	53%	60%	202	52%	57%
85+	207	27%	208	28%	99	24%	48%	91	23%	44%
Race										
White	521	68%	395	53%	342	83%	66%	319	82%	81%
Non-White	115	15%	135	18%	68	17%	59%	71	18%	53%
Unknown	127	17%	220	29%	1	0%	1%	0	0%	0%
Gender										
Male	301	39%	299	40%	173	42%	57%	173	44%	58%
Female	462	61%	451	60%	238	58%	52%	217	56%	48%
Total	763	-	750	-	411	-	54%	390	-	52%

Source: Abt Associates HCIA Patient Survey

Analytic Approach

As noted, we assessed response rates for every survey item to identify any differential item nonresponse between the intervention and comparison groups. The coefficients of reliability (Cronbach's alpha) for the three sets of question for the Methodist Delirium sample were at least 0.89 as shown in Table 4.2 below.

Table 4.2. Reliability Statistics

Question Set	Number of Survey Items	Cronbach's Alpha
Q3 through Q7	5	0.94
Q9A through Q9I	9	0.92
Q11A through Q11I	9	0.89

Source: Abt Associates HCIA Patient Survey

Results

This section presents results showing weighted frequency distributions, and other analyses discussed above, by respondents in the intervention and comparison groups.[76]

General Profile of Respondents

Respondents in the intervention group had similar levels of educational attainment as those in the comparison group (e.g. 32 percent vs. 30 percent had attained a college degree or higher) (Table 4.3). There were no significant differences between intervention and comparison groups on any of the demographic variables: age, gender, educational level, living arrangement, race, ethnicity, or Medicaid/dual-eligibility.[77]

Table 4.3. Demographic Profile of Respondents

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total respondents	411	100%	390	100%
Highest Grade Level Completed (Q31)				
Not high school grad	58	15%	62	18%
High school grad	105	27%	83	23%
Some college	105	26%	108	29%
College graduate	128	32%	116	30%

[76] Unweighted frequency distributions of responses to all survey questions in their original form are presented in Attachment 4.A. All estimates presented in the result section of this report have been weighted to reflect the intervention and comparison populations.

[77] Note: Medicaid/dual eligibility was obtained from Medicare administrative data.

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
With Whom Do You Live (Q32)				
Alone	94	24%	105	29%
With spouse	206	50%	166	42%
With family	68	18%	69	19%
With friends	7	2%	10	3%
Other residents	21	6%	25	7%
Ethnicity (Q33)				
Hispanic	26	7%	30	9%
Non-Hispanic	308	90%	299	87%
Not answered	9	3%	13	4%
Reported Race (Q34)				
White	318	80%	304	82%
Non-White	68	17%	54	15%
Preferred not answering	9	3%	12	3%
Medicaid-Eligible *				
No	366	89%	335	85%
Yes	45	11%	55	15%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

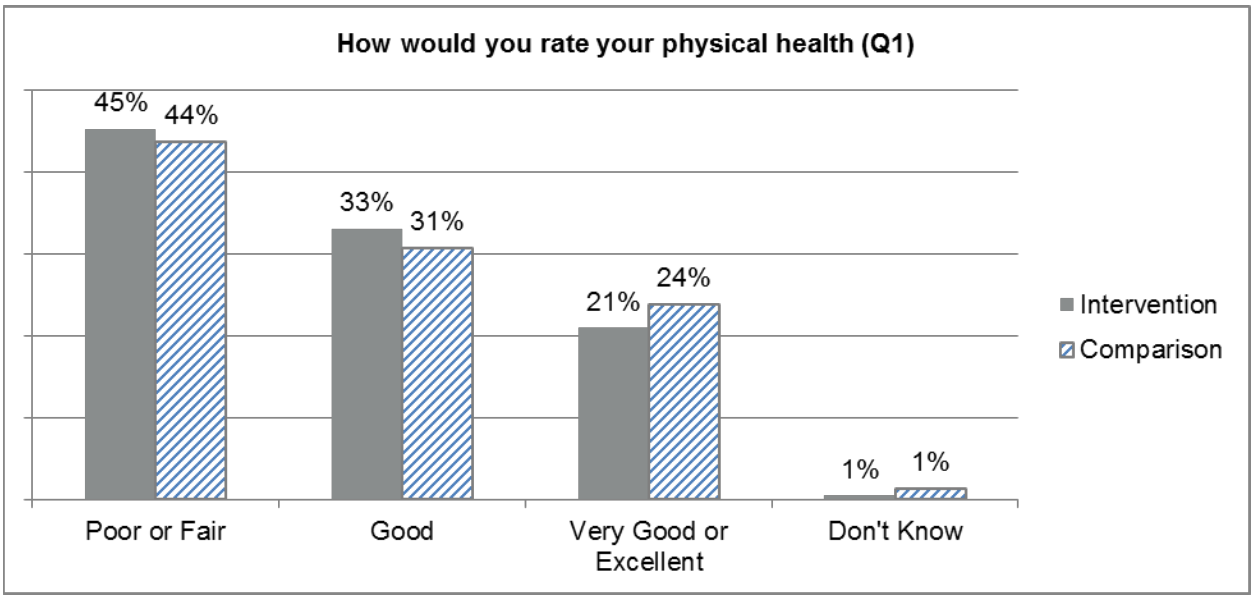
Respondents who indicated that English was not their preferred language were asked whether the facility staff spoke to them in their preferred language (Q27) and how often the respondents used an interpreter provided by the facility (Q28). Twenty-four respondents, representing less than three percent of all respondents, indicated that English was not their preferred language.[78]

Respondents' Health and Health-Related Quality of Life (Q3-Q12)

Just over half the respondents in both intervention and comparison groups reported that their physical health was good to excellent (Figure 4.1). The observed differences for physical health were not statistically significant. Figure 4.2 shows that approximately three quarters of respondents in both the intervention and comparison groups reported that their mental health was good to excellent; about one-quarter of intervention respondents reported having poor mental health while only a fifth of comparison respondents reported poor mental health ($p<0.10$).

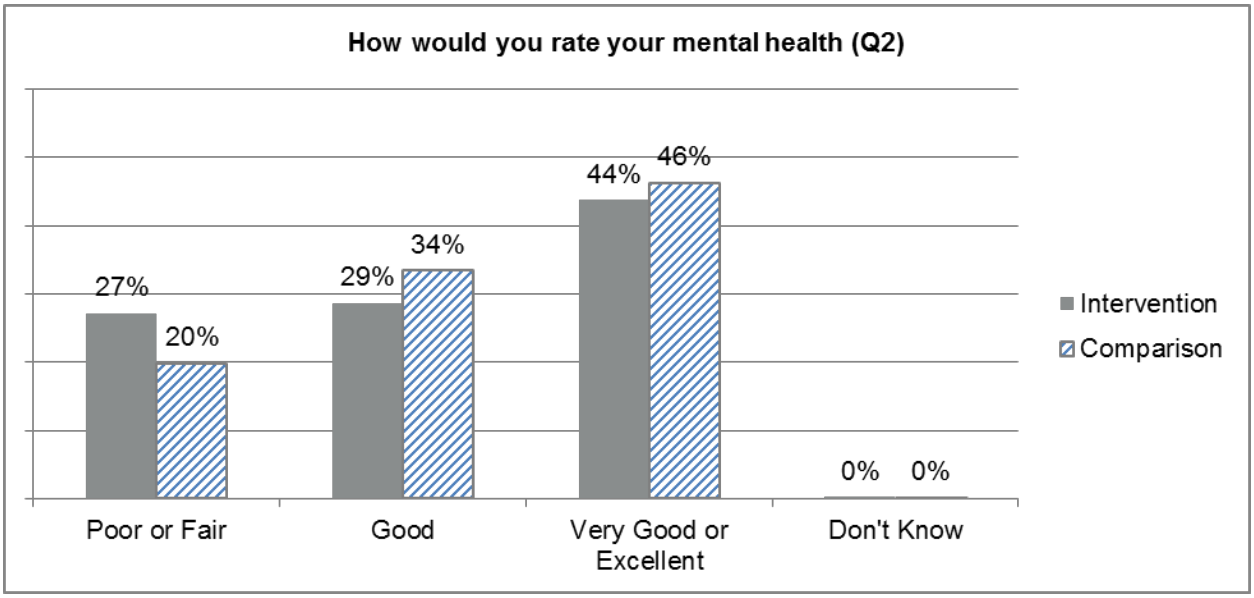
[78] For the two questions (Q27 and Q28) on preferred language of communication, we did not conduct tests of statistically significant differences in responses across the two analytic groups due to very small sample sizes.

Figure 4.1. Respondents' Self-Reported Physical Health Status



Source: Abt Associates HCIA Patient Survey

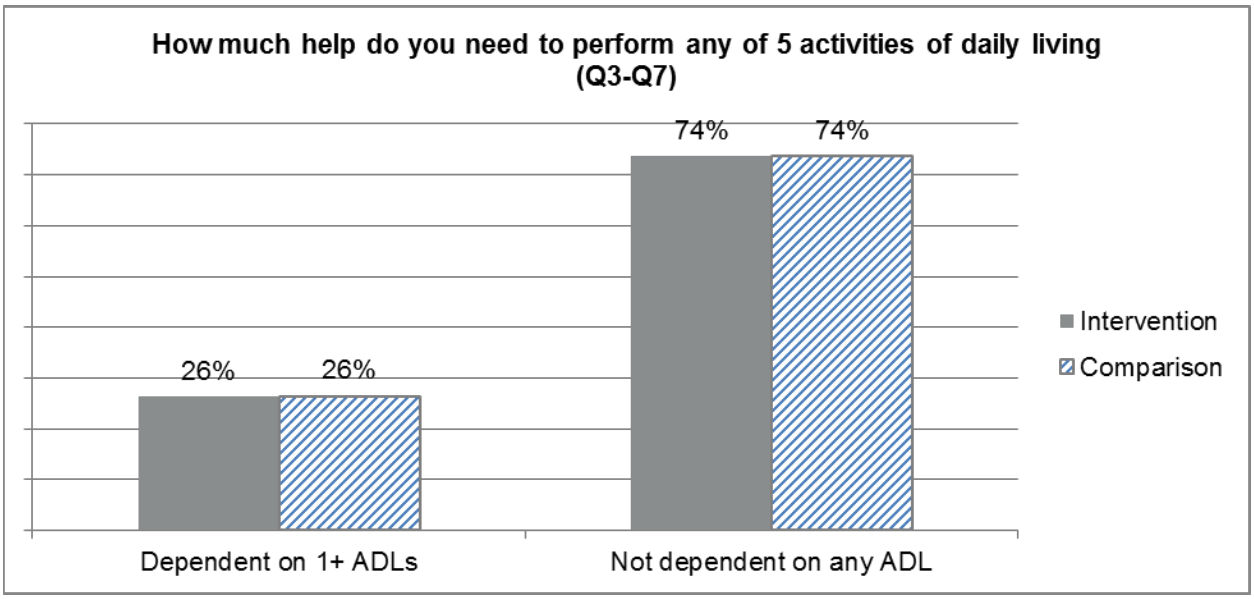
Figure 4.2. Respondents' Self-Reported Mental Health Status



Source: Abt Associates HCIA Patient Survey

To assess functional status, respondents were asked how much help they needed in performing five activities such as putting on and taking off clothing, bathing, toileting, etc. (Q3-Q7). As described in the overall Analytic Approach section, these five items were combined into one index variable to compare overall functional status with respect to all five questions combined. About three-quarters of respondents in both intervention and comparison groups needed little or no help to perform any of the five activities (Figure 4.3). There were no statistically significant differences between the intervention and comparison groups for the combined index variables or any of the five individual items.

Figure 4.3. Respondents' Index/Composite Functional Status

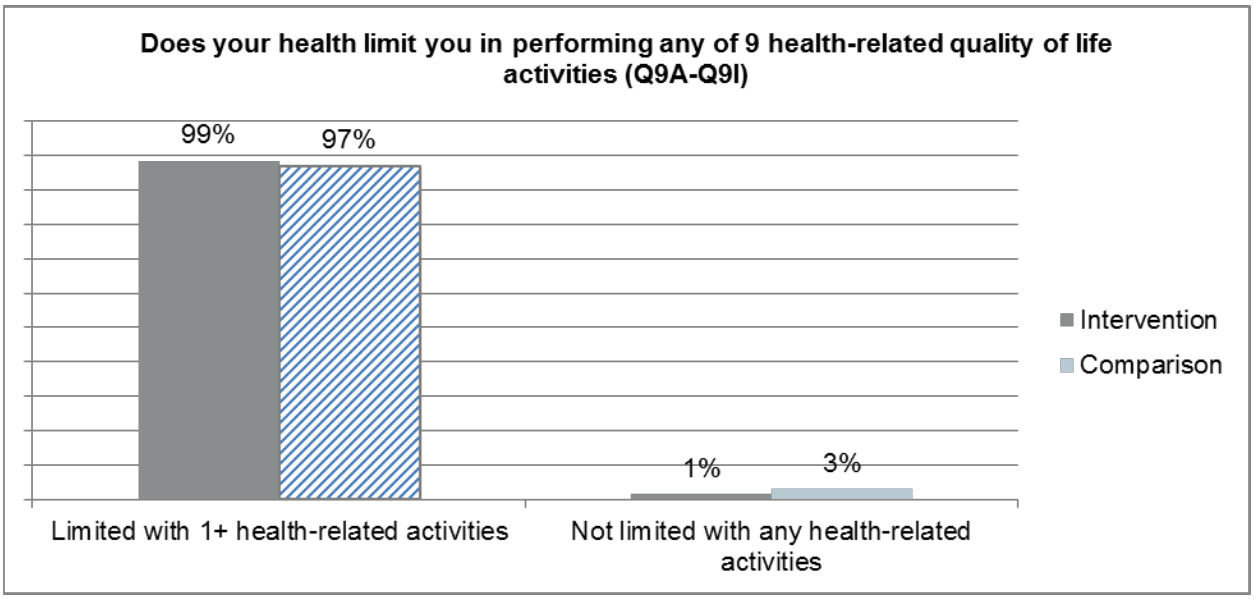


Source: Abt Associates HCIA Patient Survey

Nine questions (Q9A-Q9I) asked respondents whether their health limited their performance of certain activities like moving or pushing objects, climbing, walking, and so on. These nine items were combined into a single index variable to examine overall differences. As Figure 4.4 displays, almost all respondents, in both groups, reported that they were limited in performing at least one of the nine activities. When analyzed individually, there was no statistically significant difference between the intervention and comparison respondents for any of Q3-Q7 or Q9A-Q9I.[79]

[79] We also created multiple categories indicating the number of activities in which respondents had limitations and considered alternative cut-off points for the categories, for example 1-2, 3-5, 6+. The results of this robustness check were substantially similar to the results presented in this report.

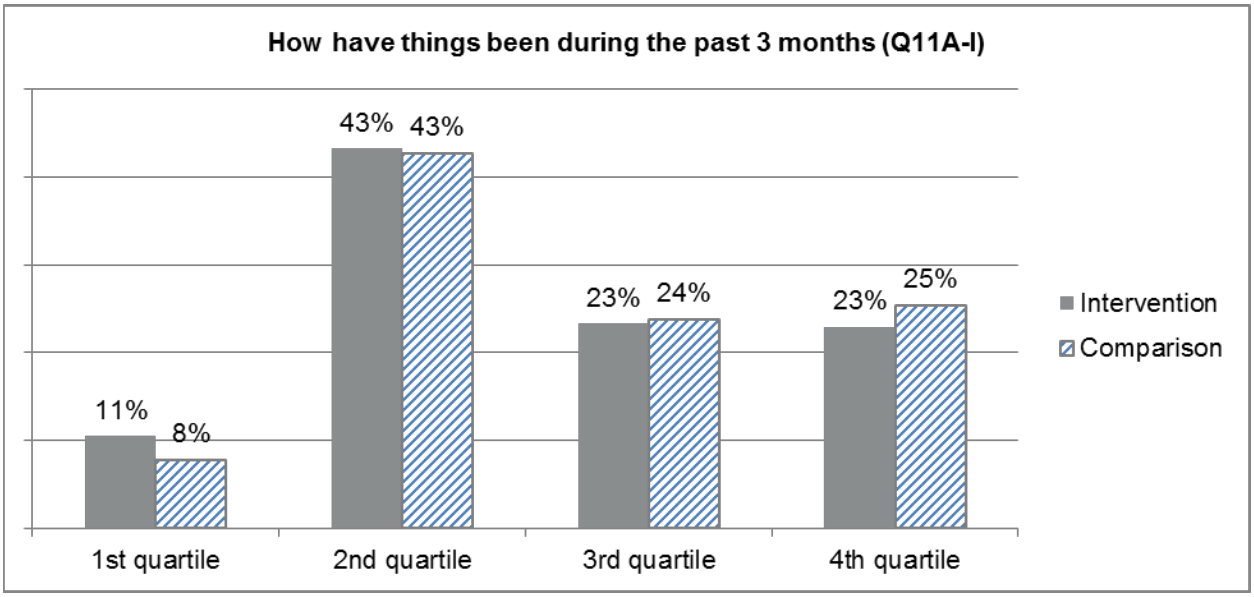
Figure 4.4. Respondents' Performance of Health-Related Quality of Life Activities



Source: Abt Associates HCIA Patient Survey

Figure 4.5 displays the perception of respondents regarding their overall mood as measured by the index/composite variable combining Q11_A through Q11_I. The observed differences between the intervention and comparison groups were not significant - a little over half of intervention and comparison group respondents indicated a poor mood (in the 1st or 2nd quartile) while a little less than half indicated a more positive mood (in the 3rd or 4th quartile).

