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See you in 7: regional hospital collaboration and outcomes in Medicare heart failure patients

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Abstract

Background—Early post-discharge follow-up after heart failure (HF) hospitalization is associated with lower 30-day readmission rates.

Objectives—Evaluate an inter-hospital collaborative approach to improve 7-day post-discharge follow-up (7dFU) rates and reduce 30-day readmissions in HF patients.

Methods—Observational analysis of Medicare HF patients discharged from 10 collaborating hospitals (CH) participating in the Southeast Michigan See You in 7 Collaborative. We compared pre-intervention (May 1, 2011–April 30, 2012) and intervention (May 1, 2012–April 30, 2013) 7dFU, unadjusted 30-day readmission, risk-standardized 30-day readmission (RSRR), and Medicare payments in CH and Michigan non-participating hospitals (NPH).

Results—7dFU increased but remained low in both groups (CH: 31.1% to 34.4%, $p < 0.001$; NPH: 30.2% to 32.6%, $p < 0.001$). During the intervention period, unadjusted readmissions significantly decreased in both groups (CH: 29.0% to 27.3%, $p < 0.001$; NPH: 26.4% to 25.8%, $p = 0.004$); mean RSRR decreased more in CH than NPH (CH: 31.1% to 28.5%, $p < 0.001$; NPH: 26.7% to 26.1%, $p = 0.02$; $p = 0.015$ for inter-group comparison). Findings were similar when CH was matched 1:1 with similar NPH. Combined Medicare payments for inpatient and 30 days of post-discharge care decreased by \$182 in the CH and by \$63 in NPH (per eligible HF discharge).

Conclusions—See you in 7 Collaborative participation was associated with significantly lower 30-day readmission and Medicare payments in HF patients. Increases in 7dFU were modest, but associated processes aimed at this goal may have improved the transition from inpatient to

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outpatient care. Regional hospital collaboration to share best practices could potentially reduce HF readmissions and associated costs.

Keywords

Heart Failure; Readmissions; Outcomes; Care Transitions

INTRODUCTION

Heart failure (HF) affects over 5 million adults and is a leading cause of hospitalizations among those 65 years and older in the United States (1). For patients hospitalized with HF, readmissions following hospital discharge are common and can indicate healthcare inefficiencies (2, 3). The Medicare Payment Advisory Commission estimates that preventable readmissions account for at least \$12 billion of Medicare annual spending (3, 4). Approximately 50% of readmissions are possibly or probably preventable (5), with potentially remediable factors including inadequate transitions from inpatient to outpatient care (3). To address these issues, the American College of Cardiology and the Institute for Healthcare Improvement launched the national Hospital-to-Home Initiative in 2009. Hospital-to-Home aims to reduce 30-day, all-cause, risk-standardized readmission rates for patients discharged with HF or acute myocardial infarction by creating a rapid learning community where experts and clinical providers at multiple levels of care share best practices.(6). One area of focus for Hospital-to-Home is promoting early post-discharge outpatient follow-up, which is associated with lower risk for 30-day readmission in HF patients.(7)

In 2011, the Greater Detroit Area Health Council, the American College of Cardiology's Michigan Chapter, the Michigan Peer Review Organization (Michigan's Quality Improvement Organization), and 11 previously non-affiliated hospitals teamed up to establish the Southeast Michigan "See You in 7" Collaborative, with the common goals to increase 7-day post-discharge follow-up and reduce all-cause 30-day readmission rates in HF patients (7). In this study, we examine the relationship between SY7 Collaborative participation and the rates of 7-day follow-up and 30-day readmissions in Medicare fee-for-service HF patients discharged from the collaborating hospitals (CH), and compare these findings to secular statewide trends in the remaining 82 Michigan non-participating hospitals (NPH).

METHODS

Hospital Recruitment and Group Definition

In 2011, Great Detroit Area Health Council conducted open recruitment of hospitals in Southeast Michigan for the SY7 Collaborative utilizing recruitment letters, teleconferences, and face to face scheduled meetings with stakeholders to discuss the expectations of the project. As a result, 11 urban and suburban acute care hospitals, including large teaching (n=7), large non-teaching (n=3), and medium urban (n=1) hospitals, enrolled in the year-long program. A large teaching Veterans Affairs hospital participated in the collaborative activities, but since comparable outcomes data could not be obtained through Michigan Peer

Review Organization, only non-federal hospitals are included in this analysis. Michigan Peer Review Organization privately provided the CH with quarterly 7-day follow-up and 30-day readmission data. Each institution was de-identified, and only aggregate data reported to the participants.

Intervention and Intended Improvement

The intervention period was divided into 3 phases over a period of 1 year: pre-implementation (May 1, 2012 through July 31, 2012), test-intervention (August 1, 2012 through January 31, 2013), and evaluation (February 1, 2013 through April 30, 2013). Table 1 shows the timeframes, scheduled activities for the collaborative, and the evaluation plan. Over the 12-month intervention, See You in 7 Collaborative activities included quarterly face-to-face meetings and several telephone conferences/webinars; participating hospitals submitted a total of 8 assignments for review and discussion.

During the pre-implementation phase, CH reviewed baseline data, conducted gap analysis, identified process improvement measurements, and selected strategies from the Hospital to Home “See you in 7” Toolkit (6). During the test-intervention period, based on the hospital-specific gap analysis, each collaborating hospital selected 1 or several of the 7 care process goals (Table