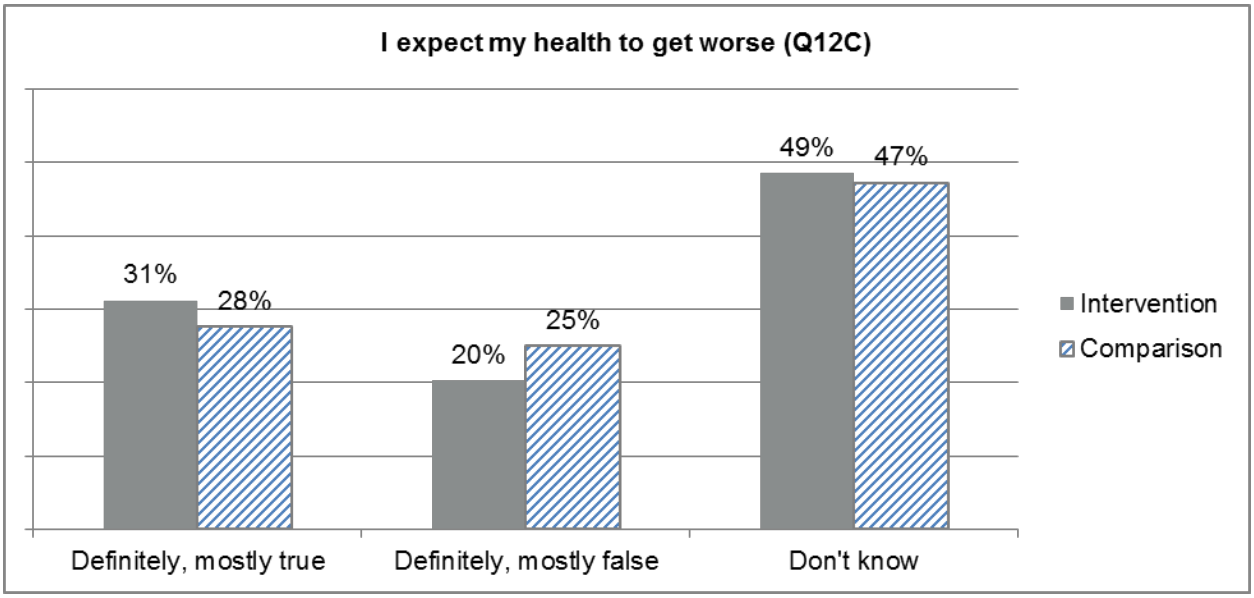
Figure 4.5. Respondents' Mood Index



Source: Abt Associates HCIA Patient Survey

Regarding respondents' outlook (or expectation) about their health (Q12_A-Q12D), respondents in both groups seemed unsure of their health outlook for all four questions, and there was no significant difference between intervention and comparison respondents. For example, Figure 4.6 shows that about half in each group were uncertain about whether they expected their health to get worse (detailed results of other variables are presented in Table 4.B.3, Attachment 4.B).

Figure 4.6. Respondents' Expectation of Own Health

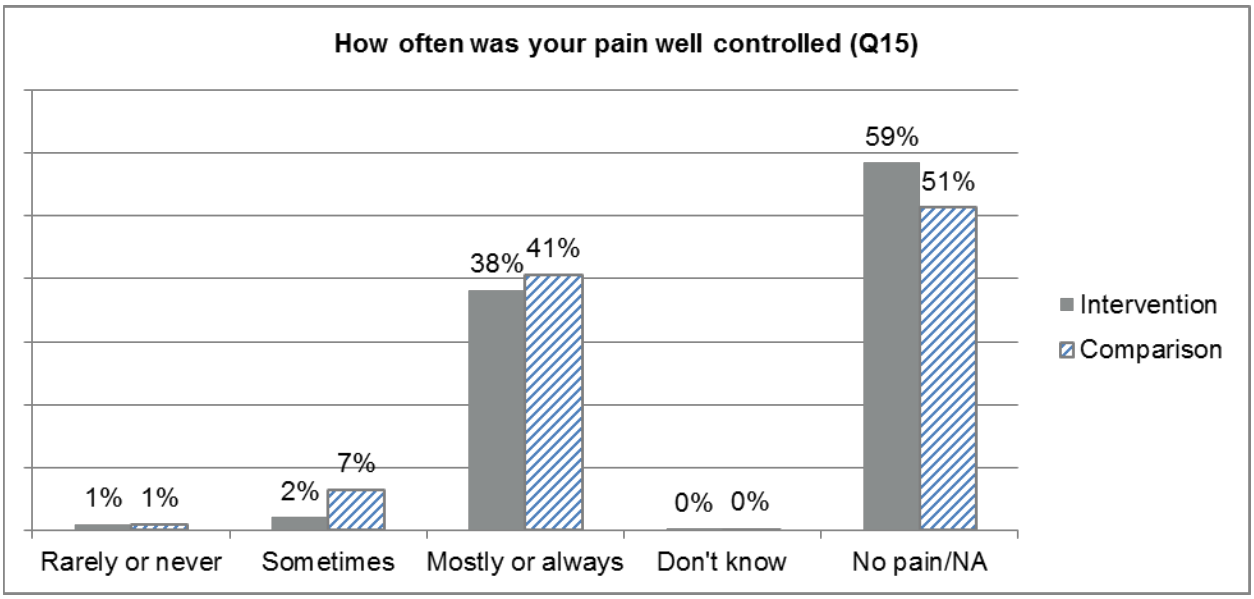


Source: Abt Associates HCIA Patient Survey

Satisfaction with Care/Care Experience (Q13-Q28)

Figure 4.7 shows that over half of both intervention and comparison patients reported having no pain, however, 41 percent of respondents in the intervention group, compared to 38 percent of respondents in the comparison group reported that their pain was sometimes or always controlled compared with about half of respondents in the comparison group ($p<0.05$).

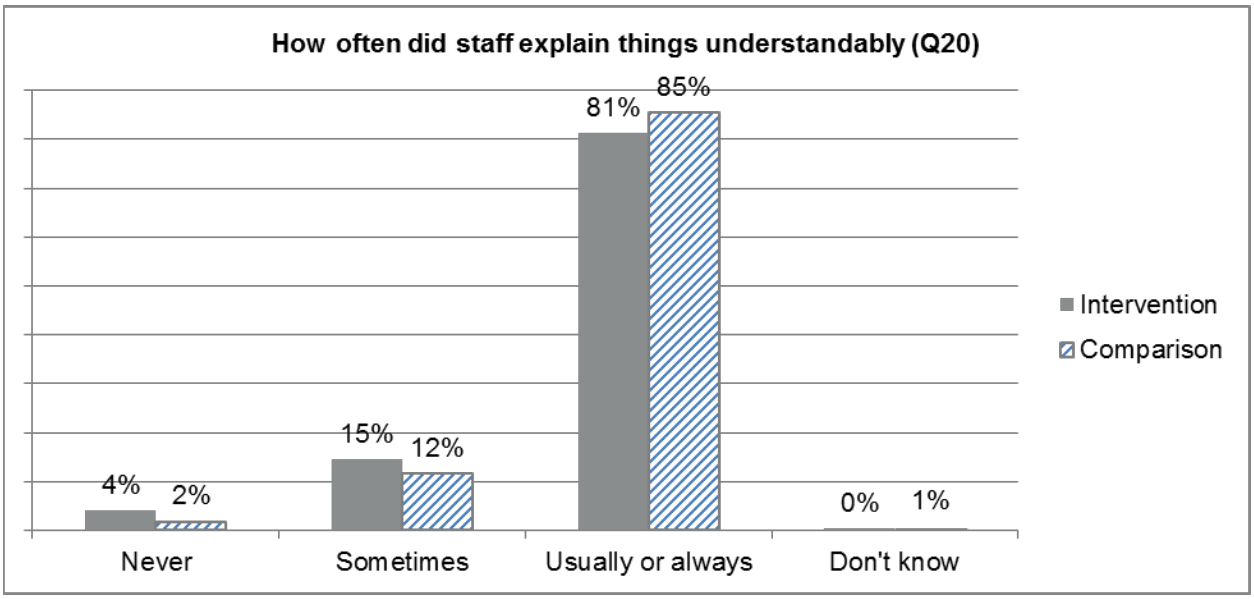
Figure 4.7. Pain Management



Source: Abt Associates HCIA Patient Survey

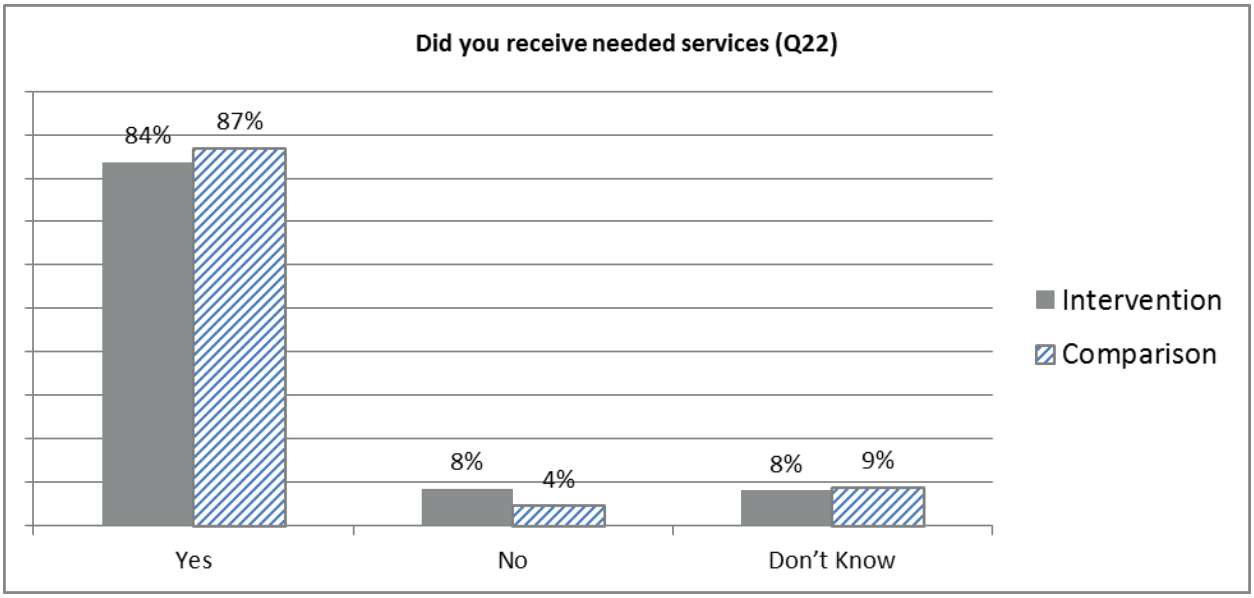
Comparison respondents reported slightly higher care access and engagement with hospital staff than did intervention respondents, in areas such as staff explaining things understandably, patients receiving needed services, and staff taking their preferences into account regarding services after discharge. As displayed in Figures 4.8 through 4.10, a vast majority of respondents in both intervention and comparison groups reported that staff usually or always explained things understandably, that they received the services they needed, and agreed that staff took their preferences into account after discharge, respectively. The difference in responses between intervention and comparison groups with respect to these three questions were weakly statistically significant ($p<0.10$) in favor of the comparison group.

Figure 4.8. Understandability of Staff Explanations



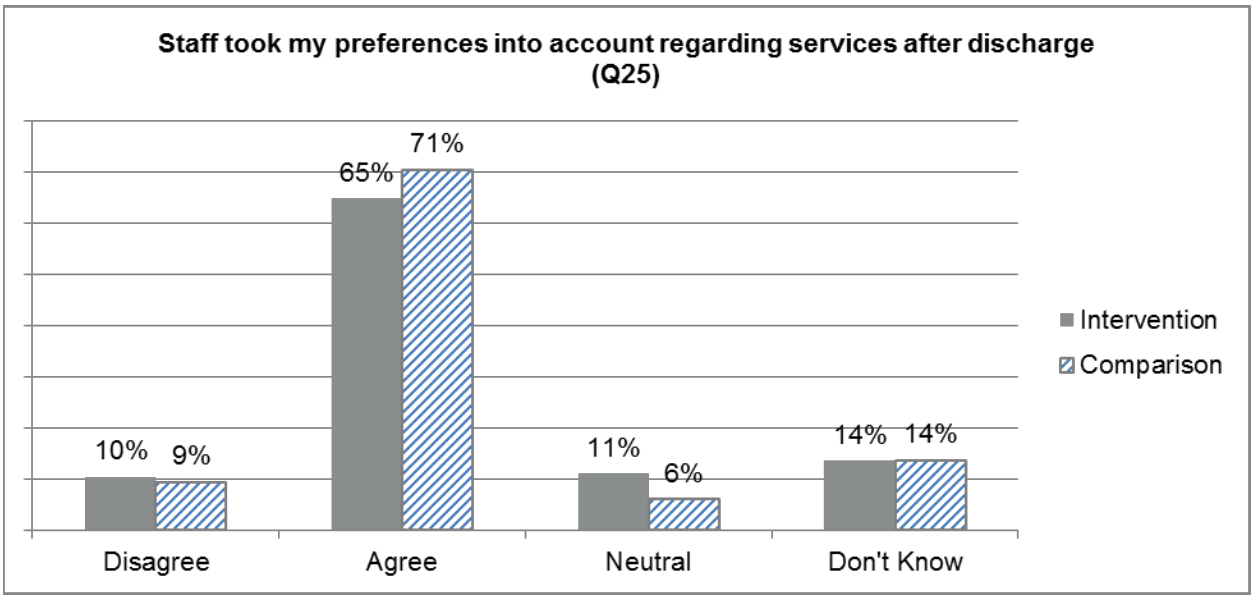
Source: Abt Associates HCIA Patient Survey

Figure 4.9. Receiving Needed Services



Source: Abt Associates HCIA Patient Survey

Figure 4.10. Consideration of Patient Preferences after Discharge

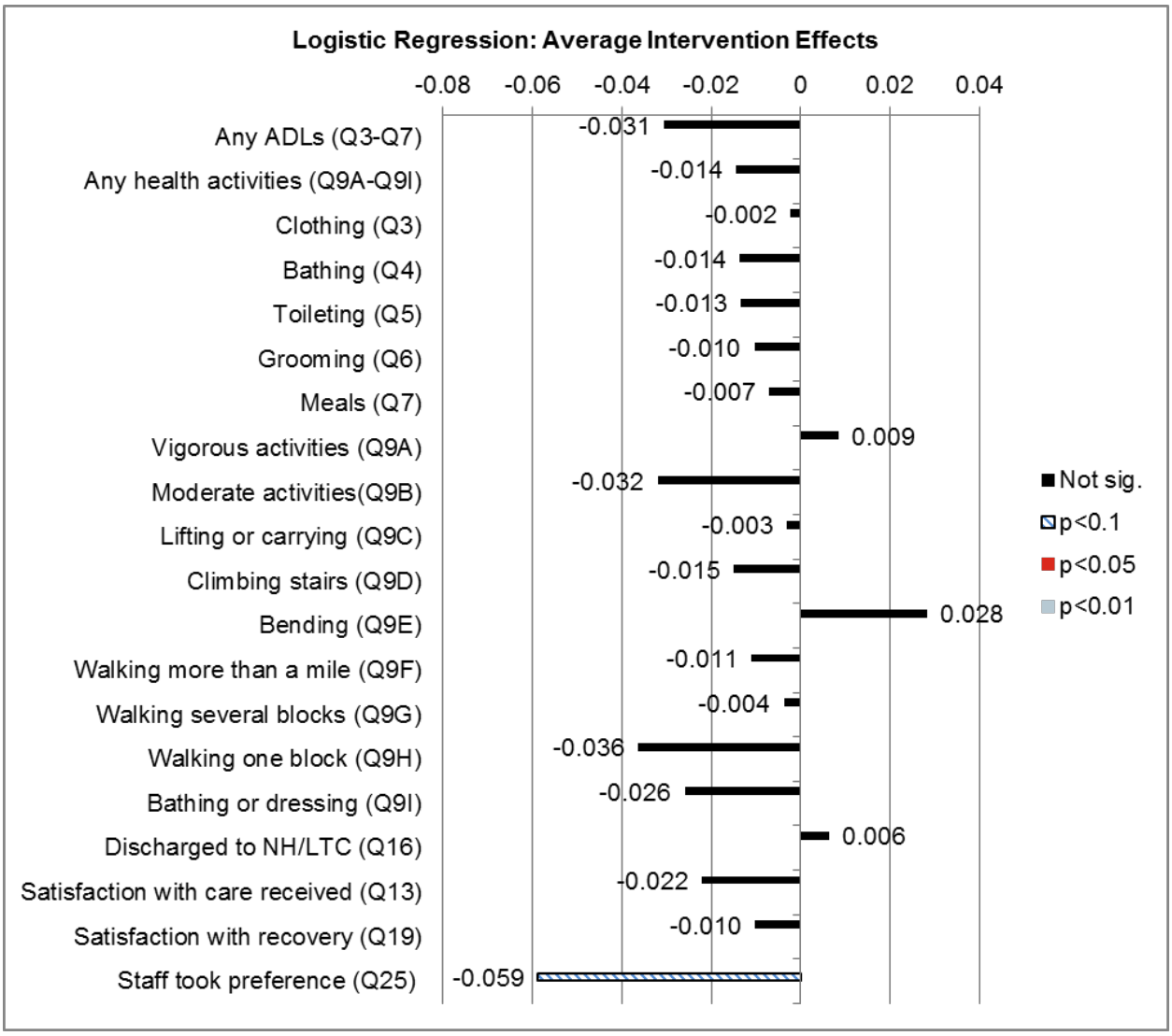


Source: Abt Associates HCIA Patient Survey

Multivariate Logistic Regression Findings

We estimated multivariate logistic regression models for the functional status questions, discharge setting (or destination), as well as for overall satisfaction questions (Q13, Q19, and Q25) as described in the overall Analytic Approach section. Figure 4.11 presents the intervention effects, as measured by the average marginal effects, on these outcomes. For both index variables combining Q3-Q7 and Q9A-Q9I, regression results indicate no statistically significant differences between intervention and comparison respondents. However, being in the intervention group was associated with a six percent decreased probability of having staff take patient preferences into account at discharge ($p<0.10$).

Figure 4.11. Logistic Regression: Average Intervention Effects



Source: Abt Associates HCIA Patient Survey

Conclusions

Overall, we observed few statistically significant differences between intervention and comparison survey respondents. While the majority of both groups reported that their mental health was good, a larger portion of the intervention group reported having poor or fair mental health than was true for the comparison group. This may be due to the fact that careful screening in the intervention hospitals identified patients at risk for delirium, but these risks were not reflected in ICD9 codes on claims, making it impossible to create an optimal comparison group. Regarding respondents' functional status (Q3-Q7 and Q9A-Q9I), whether analyzed individually or as composite measures, chi-square as well regression analyses indicated no statistically significant differences between the intervention and comparison respondents. There was weak evidence that comparison respondents had slightly higher engagement with hospital staff than intervention respondents, in areas such as staff explaining things understandably, patients receiving needed services, and staff taking patient preferences into account regarding post-discharge services. Findings from multivariate logistic regression models also indicated that being in the intervention group was associated with having a lower probability of staff taking into account the patient's preferences at discharge.

Overall, these mostly statistically insignificant intervention effects of the Methodist Delirium program are consistent with our analyses of claims-based outcomes, which have found generally insignificant results for this program.

Attachment 4.A: Unweighted Frequency Distributions of all Survey Questions in their Original Form

Table 4.A.1. Health Outcomes

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Rate your physical health today (Q1)				
Excellent	17	4%	23	6%
Very Good	67	16%	70	18%
Good	129	31%	119	31%
Fair	124	30%	112	29%
Poor	51	12%	49	13%
Don't Know	2	0%	5	1%
Missing	21	5%	12	3%
Totals	411	100%	390	100%
Rate your mental health today (Q2)				
Excellent	70	17%	72	18%
Very Good	103	25%	105	27%
Good	111	27%	126	32%
Fair	71	17%	51	13%
Poor	31	8%	23	6%
Don't Know	1	0%	1	0%
Missing	24	6%	12	3%
Totals	411	100%	390	100%
How much help do you need putting on clothing (Q3)				
Total help	27	7%	30	8%
A lot	37	9%	37	9%
A little	79	19%	62	16%
None	246	60%	249	64%
Missing	22	5%	12	3%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much help do you need bathing (Q4)				
Total help	42	10%	49	13%
A lot	40	10%	33	8%
A little	56	14%	55	14%
None	250	61%	240	62%
Don't Know	0	0%	0	0%
Missing	23	6%	13	3%
Totals	411	100%	390	100%
How much help do you need toileting (Q5)				
Total help	24	6%	36	9%
A lot	27	7%	17	4%
A little	37	9%	36	9%
None	299	73%	289	74%
Don't Know	0	0%	0	0%
Missing	24	6%	12	3%
Totals	411	100%	390	100%
How much help do you need in personal grooming (Q6)				
Total help	17	4%	19	5%
A lot	25	6%	24	6%
A little	32	8%	28	7%
None	315	77%	306	78%
Don't Know	0	0%	1	0%
Missing	22	5%	12	3%
Totals	411	100%	390	100%
How much help do you need eating meals (Q7)				
Total help	11	3%	13	3%
A lot	16	4%	16	4%
A little	47	11%	42	11%
None	314	76%	307	79%
Don't Know	0	0%	1	0%
Missing	23	6%	11	3%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much does pain or hurting limit day-to-day activities (Q8)				
Not at all	87	21%	75	19%
Slightly	102	25%	105	27%
Moderately	95	23%	85	22%
Quite a bit	72	18%	83	21%
Extremely	23	6%	23	6%
Don't Know	5	1%	4	1%
Missing	27	7%	15	4%
Totals	411	100%	390	100%

Table 4.A.2. Health-Related Quality of Life

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in vigorous activities (Q9A)				
Yes, limited a lot	306	74%	284	73%
Yes, limited a little	61	15%	67	17%
No, not limited at all	19	5%	18	5%
Don't Know	0	0%	1	0%
Missing	25	6%	20	5%
Totals	411	100%	390	100%
Does health now limit you in moderate activities (Q9B)				
Yes, limited a lot	214	52%	193	49%
Yes, limited a little	106	26%	106	27%
No, not limited at all	66	16%	79	20%
Don't Know	0	0%	0	0%
Missing	25	6%	12	3%
Totals	411	100%	390	100%
Does health now limit you in lifting or carrying groceries (Q9C)				
Yes, limited a lot	157	38%	147	38%
Yes, limited a little	114	28%	120	31%
No, not limited at all	113	27%	111	28%
Don't Know	0	0%	0	0%
Missing	27	7%	12	3%
Totals	411	100%	390	100%
Does health now limit you in climbing several flights of stairs (Q9D)				
Yes, limited a lot	236	57%	213	55%
Yes, limited a little	93	23%	100	26%
No, not limited at all	52	13%	58	15%
Don't Know	2	0%	3	1%
Missing	28	7%	16	4%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in bending, kneeling, or stooping (Q9E)				
Yes, limited a lot	194	47%	181	46%
Yes, limited a little	126	31%	141	36%
No, not limited at all	66	16%	54	14%
Don't Know	0	0%	0	0%
Missing	25	6%	14	4%
Totals	411	100%	390	100%
Does health now limit you in walking more than a mile (Q9F)				
Yes, limited a lot	271	66%	249	64%
Yes, limited a little	74	18%	72	18%
No, not limited at all	39	9%	46	12%
Don't Know	2	0%	6	2%
Missing	25	6%	17	4%
Totals	411	100%	390	100%
Does health now limit you in walking several blocks (Q9G)				
Yes, limited a lot	228	55%	207	53%
Yes, limited a little	87	21%	93	24%
No, not limited at all	71	17%	73	19%
Don't Know	0	0%	2	1%
Missing	25	6%	15	4%
Totals	411	100%	390	100%
Does health now limit you in walking one block (Q9H)				
Yes, limited a lot	145	35%	139	36%
Yes, limited a little	113	27%	93	24%
No, not limited at all	128	31%	141	36%
Don't Know	1	0%	1	0%
Missing	24	6%	16	4%
Totals	411	100%	390	100%
Does health now limit you in bathing or dressing (Q9I)				
Yes, limited a lot	68	17%	77	20%
Yes, limited a little	102	25%	81	21%
No, not limited at all	218	53%	221	57%
Don't Know	0	0%	0	0%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Missing	23	6%	11	3%
Totals	411	100%	390	100%
Extent that physical health OR emotional problems interfered with social activities (Q10)				
Not at all	114	28%	121	31%
Slightly	81	20%	82	21%
Moderately	68	17%	69	18%
Quite a bit	85	21%	63	16%
Extremely	35	9%	38	10%
Don't Know	0	0%	0	0%
Missing	28	7%	17	4%
Totals	411	100%	390	100%
Felt full of pep during the past 3 months (Q11A)				
All of the time	4	1%	8	2%
Most of the time	47	11%	72	18%
A good bit of the time	65	16%	50	13%
Some of the time	106	26%	95	24%
A little of the time	102	25%	80	21%
None of the time	72	18%	68	17%
Don't Know	0	0%	4	1%
Missing	15	4%	13	3%
Totals	411	100%	390	100%
Have been a very nervous person during the past 3 months (Q11B)				
All of the time	11	3%	6	2%
Most of the time	17	4%	17	4%
A good bit of the time	25	6%	20	5%
Some of the time	76	18%	74	19%
A little of the time	102	25%	93	24%
None of the time	167	41%	172	44%
Don't Know	0	0%	1	0%
Missing	13	3%	7	2%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt down in the dumps during the past 3 months (Q11C)				
All of the time	5	1%	6	2%
Most of the time	10	2%	14	4%
A good bit of the time	16	4%	17	4%
Some of the time	75	18%	61	16%
A little of the time	83	20%	86	22%
None of the time	210	51%	199	51%
Don't Know	1	0%	1	0%
Missing	11	3%	6	2%
Totals	411	100%	390	100%
Felt calm and peaceful during the past 3 months (Q11D)				
All of the time	35	9%	50	13%
Most of the time	138	34%	138	35%
A good bit of the time	59	14%	51	13%
Some of the time	89	22%	82	21%
A little of the time	48	12%	46	12%
None of the time	28	7%	17	4%
Don't Know	2	0%	1	0%
Missing	12	3%	5	1%
Totals	411	100%	390	100%
Had a lot of energy during the past 3 months (Q11E)				
All of the time	8	2%	10	3%
Most of the time	57	14%	57	15%
A good bit of the time	54	13%	59	15%
Some of the time	93	23%	77	20%
A little of the time	96	23%	92	24%
None of the time	93	23%	91	23%
Don't Know	0	0%	1	0%
Missing	10	2%	3	1%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt downhearted during the past 3 months (Q11F)				
All of the time	3	1%	6	2%
Most of the time	13	3%	9	2%
A good bit of the time	31	8%	27	7%
Some of the time	96	23%	81	21%
A little of the time	103	25%	112	29%
None of the time	152	37%	148	38%
Don't Know	0	0%	1	0%
Missing	13	3%	6	2%
Totals	411	100%	390	100%
Felt worn out during the past 3 months (Q11G)				
All of the time	26	6%	15	4%
Most of the time	47	11%	42	11%
A good bit of the time	58	14%	52	13%
Some of the time	113	27%	114	29%
A little of the time	106	26%	107	27%
None of the time	46	11%	51	13%
Don't Know	1	0%	3	1%
Missing	14	3%	6	2%
Totals	411	100%	390	100%
Been happy during the past 3 months (Q11H)				
All of the time	49	12%	57	15%
Most of the time	158	38%	142	36%
A good bit of the time	59	14%	72	18%
Some of the time	87	21%	71	18%
A little of the time	36	9%	37	9%
None of the time	9	2%	6	2%
Don't Know	1	0%	1	0%
Missing	12	3%	4	1%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt tired during the past 3 months (Q11I)				
All of the time	38	9%	36	9%
Most of the time	74	18%	53	14%
A good bit of the time	79	19%	66	17%
Some of the time	127	31%	139	36%
A little of the time	69	17%	71	18%
None of the time	14	3%	19	5%
Don't Know	0	0%	3	1%
Missing				
Totals				
I get sick easier than other people (Q12A)				
Definitely true	26	6%	27	7%
Mostly true	50	12%	55	14%
Mostly false	125	30%	124	32%
Definitely false	6	1%	16	4%
Don't Know	191	46%	161	41%
Missing	13	3%	7	2%
Totals	411	100%	390	100%
I am as healthy as anybody I know (Q12B)				
Definitely true	32	8%	35	9%
Mostly true	116	28%	113	29%
Mostly false	85	21%	92	24%
Definitely false	6	1%	6	2%
Don't Know	160	39%	136	35%
Missing	12	3%	8	2%
Totals	411	100%	390	100%
I expect my health to get worse (Q12C)				
Definitely true	31	8%	38	10%
Mostly true	91	22%	65	17%
Mostly false	77	19%	83	21%
Definitely false	5	1%	15	4%
Don't Know	194	47%	183	47%
Missing	13	3%	6	2%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
My health is excellent (Q12D)				
Definitely true	18	4%	25	6%
Mostly true	117	28%	121	31%
Mostly false	122	30%	111	28%
Definitely false	7	2%	15	4%
Don't Know	134	33%	109	28%
Missing	13	3%	9	2%
Totals	411	100%	390	100%

Table 4.A.3. Satisfaction with Care

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How satisfied are you with the care you received (Q13)				
Very dissatisfied	55	13%	51	13%
Moderately dissatisfied	18	4%	17	4%
Neutral	19	5%	20	5%
Moderately satisfied	79	19%	72	18%
Very satisfied	222	54%	218	56%
Don't Know	10	2%	4	1%
Missing	8	2%	8	2%
Totals	411	100%	390	100%
How often did you feel like complaining about the care you received (Q14)				
Never	199	48%	180	46%
Rarely	112	27%	113	29%
Sometimes	69	17%	71	18%
Mostly	18	4%	13	3%
Always	8	2%	8	2%
Don't Know	0	0%	0	0%
Missing	5	1%	5	1%
Totals	411	100%	390	100%
How often was your pain well controlled (Q15)				
Never	4	1%	4	1%
Sometimes	9	2%	24	6%
Usually	33	8%	36	9%
Always	119	29%	118	30%
Did not have pain	183	45%	167	43%
Not applicable	55	13%	34	9%
Don't Know	1	0%	2	1%
Missing	7	2%	5	1%
Totals	411	100%	390	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
After leaving the facility, I stayed in: (Q16)				
Own home	275	67%	265	68%
Someone else's home	32	8%	20	5%
Nursing home	82	20%	91	23%
Long-term care hospital	8	2%	5	1%
Other	10	2%	4	1%
Did staff talk about needed help when you left the facility (Q17)				
Yes	302	73%	296	76%
No	62	15%	55	14%
Don't Know	40	10%	34	9%
Missing	7	2%	5	1%
Totals	411	100%	390	100%
Did you get information about what symptoms to look out for (Q18)				
Yes	277	67%	251	64%
No	68	17%	80	21%
Don't Know	57	14%	54	14%
Missing	9	2%	5	1%
Totals	411	100%	390	100%
How satisfied are you with your recovery since you left the facility (Q19)				
Not at all satisfied	16	4%	13	3%
Slightly satisfied	37	9%	27	7%
Moderately satisfied	73	18%	71	18%
Quite a bit satisfied	113	27%	110	28%
Extremely satisfied	135	33%	142	36%
Don't Know	9	2%	11	3%
Missing	28	7%	16	4%
Totals	411	100%	390	100%

Table 4.A.4. Care Experience

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How often did doctors and nurses explain things in a way you could understand (Q20)				
Never	15	4%	7	2%
Sometimes	55	13%	44	11%
Usually	124	30%	125	32%
Always	190	46%	197	51%
Don't Know	1	0%	3	1%
Missing	26	6%	14	4%
Totals	411	100%	390	100%
How often did doctors and nurses encourage you to ask questions (Q21)				
Never	47	11%	37	9%
Sometimes	58	14%	60	15%
Usually	112	27%	100	26%
Always	164	40%	176	45%
Don't Know	3	1%	2	1%
Missing	27	7%	15	4%
Totals	411	100%	390	100%
Did you receive the services you thought that you needed (Q22)				
Yes	322	78%	324	83%
No	33	8%	18	5%
Don't Know	30	7%	34	9%
Missing	26	6%	14	4%
Totals	411	100%	390	100%
Did you feel the care you received was well coordinated (Q23)				
Yes	313	76%	313	80%
No	38	9%	30	8%
Don't Know	31	8%	27	7%
Missing	29	7%	20	5%
Totals	411	100%	390	100%
Did you seem to get conflicting advice from different health care providers (Q24)				
Yes	54	13%	62	16%
No	295	72%	286	73%
Don't Know	35	9%	25	6%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Missing	27	7%	17	4%
Totals	411	100%	390	100%
The facility staff took my preferences into account regarding services after discharge (Q25)				
Strongly disagree	18	4%	15	4%
Disagree	22	5%	20	5%
Agree	147	36%	158	41%
Strongly agree	105	26%	104	27%
Not applicable	43	10%	23	6%
Don't Know/Don't Remember	51	12%	53	14%
Missing	25	6%	17	4%
Totals	411	100%	390	100%
What is your preferred language when speaking (Q26)				
English	312	76%	296	76%
Other	7	2%	17	4%
Don't Know	0	0%	0	0%
Missing	92	22%	77	20%
Totals	411	100%	390	100%
How often did staff speak to you in your preferred language (Q27)				
Never	3	3%	4	4%
Sometimes	3	3%	8	9%
Always	7	7%	10	11%
Missing	86	87%	72	77%
Totals	99	100%	94	100%
How often did you use an interpreter provided by facility (Q28)				
Never, did not need one	4	4%	11	12%
Never, was not offered one	1	1%	5	5%
Never, family interpreter	3	3%	3	3%
Sometimes	2	2%	5	5%
Always	3	3%	0	0%
Missing	86	87%	70	74%
Totals	99	100%	94	100%

Table 4.A.5. Demographic Characteristics

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Age (Q29)				
54 or younger	2	0%	0	0%
55 to 64	3	1%	4	1%
65 to 74	80	19%	93	24%
75 or older	290	71%	266	68%
Missing	36	9%	27	7%
Totals	411	100%	390	100%
Gender (Q30)				
Male	152	37%	160	41%
Female	220	54%	205	53%
Missing	39	9%	25	6%
Totals	411	100%	390	100%
Education (Q31)				
8th grade or less	25	6%	32	8%
Some high school, but did not graduate	33	8%	30	8%
High school graduate or GED	105	26%	83	21%
Some college or 2-year degree	105	26%	108	28%
4-year college degree	54	13%	53	14%
More than a 4-year college degree	74	18%	63	16%
Don't Know	0	0%	2	1%
Missing	15	4%	19	5%
Totals	411	100%	390	100%
With whom do you live: (Q32)				
Alone	94	23%	105	27%
With spouse or partner	206	50%	166	43%
With other family members	69	17%	71	18%
With non-relatives	8	2%	10	3%
Residential setting	21	5%	25	6%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Hispanic origin: (Q33)				
No	308	75%	299	77%
Yes, Mexican or Chicano	14	3%	21	5%
Yes, Puerto Rican	0	0%	0	0%
Yes, Cuban	1	0%	0	0%
Yes, another Hispanic origin	11	3%	9	2%
Prefer not to answer	9	2%	13	3%
Race: (Q34)				
White	320	78%	306	78%
Black or African American	59	14%	44	11%
American Indian or Alaska Native	2	0%	4	1%
Asian or Asian American	8	2%	7	2%
Native Hawaiian or Other Pacific Islander	0	0%	0	0%
Prefer not to answer	9	2%	12	3%

Source: Abt Associates HCIA Patient Survey.

Attachment 4.B: Descriptive Statistics and Multivariate Logistic Regression Results

4.B.1 Respondents' Health and Health-Related Quality of Life

Table 4.B.1. Self-Reported Health and Functional Status (Q1-Q8)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
How would you rate your physical health (Q1)				
Poor or Fair	175	45%	161	44%
Good	129	33%	119	31%
Very Good or Excellent	84	21%	93	24%
Don't Know	2	1%	5	1%
How would you rate your mental health (Q2)				
Poor or Fair	102	27%	74	20%
Good	111	29%	126	34%
Very Good or Excellent	173	44%	177	46%
Don't Know	1	0%	1	0%
How much help do you need to perform any of 5 activities of daily living (Q3-Q7)				
Dependent on 1+ ADLs	100	26%	96	26%
Not dependent on any ADL	289	74%	283	74%
How much does pain limit activities (Q8)				
Extreme, quite a bit	95	26%	106	29%
Slight, moderate	197	51%	190	51%
Not at all	87	22%	75	19%
Don't know	5	1%	4	1%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 4.B.2. Performance of Health-Related Quality of Life Activities (Q9-Q10)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Does your health limit you in performing any of 9 health-related quality of life activities (Q9A-Q9I)?				
Limited with 1+ health-related activities	383	99%	367	97%
Not limited with any health-related activities	6	1%	12	3%
To what extent have physical health or emotional problems interfered with social activities (Q10)				
Extreme, quite a bit	120	32%	101	28%
Slight, moderate	149	39%	151	40%
Not at all	114	29%	121	32%
Don't know	0	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 4.B.3. Perception about Own Health (Q11-Q12)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
How have things been during the past 3 months (Q11A-I)				
1st quartile	41	11%	31	8%
2nd quartile	173	43%	162	43%
3rd quartile	95	23%	93	24%
4th quartile	94	23%	102	25%
I get sick easier than other people (Q12A)				
Definitely, mostly true	76	19%	82	21%
Definitely, mostly false	131	32%	140	36%
Don't know	191	49%	161	43%
I am as healthy as anybody I know (Q12B)				
Definitely, mostly true	148	37%	148	39%
Definitely, mostly false	91	23%	98	26%
Don't know	160	40%	136	35%
I expect my health to get worse (Q12C)				
Definitely, mostly true	122	31%	103	28%
Definitely, mostly false	82	20%	98	25%
Don't know	194	49%	183	47%
My health is excellent (Q12D) *				
Definitely, mostly true	135	33%	146	38%
Definitely, mostly false	129	33%	126	34%
Don't know	134	34%	109	28%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

4.B.2 Satisfaction with Care/Care Experience

Table 4.B.4. Perception about Care Process and Transition (Q13-Q19)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
Overall satisfaction with care received (Q13) *				
Very, moderately dissatisfied	73	18%	68	18%
Neutral	19	5%	20	5%
Very, moderately satisfied	301	74%	290	76%
Don't know	10	3%	4	1%
How often did you feel like complaining about the care received (Q14)				
Mostly or always	26	6%	21	5%
Sometimes	69	18%	71	19%
Rarely or never	311	76%	293	76%
Don't know	0	0%	0	0%
How often was your pain well controlled (Q15)				
Rarely or never	4	1%	4	1%
Sometimes	9	2%	24	7%
Mostly or always	152	38%	154	41%
Don't know	1	0%	2	0%
No pain/NA	238	59%	201	51%
Discharge setting (Q16) ***				
Non-institutional	305	75%	285	73%
NH/LTC Hospital	99	25%	100	27%
Did staff talk about having help after discharge (Q17) *				
Yes	302	74%	296	77%
No	62	16%	55	14%
Don't Know	40	10%	34	9%
Did you get information on health problems after discharge (Q18)				
Yes	277	69%	251	65%
No	68	17%	80	20%
Don't Know	57	14%	54	15%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Satisfaction with recovery since discharge (Q19) ***				
Not satisfied	16	4%	13	3%
Moderately satisfied	110	29%	98	27%
Very satisfied	248	64%	252	67%
Don't know	9	3%	11	3%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 4.B.5. Perception about Care Access and Involvement (Q20-Q25)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
How often did staff explain things understandably (Q20)				
Never	15	4%	7	2%
Sometimes	55	15%	44	12%
Usually or always	314	81%	322	85%
Don't know	1	0%	3	1%
How often did staff encourage questions (Q21) ***				
Never	47	12%	37	10%
Sometimes	58	15%	60	16%
Usually or always	276	72%	276	73%
Don't know	3	1%	2	1%
Did you receive needed services (Q22) ***				
Yes	322	84%	324	87%
No	33	8%	18	4%
Don't Know	30	8%	34	9%
Did you feel that care was well coordinated (Q23) *				
Yes	313	82%	313	85%
No	38	10%	30	8%
Don't Know	31	8%	27	7%
Did you get conflicting advice from providers (Q24)				
Yes	54	14%	62	17%
No	295	76%	286	76%
Don't Know	35	10%	25	7%
Staff took my preferences into account regarding services after discharge (Q25)				
Disagree	40	10%	35	9%
Agree	252	65%	262	71%
Neutral	43	11%	23	6%
Don't Know	51	14%	53	14%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 4.B.6. Access and Communication (Q27-Q28)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
How often did staff speak to you in your preferred language (Q27)				
Never	3	24%	4	18%
Sometimes	3	23%	8	38%
Always	7	53%	10	44%
Don't Know	0	0%	0	0%
How often did you use an interpreter provided by the hospital (Q28)				
Not needed	7	52%	14	58%
Not offered	1	8%	5	19%
Sometimes offered	2	17%	5	23%
Always offered	3	23%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

4.B.3 Individual Functional Status

Table 4.B.7. Individual Functional Status Items: ADLs (Q3-Q7)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
How much help needed with clothing (Q3)				
Total or lot of help	64	17%	67	19%
Little or no help	325	83%	311	81%
How much help needed with bathing (Q4)				
Total or lot of help	82	22%	82	23%
Little or no help	306	78%	295	77%
Don't know	0	0%	0	0%
How much help needed with toileting (Q5)				
Total or lot of help	51	14%	53	15%
Little or no help	336	86%	325	85%
Don't know	0	0%	0	0%
How much help needed with grooming (Q6)				
Total or lot of help	42	11%	43	12%
Little or no help	347	89%	334	88%
Don't know	0	0%	1	0%
How much help needed with eating meals (Q7)				
Total or lot of help	27	7%	29	8%
Little or no help	361	93%	349	92%
Don't know	0	0%	1	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

4.B.4 Individual Health-Related Quality of Life Activities

Table 4.B.8. Individual Health-Related Quality of Life Activities (Q9A-Q9I)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	411	100%	390	100%
Limited in vigorous activities (Q9A)				
Limited	367	95%	351	95%
Not limited	19	5%	18	5%
Don't know	0	0%	1	0%
Limited in moderate activities (Q9B)				
Limited	320	83%	299	80%
Not limited	66	17%	79	20%
Don't know	0	0%	0	0%
Limited in lifting or carrying (Q9C)				
Limited	271	71%	267	72%
Not limited	113	29%	111	28%
Don't know	0	0%	0	0%
Limited in climbing stairs (Q9D)				
Limited	329	86%	313	84%
Not limited	52	13%	58	15%
Don't know	2	1%	3	1%
Limited in bending (Q9E)				
Limited	320	83%	322	86%
Not limited	66	17%	54	14%
Don't know	0	0%	0	0%
Limited in walking more than a mile (Q9F)				
Limited	345	89%	321	87%
Not limited	39	10%	46	12%
Don't know	2	1%	6	1%
Limited in walking several blocks (Q9G)				
Limited	315	82%	300	81%
Not limited	71	18%	73	19%
Don't know	0	0%	2	0%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Limited in walking one block (Q9H)				
Limited	258	67%	232	63%
Not limited	128	33%	141	37%
Don't know	1	0%	1	0%
Limited in bathing or dressing (Q9I)				
Limited	170	45%	158	43%
Not limited	218	55%	221	57%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

4.B.5 Multivariate Logistic Regression: Intervention Effects

Table 4.B.9. Multivariate Logistic Regression: Intervention Effects

	Sample Size n	Average Marginal Effect	Confidence Limits Lower	Confidence Limits Upper	p-Value
Index/Composite Functional Status					
Needs little or no help performing any ADLs (Q3-Q7)	716	-0.031	-0.089	0.028	0.304
Needs little or no help performing any health-related quality of life activities (Q9A-Q9I)	555	-0.014	-0.040	0.011	0.271
Individual Functional Status					
Needs little or no help with clothing (Q3)	715	-0.002	-0.054	0.050	0.934
Needs little or no help with bathing (Q4)	713	-0.014	-0.069	0.041	0.626
Needs little or no help with toileting (Q5)	713	-0.013	-0.060	0.033	0.573
Needs little or no help with grooming (Q6)	707	-0.010	-0.056	0.035	0.659
Needs little or no help with eating meals (Q7)	707	-0.007	-0.046	0.032	0.721
Not limited in vigorous activities (Q9A)	659	0.009	-0.024	0.041	0.602
Not limited in moderate activities(Q9B)	705	-0.032	-0.086	0.022	0.249
Not limited in lifting or carrying (Q9C)	705	-0.003	-0.063	0.056	0.919
Not limited in climbing stairs (Q9D)	694	-0.015	-0.067	0.037	0.575
Not limited in bending (Q9E)	704	0.028	-0.024	0.081	0.292
Not limited in walking more than a mile (Q9F)	680	-0.011	-0.058	0.036	0.647
Not limited in walking several blocks (Q9G)	701	-0.004	-0.059	0.052	0.895
Not limited in walking one block (Q9H)	707	-0.036	-0.103	0.031	0.289
Not limited in bathing or dressing (Q9I)	715	-0.026	-0.092	0.040	0.441
Discharge Destination					
Discharged to NH/LTC Hospital (Q16)	735	0.006	-0.053	0.066	0.835
Overall Satisfaction Rating					
Satisfaction with care received (Q13)	731	-0.022	-0.085	0.041	0.492
Satisfaction with recovery since discharge (Q19)	695	-0.010	-0.048	0.028	0.597
Staff took patient's preference into account (Q25)	708	-0.059 *	-0.128	0.010	0.095

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Methodist Sepsis

Overview

We surveyed patients served by the Sepsis Early Recognition and Response Initiative program (hereinafter SERRI) and a matched comparison group. The SERRI program was designed to detect and treat early sepsis in participating acute care hospitals (ACHs); long term care acute care hospitals (LTACHs); and skilled nursing facilities (SNFs). Individuals in these institutional settings were screened daily to identify signs of emerging sepsis such as changes in blood pressure, heart rate, and fever. When patients were identified as possibly becoming septic, the care team quickly initiates evidence-based sepsis treatment bundles (e.g., aggressive fluid resuscitation, multiple sequences of antibiotics). Program staff expected this program to result in reduced rates of organ failure and consequent reduced mortality, shorter length of stay (LOS) in the hospital, fewer readmissions, better patient outcomes, and lower costs for Medicare and Medicaid. For patients in post-acute institutional settings, the program also aimed to reduce ED visits and admissions to the hospital.

Methods

Survey Sample

The survey probability sample was constructed using index stays defined for Abt's accompanying Medicare claims analyses. The criteria for defining index stays for each Awardee surveyed are as follows:

- The claim included the correct ICU, ED, or medical surgical/general unit revenue center codes
- The claim did not involve solid organ transplant
- The claim included ICD-9 code for sepsis

To create a comparison group, we first matched hospitals in the Houston HRR that resemble the Houston Methodist Hospital as well as its partner hospitals and sites, based on size (75+ beds for LTCH, 50-150 beds for SNF, >300 beds for hospital). Within selected hospitals, we then defined intervention and comparison populations using identical inclusion and exclusion rules. Abt's Third Annual Report and Technical Appendix B details more information about the creation of intervention and comparison groups.

In addition to the claims-based inclusion/exclusion rules, stays during which the patient expired in the hospital were excluded. In order to minimize recall bias, the sampling frame was limited to index stays that began between April 1 to September 30, 2014, which was the most recent quarter of claims data available at the time that we constructed the survey sample. Duplicate index stays for a given beneficiary were removed from the sampling frame so that each individual would only be surveyed once.

Within the intervention and comparison groups, the sampling frame was stratified by age (<65, 65-74, 75-84, 85+) and gender, yielding eight strata for each intervention and comparison group. We then selected a probability sample of 800 intervention and 800 comparison group beneficiaries. The survey sample was allocated to the gender and age group strata in proportion to the number in the intervention group population in that stratum, using an equal probability sample.

Beneficiaries who expired during the period covered by our data were included in the sampling frame but not included in the survey sample. Using beneficiary identification numbers in the Medicare claims data set that was originally used to select the sample, we applied April 7 (the earliest survey field date for administering patient surveys for all five Awardees) as the cut-off date to identify and remove all such deaths that occurred prior to the start of survey administration.

After the removal of decedents, a total of 1,369 beneficiaries (the intervention and comparison groups combined) remained for the survey. Of these beneficiaries, 542 completed at least one survey question, representing an overall response rate of 40 percent (42 percent and 37 percent for the intervention and comparison groups, respectively). If demographics were missing from a completed survey (respondent did not answer) we replaced the missing values for age and gender using information from that individual's Medicare administrative data. The table below presents the demographics of beneficiaries selected for the survey, and the respondents.

Table 5.1. Survey Response Rates

	Survey Sample Intervention *N*	Survey Sample Intervention %	Survey Sample Comparison *N*	Survey Sample Comparison %	Respondents Intervention *N*	Respondents Intervention %	Respondents Intervention Response Rate	Respondents Comparison *N*	Respondents Comparison %	Respondents Comparison Response Rate
Age										
Under 65	203	32%	267	36%	71	27%	35%	79	29%	30%
65-74	204	32%	241	33%	97	37%	48%	109	39%	45%
75-84	135	21%	147	20%	63	24%	47%	58	21%	39%
85+	88	14%	84	11%	34	13%	39%	31	11%	37%
Race										
White	417	66%	351	47%	191	72%	46%	186	67%	53%
Non-White	209	33%	260	35%	72	27%	34%	91	33%	35%
Unknown	4	1%	128	17%	2	1%	50%	0	0%	0%
Gender										
Male	290	46%	369	50%	128	48%	44%	141	51%	38%
Female	340	54%	370	50%	137	52%	40%	136	49%	37%
Total	630	-	739	-	265	-	42%	277	-	37%

Source: Abt Associates HCIA Patient Survey

Analytic Approach

As noted above, we assessed response rates for every survey item to identify any differential item nonresponse between the intervention and comparison groups. The coefficients of reliability (Cronbach's alpha) for the three sets of questions for Methodist Sepsis were at least 0.88 as shown in Table 5.2 below.

Table 5.2. Reliability Statistics

Question Set	Number of Survey Items	Cronbach's Alpha
Q3 through Q7	5	0.93
Q9A through Q9I	9	0.93
Q11A through Q11I	9	0.88

Source: Abt Associates HCIA Patient Survey

Results

This section presents results showing weighted frequency distributions, and other analyses discussed above, by respondents in the intervention and comparison groups.[80]

General Profile of Respondents

Respondents in the intervention group had slightly higher educational attainment than those in the comparison group (e.g. 25 percent vs. 19 percent had attained a college degree) (Table 5.3). There were no significant differences between intervention and comparison groups in race or ethnicity, however there were statistically significant differences regarding living arrangement and Medicaid/dual-eligibility ($p<0.10$).Just under half of respondents in the intervention group reported living with a spouse, while a smaller proportion (42 percent) of respondents in the comparison group reported living with a spouse. Also, 58 percent of respondents in the comparison group were eligible for both the Medicaid and Medicare programs, that is, dually eligible, while just half of respondents in the intervention group were dually eligible.[81]

Table 5.3. Demographic Profile of Respondents

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total respondents	265	100%	277	100%
Highest Grade Level Completed (Q31)				
Not high school grad	55	22%	48	19%
High school grad	72	31%	82	32%
Some college	55	22%	78	30%
College graduate	69	25%	56	19%

[80] Unweighted frequency distributions of responses to all survey questions in their original form are presented in Attachment 5.A. All estimates presented in the result section of this report have been weighted to reflect the intervention and comparison populations.

[81] Note: Medicaid/dual eligibility was obtained from Medicare administrative data.

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
With Whom Do You Live (Q32)				
Alone	41	17%	70	26%
With spouse	130	49%	118	42%
With family	60	26%	59	23%
With friends	3	1%	5	2%
Other residents	18	7%	16	7%
Ethnicity (Q33)				
Hispanic	58	25%	57	24%
Non-Hispanic	166	71%	177	70%
Not answered	9	4%	14	6%
Reported Race (Q34)				
White	180	72%	185	68%
Non-White	52	23%	68	27%
Preferred not answering	12	5%	12	5%
Medicaid-Eligible *				
No	134	49%	121	42%
Yes	131	51%	156	58%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

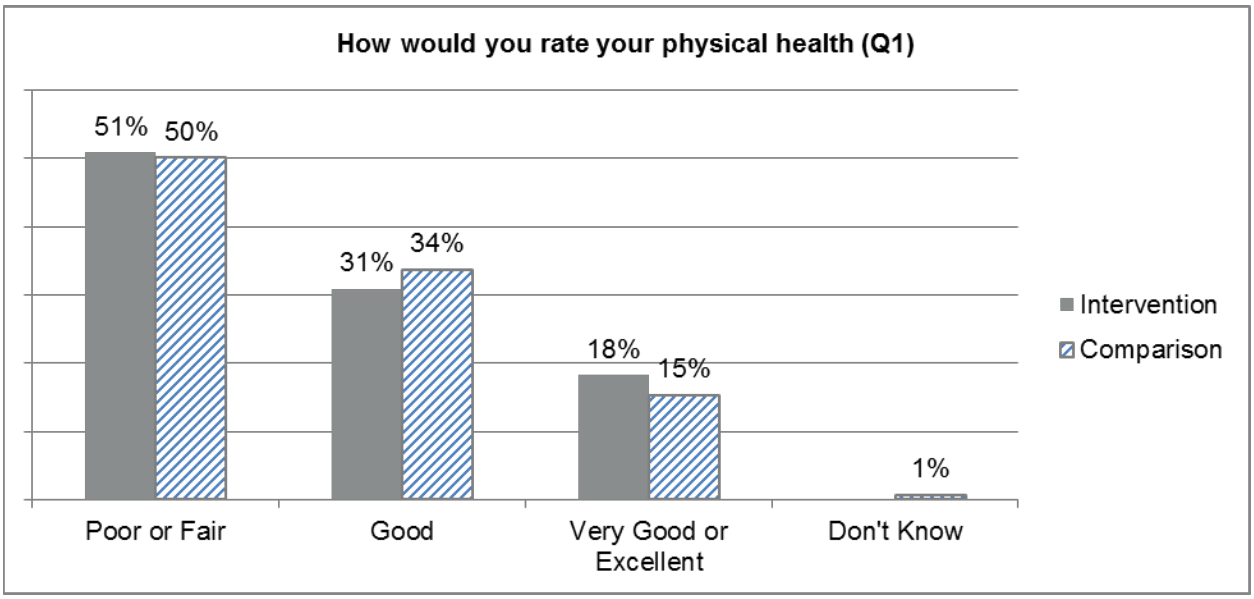
Respondents who indicated that English was not their preferred language were asked whether the facility staff spoke to them in their preferred language (Q27) and how often the respondents used an interpreter provided by the facility (Q28). Fifty respondents, about nine percent of all respondents, indicated that English was not their preferred language.[82]

Respondents' Health and Health-Related Quality of Life (Q3-Q12)

About half the respondents in both intervention and comparison groups reported that their physical health was good to excellent (Figure 5.1). Most respondents in both the intervention and comparison groups reported that their mental health was good to excellent, while 24 percent of intervention respondents and 30 percent of comparison respondents reported having poor mental health (Figure 5.2). None of the differences between intervention and comparison groups reported in Figure 5.2 were statistically significant.

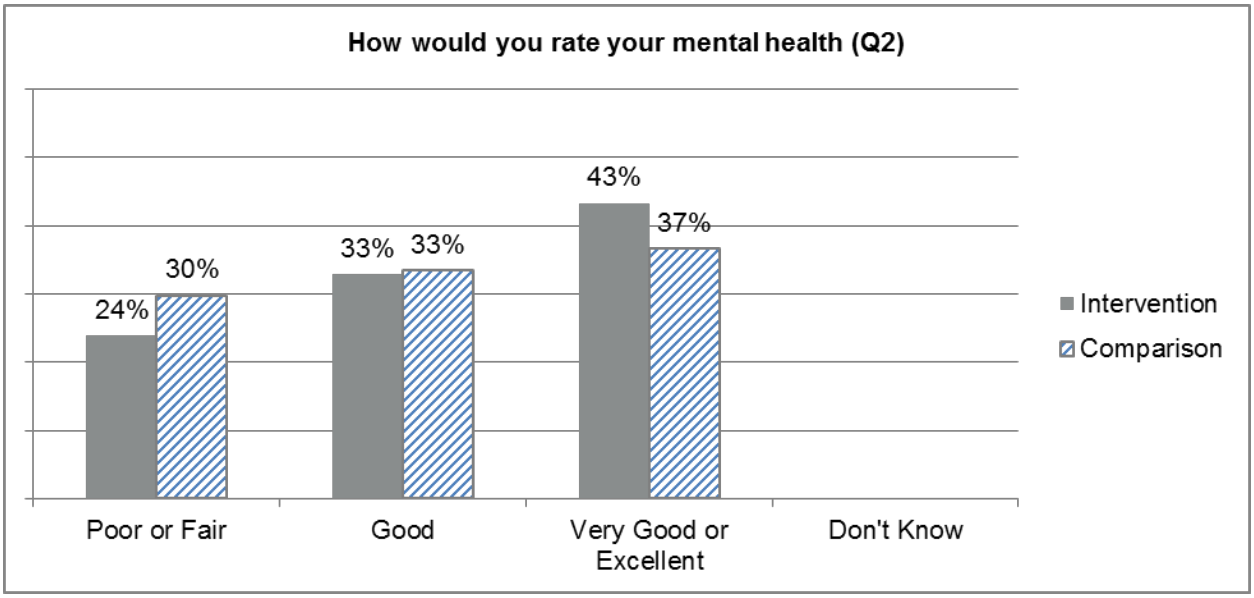
[82] For the two questions (Q27 and Q28) on preferred language of communication, we did not conduct tests of statistically significant differences in responses across the two analytic groups due to very small sample sizes in some table cells.

Figure 5.1. Respondents' Self-Reported Physical Health Status



Source: Abt Associates HCIA Patient Survey

Figure 5.2. Respondents' Self-Reported Mental Health Status

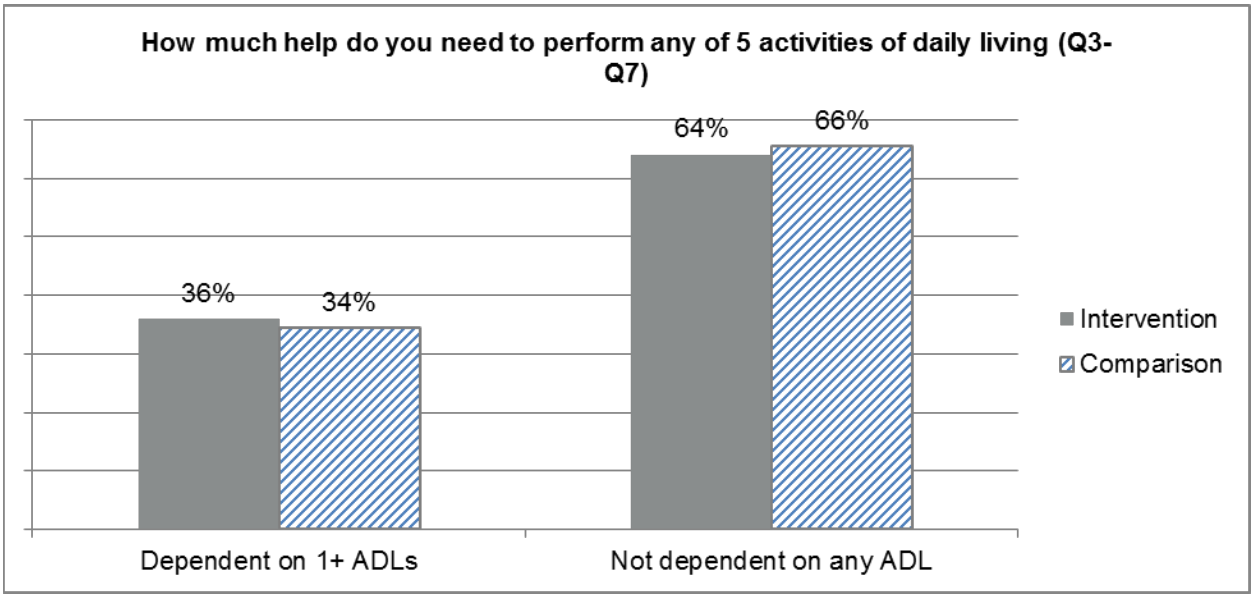


Source: Abt Associates HCIA Patient Survey

To assess functional status, respondents were asked how much help they needed in performing five activities such as putting on and taking off clothing, bathing, toileting, etc. (Q3-Q7). As described in the overall Analytic Approach section, these five items were combined into one index variable to compare overall functional status with respect to all five questions combined. About two-thirds of respondents in both intervention and comparison groups needed little or no help to perform any of the five activities (Figure 5.3). There were no statistically significant differences between the intervention and comparison

groups for the combined index variables or any of the five individual items (detailed results are presented in Tables 5.B.1 and 5.B.7 in Attachment 5.B).

Figure 5.3. Respondents' Index/Composite Functional Status

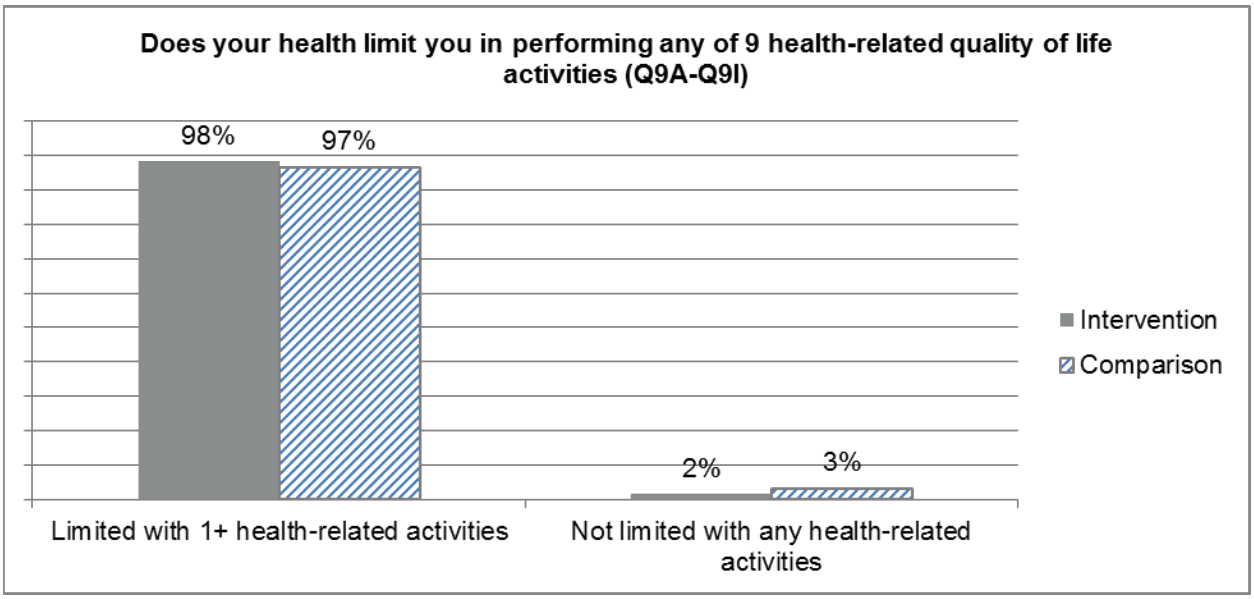


Source: Abt Associates HCIA Patient Survey

Nine questions (Q9A-Q9I) asked respondents whether their health limited their performance of certain activities like moving or pushing objects, climbing, walking, and so on. These nine items were combined into a single index variable to examine overall differences. As Figure 5.4 displays, there was no significant difference between the intervention and comparison groups as almost all respondents, in both groups, reported that they were limited in performing at least one of the nine activities.[83]

[83] We also created multiple categories indicating the number of activities in which respondents had limitations and considered alternative cut-off points for the categories, for example 1-2, 3-5, 6+. The results of this robustness check were substantially similar to the results presented in this report.

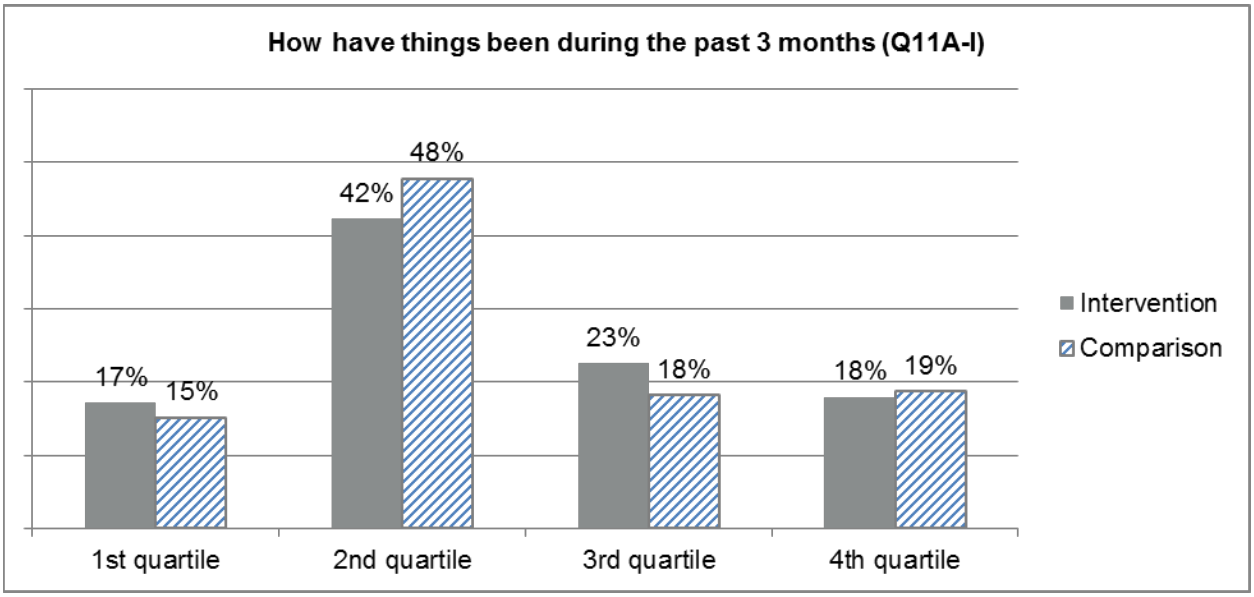
Figure 5.4. Respondents' Performance of Health-Related Quality of Life Activities



Source: Abt Associates HCIA Patient Survey

Figure 5.5 displays the perception of respondents regarding their overall mood as measured by the index/composite variable combining Q11_A through Q11_I. The observed differences between the intervention and comparison groups were not significant as approximately 60 percent of intervention and comparison group respondents indicated a poor mood (in the 1st or 2nd quartile) while the remaining 40 percent indicated a more positive mood (in the 3rd or 4th quartile).

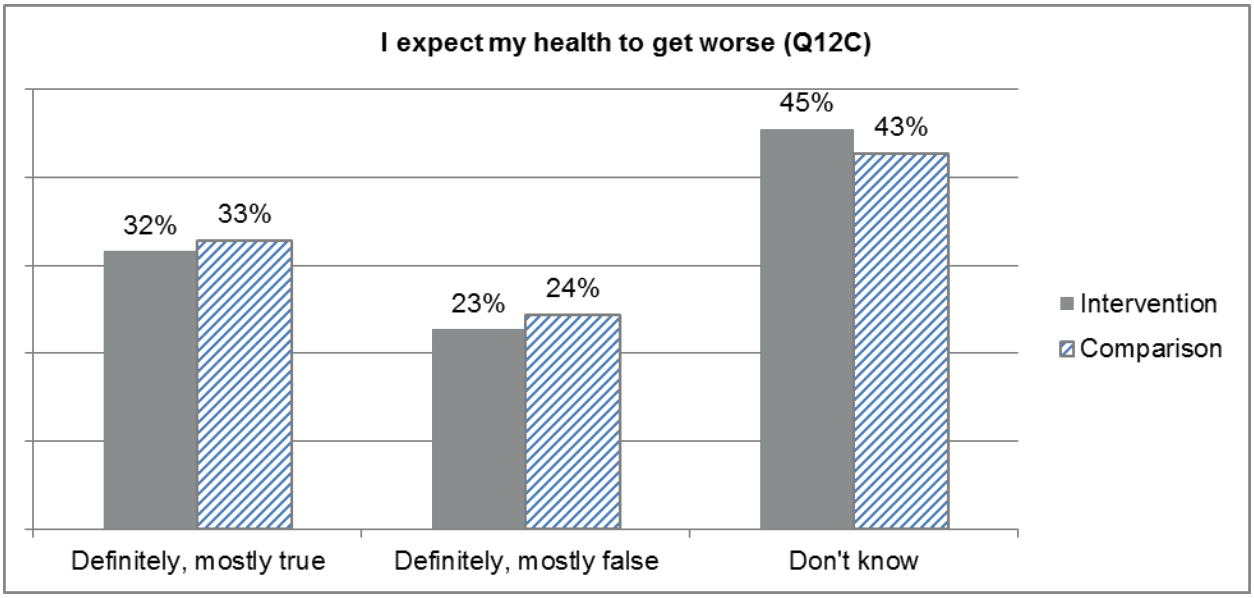
Figure 5.5. Respondents' Mood Index



Source: Abt Associates HCIA Patient Survey

Regarding respondents' outlook (or expectation) about their health (Q12_A-Q12D), respondents in both groups seemed unsure of their health outlook for all four questions, and there was no significant difference between intervention and comparison respondents. For example, Figure 5.6 shows a little over 40 percent of each group were uncertain about whether they expected their health to get worse (detailed results of other variables are presented in Table 5.B.3, Attachment 5.B).

Figure 5.6. Respondents' Expectation of Own Health

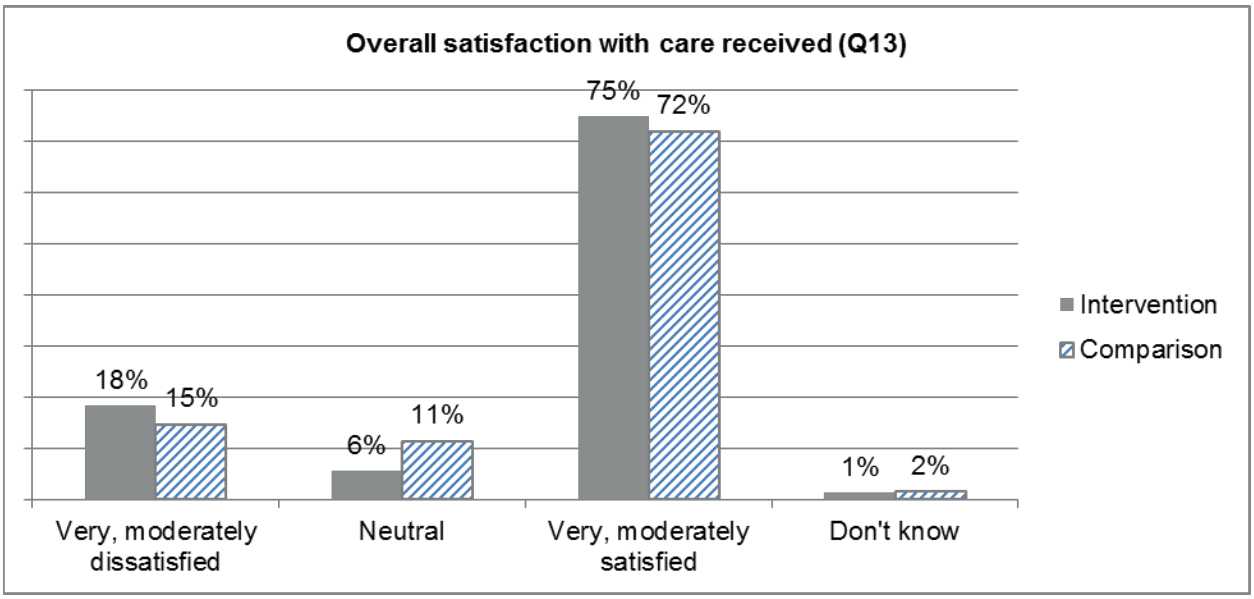


Source: Abt Associates HCIA Patient Survey

Satisfaction with Care/Care Experience (Q13-Q28)

As Figure 5.7 displays, roughly three-quarters of both intervention and comparison patients reported being very or moderately satisfied with the care they received. Less than a fifth of patients reported being very or moderately dissatisfied (18 percent of intervention, and 15 percent of comparison respondents) ($p<0.10$).

Figure 5.7. Satisfaction with Care Received



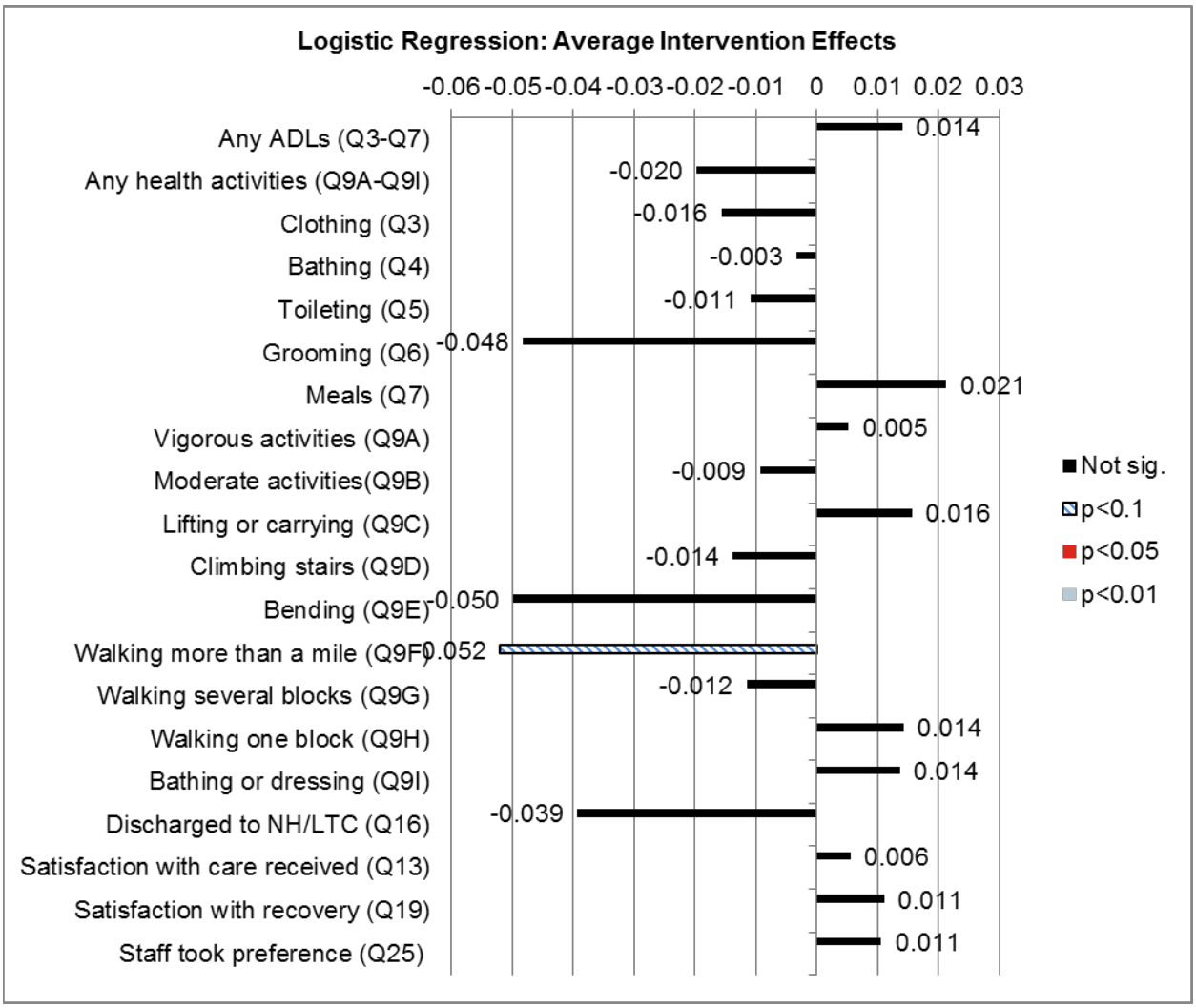
Source: Abt Associates HCIA Patient Survey

With respect to other questions relating to satisfaction with care and care experience, intervention and comparison respondents reported very similar responses, which were all statistically insignificant (detailed results are presented in Tables 5.B.4–5.B.6, Attachment 5.B).

Multivariate Logistic Regression Findings

We estimated multivariate logistic regression models for the functional status questions, discharge setting (or destination), as well as for overall satisfaction questions (Q13, Q19, and Q25) as described in the overall Analytic Approach section. Figure 5.8 presents the intervention effects, as measured by the average marginal effects, on these outcomes. Regression results indicate that being in the intervention group was associated with a five percent decreased probability of being able to walk more than one mile ($p<0.10$). There were no other significant regression results.

Figure 5.8. Logistic Regression: Average Intervention Effects



Source: Abt Associates HCIA Patient Survey

Conclusions

Overall, we observed no meaningful statistically significant differences between intervention and comparison survey respondents relating to health outcomes, health-related quality of life, satisfaction with care, or care experiences. Intervention and comparison respondents reported very similar responses across all these domains. However, findings from multivariate logistic regression models indicate that being in the intervention group was associated with lower probability of being able to walk more than a mile, several months after hospital discharge. We note that we've observed nothing in this or other evaluation analyses that indicates more limited mobility was due to the sepsis screening and treatment interventions.

The mostly insignificant findings are generally consistent with our analyses of claims-based outcomes, which did not find statistically significant results for the SERRI program. A number of factors may explain the lack of significant program impacts: i) the SERRI tool was not utilized in EDs and ICUs where it might have been most impactful; ii) prior sepsis programs had already been in place, and probably also existed in comparison hospitals, thus reducing any marginal effect of SERRI; and iii) patients exhibiting early signs of sepsis in post-acute settings were often transferred to acute care hospitals to receive treatment.

Attachment 5.A: Unweighted Frequency Distributions of all Survey Questions in their Original Form

Table 5.A.1. Health Outcomes

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Rate your physical health today (Q1)				
Excellent	14	5%	19	7%
Very Good	35	13%	23	8%
Good	80	30%	92	33%
Fair	79	30%	87	31%
Poor	45	17%	46	17%
Don't Know	0	0%	2	1%
Missing	12	5%	8	3%
Totals	265	100%	277	100%
Rate your mental health today (Q2)				
Excellent	50	19%	44	16%
Very Good	63	24%	58	21%
Good	83	31%	88	32%
Fair	39	15%	53	19%
Poor	18	7%	24	9%
Don't Know	0	0%	0	0%
Missing	12	5%	10	4%
Totals	265	100%	277	100%
How much help do you need putting on clothing (Q3)				
Total help	36	14%	32	12%
A lot	37	14%	28	10%
A little	45	17%	62	22%
None	137	52%	146	53%
Missing	10	4%	9	3%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much help do you need bathing (Q4)				
Total help	48	18%	42	15%
A lot	33	12%	31	11%
A little	43	16%	50	18%
None	129	49%	145	52%
Don't Know	1	0%	0	0%
Missing	11	4%	9	3%
Totals	265	100%	277	100%
How much help do you need toileting (Q5)				
Total help	38	14%	31	11%
A lot	21	8%	21	8%
A little	28	11%	36	13%
None	167	63%	179	65%
Don't Know	1	0%	1	0%
Missing	10	4%	9	3%
Totals	265	100%	277	100%
How much help do you need in personal grooming (Q6)				
Total help	27	10%	23	8%
A lot	19	7%	13	5%
A little	28	11%	26	9%
None	180	68%	205	74%
Don't Know	1	0%	1	0%
Missing	10	4%	9	3%
Totals	265	100%	277	100%
How much help do you need eating meals (Q7)				
Total help	14	5%	13	5%
A lot	14	5%	22	8%
A little	42	16%	31	11%
None	184	69%	201	73%
Don't Know	1	0%	0	0%
Missing	10	4%	10	4%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How much does pain or hurting limit day-to-day activities (Q8)				
Not at all	47	18%	41	15%
Slightly	60	23%	59	21%
Moderately	52	20%	67	24%
Quite a bit	60	23%	66	24%
Extremely	26	10%	29	10%
Don't Know	5	2%	3	1%
Missing	15	6%	12	4%
Totals	265	100%	277	100%

Table 5.A.2. Health-Related Quality of Life

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in vigorous activities (Q9A)				
Yes, limited a lot	203	77%	204	74%
Yes, limited a little	34	13%	47	17%
No, not limited at all	16	6%	17	6%
Don't Know	0	0%	0	0%
Missing	12	5%	9	3%
Totals	265	100%	277	100%
Does health now limit you in moderate activities (Q9B)				
Yes, limited a lot	152	57%	147	53%
Yes, limited a little	59	22%	80	29%
No, not limited at all	36	14%	41	15%
Don't Know	1	0%	0	0%
Missing	17	6%	9	3%
Totals	265	100%	277	100%
Does health now limit you in lifting or carrying groceries (Q9C)				
Yes, limited a lot	123	46%	115	42%
Yes, limited a little	67	25%	90	32%
No, not limited at all	61	23%	62	22%
Don't Know	0	0%	0	0%
Missing	14	5%	10	4%
Totals	265	100%	277	100%
Does health now limit you in climbing several flights of stairs (Q9D)				
Yes, limited a lot	158	60%	164	59%
Yes, limited a little	56	21%	58	21%
No, not limited at all	32	12%	42	15%
Don't Know	0	0%	1	0%
Missing	19	7%	12	4%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Does health now limit you in bending, kneeling, or stooping (Q9E)				
Yes, limited a lot	140	53%	133	48%
Yes, limited a little	79	30%	86	31%
No, not limited at all	32	12%	47	17%
Don't Know	0	0%	0	0%
Missing	14	5%	11	4%
Totals	265	100%	277	100%
Does health now limit you in walking more than a mile (Q9F)				
Yes, limited a lot	181	68%	183	66%
Yes, limited a little	47	18%	45	16%
No, not limited at all	22	8%	38	14%
Don't Know	0	0%	2	1%
Missing	15	6%	9	3%
Totals	265	100%	277	100%
Does health now limit you in walking several blocks (Q9G)				
Yes, limited a lot	152	57%	148	53%
Yes, limited a little	55	21%	67	24%
No, not limited at all	43	16%	50	18%
Don't Know	0	0%	0	0%
Missing	15	6%	12	4%
Totals	265	100%	277	100%
Does health now limit you in walking one block (Q9H)				
Yes, limited a lot	105	40%	103	37%
Yes, limited a little	63	24%	80	29%
No, not limited at all	82	31%	83	30%
Don't Know	1	0%	0	0%
Missing	14	5%	11	4%
Totals	265	100%	277	100%
Does health now limit you in bathing or dressing (Q9I)				
Yes, limited a lot	67	25%	56	20%
Yes, limited a little	68	26%	81	29%
No, not limited at all	117	44%	131	47%
Don't Know	0	0%	0	0%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Missing	13	5%	9	3%
Totals	265	100%	277	100%
Extent that physical health OR emotional problems interfered with social activities (Q10)				
Not at all	61	23%	62	22%
Slightly	49	18%	58	21%
Moderately	51	19%	53	19%
Quite a bit	47	18%	53	19%
Extremely	37	14%	34	12%
Don't Know	2	1%	1	0%
Missing	18	7%	16	6%
Totals	265	100%	277	100%
Felt full of pep during the past 3 months (Q11A)				
All of the time	5	2%	13	5%
Most of the time	32	12%	35	13%
A good bit of the time	34	13%	33	12%
Some of the time	69	26%	63	23%
A little of the time	53	20%	70	25%
None of the time	57	22%	50	18%
Don't Know	3	1%	5	2%
Missing	12	5%	8	3%
Totals	265	100%	277	100%
Have been a very nervous person during the past 3 months (Q11B)				
All of the time	9	3%	18	6%
Most of the time	18	7%	19	7%
A good bit of the time	16	6%	15	5%
Some of the time	49	18%	57	21%
A little of the time	65	25%	71	26%
None of the time	101	38%	94	34%
Don't Know	1	0%	0	0%
Missing	6	2%	3	1%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt down in the dumps during the past 3 months (Q11C)				
All of the time	6	2%	9	3%
Most of the time	17	6%	16	6%
A good bit of the time	21	8%	18	6%
Some of the time	38	14%	51	18%
A little of the time	50	19%	59	21%
None of the time	127	48%	119	43%
Don't Know	1	0%	1	0%
Missing	5	2%	4	1%
Totals	265	100%	277	100%
Felt calm and peaceful during the past 3 months (Q11D)				
All of the time	30	11%	20	7%
Most of the time	73	28%	77	28%
A good bit of the time	42	16%	31	11%
Some of the time	63	24%	69	25%
A little of the time	36	14%	50	18%
None of the time	16	6%	25	9%
Don't Know	1	0%	0	0%
Missing	4	2%	5	2%
Totals	265	100%	277	100%
Had a lot of energy during the past 3 months (Q11E)				
All of the time	8	3%	7	3%
Most of the time	33	12%	29	10%
A good bit of the time	25	9%	30	11%
Some of the time	61	23%	66	24%
A little of the time	62	23%	67	24%
None of the time	69	26%	73	26%
Don't Know	0	0%	2	1%
Missing	7	3%	3	1%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt downhearted during the past 3 months (Q11F)				
All of the time	7	3%	8	3%
Most of the time	20	8%	18	6%
A good bit of the time	17	6%	16	6%
Some of the time	49	18%	62	22%
A little of the time	86	32%	85	31%
None of the time	76	29%	84	30%
Don't Know	0	0%	1	0%
Missing	10	4%	3	1%
Totals	265	100%	277	100%
Felt worn out during the past 3 months (Q11G)				
All of the time	27	10%	26	9%
Most of the time	36	14%	34	12%
A good bit of the time	36	14%	33	12%
Some of the time	60	23%	77	28%
A little of the time	64	24%	63	23%
None of the time	32	12%	41	15%
Don't Know	1	0%	0	0%
Missing	9	3%	3	1%
Totals	265	100%	277	100%
Been happy during the past 3 months (Q11H)				
All of the time	28	11%	30	11%
Most of the time	86	32%	81	29%
A good bit of the time	44	17%	43	16%
Some of the time	52	20%	82	30%
A little of the time	31	12%	26	9%
None of the time	19	7%	10	4%
Don't Know	0	0%	1	0%
Missing	5	2%	4	1%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Felt tired during the past 3 months (Q11I)				
All of the time	37	14%	34	12%
Most of the time	53	20%	51	18%
A good bit of the time	29	11%	39	14%
Some of the time	93	35%	89	32%
A little of the time	36	14%	46	17%
None of the time	11	4%	14	5%
Don't Know	1	0%	2	1%
Missing	5	2%	2	1%
Totals	265	100%	277	100%
I get sick easier than other people (Q12A)				
Definitely true	35	13%	33	12%
Mostly true	65	25%	61	22%
Mostly false	52	20%	64	23%
Definitely false	6	2%	7	3%
Don't Know	100	38%	107	39%
Missing	7	3%	5	2%
Totals	265	100%	277	100%
I am as healthy as anybody I know (Q12B)				
Definitely true	23	9%	19	7%
Mostly true	57	22%	52	19%
Mostly false	66	25%	77	28%
Definitely false	13	5%	8	3%
Don't Know	101	38%	116	42%
Missing	5	2%	5	2%
Totals	265	100%	277	100%
I expect my health to get worse (Q12C)				
Definitely true	26	10%	31	11%
Mostly true	54	20%	57	21%
Mostly false	54	20%	52	19%
Definitely false	6	2%	14	5%
Don't Know	120	45%	118	43%
Missing	5	2%	5	2%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
My health is excellent (Q12D)				
Definitely true	12	5%	13	5%
Mostly true	62	23%	52	19%
Mostly false	85	32%	98	35%
Definitely false	16	6%	20	7%
Don't Know	85	32%	89	32%
Missing	5	2%	5	2%
Totals	265	100%	277	100%

Table 5.A.3. Satisfaction with Care

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
How satisfied are you with the care you received (Q13)				
Very dissatisfied	31	12%	23	8%
Moderately dissatisfied	16	6%	18	6%
Neutral	13	5%	30	11%
Moderately satisfied	48	18%	76	27%
Very satisfied	152	57%	121	44%
Don't Know	3	1%	4	1%
Missing	2	1%	5	2%
Totals	265	100%	277	100%
How often did you feel like complaining about the care you received (Q14)				
Never	110	42%	116	42%
Rarely	69	26%	63	23%
Sometimes	51	19%	65	23%
Mostly	23	9%	16	6%
Always	10	4%	12	4%
Don't Know	0	0%	1	0%
Missing	2	1%	4	1%
Totals	265	100%	277	100%
How often was your pain well controlled (Q15)				
Never	6	2%	6	2%
Sometimes	23	9%	12	4%
Usually	36	14%	36	13%
Always	91	34%	108	39%
Did not have pain	87	33%	93	34%
Not applicable	15	6%	17	6%
Don't Know	2	1%	0	0%
Missing	5	2%	5	2%
Totals	265	100%	277	100%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
After leaving the facility, I stayed in: (Q16)				
Own home	192	72%	185	67%
Someone else's home	17	6%	23	8%
Nursing home	40	15%	46	17%
Long-term care hospital	7	3%	13	5%
Other	10	4%	5	2%
Did staff talk about needed help when you left the facility (Q17)				
Yes	187	71%	206	74%
No	47	18%	46	17%
Don't Know	28	11%	20	7%
Missing	3	1%	5	2%
Totals	265	100%	277	100%
Did you get information about what symptoms to look out for (Q18)				
Yes	185	70%	188	68%
No	50	19%	48	17%
Don't Know	29	11%	36	13%
Missing	1	0%	5	2%
Totals	265	100%	277	100%
How satisfied are you with your recovery since you left the facility (Q19)				
Not at all satisfied	16	6%	21	8%
Slightly satisfied	8	3%	21	8%
Moderately satisfied	69	26%	60	22%
Quite a bit satisfied	62	23%	84	30%
Extremely satisfied	90	34%	75	27%
Don't Know	6	2%	7	3%
Missing	14	5%	9	3%
Totals	265	100%	277	100%

Table 5.A.4. Care Experience

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted "N	Comparison Group Percent
How often did doctors and nurses explain things in a way you could understand (Q20)				
Never	11	4%	1	0%
Sometimes	31	12%	52	19%
Usually	89	34%	87	31%
Always	124	47%	131	47%
Don't Know	2	1%	0	0%
Missing	8	3%	6	2%
Totals	265	100%	277	100%
How often did doctors and nurses encourage you to ask questions (Q21)				
Never	28	11%	33	12%
Sometimes	47	18%	63	23%
Usually	64	24%	68	25%
Always	115	43%	106	38%
Don't Know	2	1%	0	0%
Missing	9	3%	7	3%
Totals	265	100%	277	100%
Did you receive the services you thought that you needed (Q22)				
Yes	209	79%	223	81%
No	28	11%	25	9%
Don't Know	18	7%	23	8%
Missing	10	4%	6	2%
Totals	265	100%	277	100%
Did you feel the care you received was well coordinated (Q23)				
Yes	204	77%	212	77%
No	34	13%	35	13%
Don't Know	15	6%	21	8%
Missing	12	5%	9	3%
Totals	265	100%	277	100%
Did you seem to get conflicting advice from different health care providers (Q24)				
Yes	59	22%	72	26%
No	168	63%	176	64%
Don't Know	29	11%	24	9%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted "N	Comparison Group Percent
Missing	9	3%	5	2%
Totals	265	100%	277	100%
The facility staff took my preferences into account regarding services after discharge (Q25)				
Strongly disagree	13	5%	19	7%
Disagree	18	7%	19	7%
Agree	112	42%	128	46%
Strongly agree	61	23%	57	21%
Not applicable	23	9%	11	4%
Don't Know/Don't Remember	27	10%	40	14%
Missing	11	4%	3	1%
Totals	265	100%	277	100%
What is your preferred language when speaking (Q26)				
English	193	73%	209	75%
Other	25	9%	25	9%
Don't Know	0	0%	1	0%
Missing	47	18%	42	15%
Totals	265	100%	277	100%
How often did staff speak to you in your preferred language (Q27)				
Never	3	4%	6	9%
Sometimes	8	11%	14	21%
Always	20	28%	15	22%
Missing	41	57%	33	49%
Totals	72	100%	68	100%
How often did you use an interpreter provided by facility (Q28)				
Never, did not need one	14	19%	13	19%
Never, was not offered one	1	1%	0	0%
Never, family interpreter	9	13%	11	16%
Sometimes	2	3%	8	12%
Always	6	8%	3	4%
Missing	40	56%	33	49%
Totals	72	100%	68	100%

Table 5.A.5. Demographic Characteristics

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Age (Q29)				
54 or younger	37	14%	40	14%
55 to 64	36	14%	37	13%
65 to 74	91	34%	107	39%
75 or older	82	31%	80	29%
Missing	19	7%	13	5%
Totals	265	100%	277	100%
Gender (Q30)				
Male	116	44%	129	47%
Female	131	49%	135	49%
Missing	18	7%	13	5%
Totals	265	100%	277	100%
Education (Q31)				
8th grade or less	30	11%	32	12%
Some high school, but did not graduate	25	9%	16	6%
High school graduate or GED	72	27%	82	30%
Some college or 2-year degree	55	21%	78	28%
4-year college degree	31	12%	22	8%
More than a 4-year college degree	38	14%	34	12%
Don't Know	1	0%	1	0%
Missing	13	5%	12	4%
Totals	265	100%	277	100%
With whom do you live: (Q32)				
Alone	41	15%	70	25%
With spouse or partner	130	49%	118	43%
With other family members	64	24%	60	22%
With non-relatives	3	1%	5	2%
Residential setting	18	7%	16	6%

	Intervention Group Unweighted N	Intervention Group Percent	Comparison Group Unweighted N	Comparison Group Percent
Hispanic origin: (Q33)				
No	166	63%	178	64%
Yes, Mexican or Chicano	38	14%	39	14%
Yes, Puerto Rican	1	0%	2	1%
Yes, Cuban	0	0%	3	1%
Yes, another Hispanic origin	23	9%	18	6%
Prefer not to answer	9	3%	14	5%
Race: (Q34)				
White	181	68%	186	67%
Black or African American	36	14%	56	20%
American Indian or Alaska Native	6	2%	3	1%
Asian or Asian American	10	4%	9	3%
Native Hawaiian or Other Pacific Islander	0	0%	1	0%
Prefer not to answer	12		12	4%

Source: Abt Associates HCIA Patient Survey.

Attachment 5.B: Descriptive Statistics and Multivariate Logistic Regression Results

5.B.1 Respondents' Health and Health-Related Quality of Life

Table 5.B.1. Self-Reported Health and Functional Status (Q1-Q8)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
How would you rate your physical health (Q1)				
Poor or Fair	124	51%	133	50%
Good	80	31%	92	34%
Very Good or Excellent	49	18%	42	15%
Don't Know	0	0%	2	1%
How would you rate your mental health (Q2)				
Poor or Fair	57	24%	77	30%
Good	83	33%	88	33%
Very Good or Excellent	113	43%	102	37%
Don't Know	0	0%	0	0%
How much help do you need to perform any of 5 activities of daily living (Q3-Q7)				
Dependent on 1+ ADLs	89	36%	88	34%
Not dependent on any ADL	166	64%	181	66%
How much does pain limit activities (Q8)				
Extreme, quite a bit	86	36%	95	37%
Slight, moderate	112	44%	126	47%
Not at all	47	18%	41	15%
Don't know	5	2%	3	1%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 5.B.2. Performance of Health-Related Quality of Life Activities (Q9-Q10)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Does your health limit you in performing any of 9 health-related quality of life activities (Q9A-Q9I)?				
Limited with 1+ health-related activities	248	98%	260	97%
Not limited with any health-related activities	5	2%	10	3%
To what extent have physical health or emotional problems interfered with social activities (Q10)				
Extreme, quite a bit	84	35%	87	35%
Slight, moderate	100	41%	111	43%
Not at all	61	23%	62	22%
Don't know	2	1%	1	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 5.B.3. Perception about Own Health (Q11-Q12)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
How have things been during the past 3 months (Q11A-I)				
1st quartile	42	17%	39	15%
2nd quartile	111	42%	130	48%
3rd quartile	59	23%	52	18%
4th quartile	50	18%	54	19%
I get sick easier than other people (Q12A)				
Definitely, mostly true	100	41%	94	37%
Definitely, mostly false	58	21%	71	25%
Don't know	100	38%	107	38%
I am as healthy as anybody I know (Q12B)				
Definitely, mostly true	80	29%	71	25%
Definitely, mostly false	79	32%	85	33%
Don't know	101	39%	116	42%
I expect my health to get worse (Q12C)				
Definitely, mostly true	80	32%	88	33%
Definitely, mostly false	60	23%	66	24%
Don't know	120	45%	118	43%
My health is excellent (Q12D) *				
Definitely, mostly true	74	27%	65	23%
Definitely, mostly false	101	41%	118	45%
Don't know	85	32%	89	32%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

5.B.2 Satisfaction with Care/Care Experience

Table 5.B.4. Perception about Care Process and Transition (Q13-Q19)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
Overall satisfaction with care received (Q13) *				
Very, moderately dissatisfied	47	18%	41	15%
Neutral	13	6%	30	11%
Very, moderately satisfied	200	75%	197	72%
Don't know	3	1%	4	2%
How often did you feel like complaining about the care received (Q14)				
Mostly or always	33	13%	28	11%
Sometimes	51	19%	65	24%
Rarely or never	179	68%	179	65%
Don't know	0	0%	1	0%
How often was your pain well controlled (Q15)				
Rarely or never	6	3%	6	2%
Sometimes	23	9%	12	5%
Mostly or always	127	49%	144	55%
Don't know	2	1%	0	0%
No pain/NA	102	38%	110	38%
Discharge setting (Q16) ***				
Non-institutional	208	79%	208	77%
NH/LTC Hospital	55	21%	63	23%
Did staff talk about having help after discharge (Q17) *				
Yes	187	71%	206	76%
No	47	19%	46	17%
Don't Know	28	10%	20	7%
Did you get information on health problems after discharge (Q18)				
Yes	185	71%	188	70%
No	50	19%	48	17%
Don't Know	29	10%	36	13%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Satisfaction with recovery since discharge (Q19) ***				
Not satisfied	16	7%	21	8%
Moderately satisfied	77	31%	81	31%
Very satisfied	152	60%	159	58%
Don't know	6	2%	7	3%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 5.B.5. Perception about Care Access and Involvement (Q20-Q25)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
How often did staff explain things understandably (Q20)				
Never	11	5%	1	0%
Sometimes	31	12%	52	20%
Usually or always	213	82%	218	80%
Don't know	2	1%	0	0%
How often did staff encourage questions (Q21) ***				
Never	28	11%	33	12%
Sometimes	47	18%	63	23%
Usually or always	179	70%	174	65%
Don't know	2	1%	0	0%
Did you receive needed services (Q22) ***				
Yes	209	82%	223	82%
No	28	11%	25	10%
Don't Know	18	7%	23	8%
Did you feel that care was well coordinated (Q23)				
Yes	204	80%	212	79%
No	34	14%	35	13%
Don't Know	15	6%	21	8%
Did you get conflicting advice from providers (Q24)				
Yes	59	24%	72	27%
No	168	65%	176	64%
Don't Know	29	11%	24	9%
Staff took my preferences into account regarding services after discharge (Q25)				
Disagree	31	13%	38	13%
Agree	173	68%	185	69%
Neutral	23	8%	11	4%
Don't Know	27	11%	40	14%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Table 5.B.6. Access and Communication (Q27-Q28)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
How often did staff speak to you in your preferred language (Q27)				
Never	3	10%	6	16%
Sometimes	8	25%	14	42%
Always	20	65%	15	42%
Don't Know	0	0%	0	0%
How often did you use an interpreter provided by the hospital (Q28)				
Not needed	23	72%	24	64%
Not offered	1	3%	0	0%
Sometimes offered	2	6%	8	26%
Always offered	6	19%	3	10%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

5.B.3 Individual Functional Status

Table 5.B.7. Individual Functional Status Items: ADLs (Q3-Q7)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
How much help needed with clothing (Q3)				
Total or lot of help	73	29%	60	23%
Little or no help	182	71%	208	77%
How much help needed with bathing (Q4)				
Total or lot of help	81	33%	73	28%
Little or no help	172	67%	195	72%
Don't know	1	0%	0	0%
How much help needed with toileting (Q5)				
Total or lot of help	59	24%	52	20%
Little or no help	195	76%	215	79%
Don't know	1	0%	1	1%
How much help needed with grooming (Q6)				
Total or lot of help	46	19%	36	14%
Little or no help	208	81%	231	86%
Don't know	1	0%	1	0%
How much help needed with eating meals (Q7)				
Total or lot of help	28	12%	35	13%
Little or no help	226	88%	232	87%
Don't know	1	0%	0	0%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

5.B.4 Individual Health-Related Quality of Life Activities

Table 5.B.8. Individual Health-Related Quality of Life Activities (Q9A-Q9I)

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Total Respondents	265	100%	277	100%
Limited in vigorous activities (Q9A)				
Limited	237	94%	251	94%
Not limited	16	6%	17	6%
Don't know	0	0%	0	0%
Limited in moderate activities (Q9B)				
Limited	211	86%	227	85%
Not limited	36	13%	41	15%
Don't know	1	1%	0	0%
Limited in lifting or carrying (Q9C)				
Limited	190	77%	205	78%
Not limited	61	23%	62	22%
Don't know	0	0%	0	0%
Limited in climbing stairs (Q9D)				
Limited	214	88%	222	85%
Not limited	32	12%	42	15%
Don't know	0	0%	1	0%
Limited in bending (Q9E)				
Limited	219	88%	219	83%
Not limited	32	12%	47	17%
Don't know	0	0%	0	0%
Limited in walking more than a mile (Q9F)				
Limited	228	92%	228	85%
Not limited	22	8%	38	14%
Don't know	0	0%	2	1%
Limited in walking several blocks (Q9G)				
Limited	207	85%	215	83%
Not limited	43	15%	50	17%
Don't know	0	0%	0	0%

	Intervention Group Survey Respondents n	Intervention Group Weighted Distribution %	Comparison Group Survey Respondents n	Comparison Group Weighted Distribution %
Limited in walking one block (Q9H)				
Limited	168	69%	183	70%
Not limited	82	30%	83	30%
Don't know	1	1%	0	0%
Limited in bathing or dressing (Q9I)				
Limited	135	55%	137	53%
Not limited	117	45%	131	47%

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

5.B.5 Multivariate Logistic Regression: Intervention Effects

Table 5.B.9. Multivariate Logistic Regression: Intervention Effects

	Sample Size n	Average Marginal Effect	Confidence Limits Lower	Confidence Limits Upper	p-Value
Index/Composite Functional Status					
Needs little or no help performing any ADLs (Q3-Q7)	452	0.014	-0.070	0.099	0.743
Needs little or no help performing any health-related quality of life activities (Q9A-Q9I)	412	-0.020	-0.051	0.011	0.212
Individual Functional Status					
Needs little or no help with clothing (Q3)	445	-0.016	-0.095	0.064	0.698
Needs little or no help with bathing (Q4)	450	-0.003	-0.085	0.078	0.936
Needs little or no help with toileting (Q5)	444	-0.011	-0.086	0.065	0.779
Needs little or no help with grooming (Q6)	444	-0.048	-0.113	0.017	0.144
Needs little or no help with eating meals (Q7)	450	0.021	-0.043	0.085	0.512
Not limited in vigorous activities (Q9A)	443	0.005	-0.038	0.049	0.810
Not limited in moderate activities(Q9B)	438	-0.009	-0.072	0.053	0.769
Not limited in lifting or carrying (Q9C)	440	0.016	-0.058	0.090	0.677
Not limited in climbing stairs (Q9D)	434	-0.014	-0.078	0.051	0.675
Not limited in bending (Q9E)	439	-0.050	-0.118	0.018	0.152
Not limited in walking more than a mile (Q9F)	440	-0.052 *	-0.110	0.006	0.078
Not limited in walking several blocks (Q9G)	438	-0.012	-0.079	0.056	0.736
Not limited in walking one block (Q9H)	438	0.014	-0.070	0.098	0.737
Not limited in bathing or dressing (Q9I)	442	0.014	-0.076	0.103	0.766
Discharge Destination					
Discharged to NH/LTC Hospital (Q16)	453	-0.039	-0.109	0.030	0.269
Overall Satisfaction Rating					
Satisfaction with care received (Q13)	460	0.006	-0.078	0.089	0.897
Satisfaction with recovery since discharge (Q19)	440	0.011	-0.052	0.074	0.729
Staff took patient's preference into account (Q25)	453	0.011	-0.078	0.099	0.814

Source: Abt Associates HCIA Patient Survey

*p<0.10 **p<0.05 ***p<0.01

Appendix C.1

Sources of Items Selected for Patient Survey

Domains and Survey Item Sources

I. Health Outcomes

PROMIS: Patient Reported Outcomes Measurement Information System, NIH.[84] Ten-item global health patient-reported measure.

MDS 3.0.[85] A self-reported measure of pain.

Boston University AM-PAC Daily Activities "6 Clicks" Inpatient Short Form:[86] Boston University Activity Measure for Post Acute Care™; **CMS DOTPA** short form Public Domain Version, NQF #0429, 0430. Recommended as an Awardee self-monitoring measure and as a CMMI priority measure. A functional status assessment for post-acute care patients across diagnoses, conditions, and settings.

II. Health-Related Quality of Life (HRQoL)

HRQoL:[87] The RAND-36 measure of health-related quality of life is self-administered and assesses eight health concepts.

III. Satisfaction with Care

H CAHPS®:[88] Hospital CAHPS, AHRQ. Recommended as an Awardee self-monitoring measure. Measures adult inpatients' perceptions of their hospital.

CPoCQ:[89] Client Perception of Coordination Questionnaire. Self-assessment of care coordination. http://intqhc.oxfordjournals.org/content/15/4/309.full.pdf+html

IV. Care Experience

H CAHPS®: Hospital CAHPS, AHRQ. Recommended as an Awardee self-monitoring measure. Measures adult inpatients' perceptions of their hospital.

CAHPS®:[90] **Consumer Assessment of Healthcare Providers and Systems**, AHRQ NQF# 0005-0009, 0517, 0691-0693, 0258. Recommended as an Awardee self-monitoring measure and as a CMMI priority measure. Consumers and patients report on and evaluate their experiences with health care.

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84 http://www.nihpromis.org/measures/instrumentoverview

85 https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursinghomeQualityInits/MDS30RAIManual.html

86 Boston University Activity Measure for Post Acute CareTM. AM-PAC Short Form Manual ©2007 (revised 2/1/13), Trustees of Boston University, under license to CREcare, LLC.

87 Hays, R. D. & Morales, L. S. (2001). The RAND-36 measure of health-related quality of life. The Finnish Medical Society Duodecim, Annuals of Medicine, 33, 350-357.

88 https://www.cahps.ahrq.gov/

89 http://intqhc.oxfordjournals.org/content/15/4/309.full.pdf+html

CPoCQ:[91] Client Perception of Coordination Questionnaire. Self-assessment of care coordination. http://intqhc.oxfordjournals.org/content/15/4/309.full.pdf+html

CTM®-3:[92] Three-Item Care Transition Measure, CMS, NQF #0228. Recommended as an Awardee self-monitoring measure and as a CMMI priority measure. Self-reported measure of the quality of preparations for care transitions.

V. About You

Health and Human Services (HHS) Standards:[93] U.S. Department HHS provides standards for data collection for race, ethnicity, sex, primary language, and disability status.

CAHPS:[94] Experience of Care and Health Outcomes Survey, AHRQ CAHPS. Recommended as an Awardee self-monitoring measure. Measures consumers' ratings of their behavioral health treatment.

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90 https://www.cahps.ahrq.gov/

91 http://intqhc.oxfordjournals.org/content/15/4/309.full.pdf+html

92 Coleman, E. http://www.caretransitions.org/documents/CTM_FAQs.pdf

93 http://aspe.hhs.gov/basic-report/hhs-implementation-guidance-data-collection-standards-race-ethnicity-sex-primary-language-and-disability-status

94 https://www.cahps.ahrq.gov/

Appendix C.2

Hospital Settings Evaluation Patient Survey

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES

Please indicate who is completing this survey.

- ☐ Person named in the cover letter
- ☐ Person named in the cover letter, with help from a family member, friend or caregiver who is knowledgeable about the care they received and their experiences
- ☐ A family member, friend, or caregiver of the person named in the cover letter who is knowledgeable about the care they received and their experiences
- ☐ Someone who is not family, friend, or caregiver of the person named in the cover letter who is knowledgeable about the care they received and their experiences
- ☐ If the person to whom this survey was mailed cannot complete the survey, and there is no one else who can do so for him or her, please check this box and return the blank survey in the enclosed postage-paid envelope. Thank you.

Instructions:

- Please read each question carefully and respond by shading the circle or box next to the response that most closely represents your opinion.
- Please shade only one circle for each question, unless it tells you to "Mark all that apply."
- While you can use a pen, please use a PENCIL in case you want to change your answer.
- Please do NOT use felt tip pens.
- Please erase cleanly or white out any marks you wish to change.
- Please do not make any stray marks on the form.

We are interested in the quality of care you received in the facility listed in the cover letter. We understand that there were probably many doctors and nurses and other staff involved in caring for you or your family member during that time in the facility. We also understand that this was probably a very difficult time, but would appreciate you taking the time to provide us with your opinions. We know that there may be exceptions but we are interested in your overall assessment of the quality of care the facility provided. Please take a moment to tell us what we did well and what we could have done better to improve your experience. Please be assured that all responses are confidential.

I. Health Outcomes

In general:	Excellent	Very Good	Good	Fair	Poor	Don't Know
1. How would you rate your physical health today?	☐	☐	☐	☐	☐	
2. How would you rate your mental health today, including your mood and your ability to think?	☐	☐	☐	☐	☐	

How much help from another person do you currently need…

	Total help	A lot	A little	None
3. Putting on and taking off regular clothing?	☐	☐	☐	☐
4. Bathing (including washing, rinsing, drying)?	☐	☐	☐	☐
5. Toileting, which includes using a toilet, bedpan or urinal?	☐	☐	☐	☐
6. Taking care of personal grooming such as brushing teeth?	☐	☐	☐	☐
7. Eating meals?	☐	☐	☐	☐

8. How much does pain or hurting limit your day-to-day activities?
   - ☐ Not at all
   - ☐ Slightly
   - ☐ Moderately
   - ☐ Quite a bit
   - ☐ Extremely
   - ☐ Don't know

II. Health-Related Quality of Life

9. Does your health now limit you in the following activities?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. ***Vigorous activities***, such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
b. ***Moderate activities***, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐	☐	☐
c. Lifting or carrying groceries	☐	☐	☐
d. Climbing ***several*** flights of stairs	☐	☐	☐
e. Bending, kneeling, or stooping	☐	☐	☐
f. Walking ***more than a mile***	☐	☐	☐
g. Walking ***several blocks***	☐	☐	☐
h. Walking ***one block***	☐	☐	☐
i. Bathing or dressing	☐	☐	☐

10. During the ***past 3 months***, to what extent has your physical health OR emotional problems interfered with normal social activities with family, friends, neighbors, or groups?
    - ☐ Not at all
    - ☐ Slightly
    - ☐ Moderately
    - ☐ Quite a bit
    - ☐ Extremely

11. The following questions are about how you feel and how things have been with you during the ***past 3 months***.

During the Past 3 Months:	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
a. Have you felt full of pep?	☐	☐	☐	☐	☐	☐
b. Have you been a very nervous person?	☐	☐	☐	☐	☐	☐

During the Past 3 Months:	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
c. Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
d. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
e. Have you had a lot of energy?	☐	☐	☐	☐	☐	☐
f. Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
g. Have you felt worn out?	☐	☐	☐	☐	☐	☐
h. Have you been happy?	☐	☐	☐	☐	☐	☐
i. Have you felt tired?	☐	☐	☐	☐	☐	☐

12. Please choose the answer that best describes how ***true*** or ***false*** each of the following statements is for you/the patient.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
j. I seem to get sick a little easier than other people	☐	☐	☐	☐	☐
k. I am as healthy as anybody I know	☐	☐	☐	☐	☐
l. I expect my health to get worse	☐	☐	☐	☐	☐
m. My health is excellent	☐	☐	☐	☐	☐

III. Satisfaction with Care

Please refer to the cover letter and answer the following questions about your experiences at the facility during the dates named in the letter. Do not include any other facility visits/stays in your answers.

13. Overall, how satisfied are you with the care you received?
    - ☐ Very dissatisfied
    - ☐ Moderately dissatisfied
    - ☐ Neutral
    - ☐ Moderately satisfied
    - ☐ Very satisfied
    - ☐ Don't Know

	Never	Rarely	Sometimes	Mostly	Always
14. How often did you feel like complaining about the care you received during that facility visit/stay?	☐	☐	☐	☐	☐
15. During this facility stay/visit, how often was your pain well controlled?	☐	☐	☐	☐	☐

16. After you left the facility, did you stay in your own home, someone else's home, or another health care facility?
    - ☐ Own home
    - ☐ Someone else's home
    - ☐ Nursing Home (including Rehabilitation, skilled nursing facility)
    - ☐ Long-term care hospital
    - ☐ Other

	Yes	No	Don't Know
17. Did doctors, nurses or other facility staff talk with you about whether you would have the help you needed when you left the facility?	☐	☐	☐
18. Did you get information in writing about what symptoms or health problems to look out for after you left the facility?	☐	☐	☐

19. Overall, how satisfied are you with your recovery **since you left the facility?**
    - ☐ Not at all satisfied
    - ☐ Slightly satisfied
    - ☐ Moderately satisfied
    - ☐ Quite a bit satisfied
    - ☐ Extremely satisfied
    - ☐ Don't Know

IV. Care Experience

	Never	Sometimes	Usually	Always
20. How often did doctors and nurses explain things in a way you could understand?	☐	☐	☐	☐
21. How often did doctors and nurses encourage you to ask questions?	☐	☐	☐	☐

	Yes	No	Don't Know
22. During and after your facility stay/visit, did you receive the services you thought that you needed?	☐	☐	☐
23. Did you feel the care you received was well coordinated?	☐	☐	☐
24. Did you seem to get conflicting advice from different health care providers?	☐	☐	☐

25. How much do you agree or disagree with this statement? "The facility staff took my preferences and those of my family or caregiver into account in deciding what health care services I would have when I left the facility."
    - ☐ Strongly disagree
    - ☐ Disagree
    - ☐ Agree
    - ☐ Strongly agree
    - ☐ Don't know/Don't remember
    - ☐ Not applicable

Again, if you are filling out the survey on behalf of the person to whom it was mailed, please answer all questions about **that person** – not about yourself.

26. What is your preferred language when speaking?
    - ☐ English ➔ If English, please go to Question #29
    - ☐ Other

27. During this hospital stay/visit, how often did hospital staff speak to you in your preferred language?
    - ☐ Never
    - ☐ Sometimes
    - ☐ Always

An interpreter is someone who helps you talk with others who do not speak your language. Interpreters can include hospital staff or telephone interpreters.

28. During this hospital stay/visit, how often did you use an interpreter provided by the ***hospital*** to help you talk with hospital staff?
    - ☐ Never, I did not need one
    - ☐ Never, I was not offered one
    - ☐ Never, a family member/friend/advocate served as my interpreter
    - ☐ Sometimes
    - ☐ Always

V. About You

29. What is your age now?
    - ☐ 54 or younger
    - ☐ 55 to 64
    - ☐ 65 to 74
    - ☐ 75 or older

30. Are you male or female?
    - ☐ Male
    - ☐ Female

31. What is the highest grade or level of school that you completed?
    - ☐ 8th grade or less
    - ☐ Some high school, but did not graduate
    - ☐ High school graduate or GED
    - ☐ Some college or 2-year degree
    - ☐ 4-year college degree
    - ☐ More than 4-year college degree

32. With whom, if anyone, do you live?
- ☐ Alone
- ☐ With a spouse or partner
- ☐ With one or more other family members
- ☐ With one or more friends/people who are not related to me
- ☐ Other residents (e.g., roommate) in a residential setting

33. Are you of Hispanic, Latino, or Spanish origin? (Choose all that apply)
- ☐ No, not of Hispanic, Latino, or Spanish origin
- ☐ Yes, Mexican, Mexican American, or Chicano
- ☐ Yes, Puerto Rican,
- ☐ Yes, Cuban
- ☐ Yes, another Hispanic, Latino, or Spanish origin.
- ☐ Prefer not to answer

34. What is your race? (One or more categories may be selected)
- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Asian or Asian American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Prefer not to answer

Thank you for participating in this survey. Please return the completed survey in the postage-paid envelope.

Abt SRBI
55 Wheeler Street
Cambridge, MA 02138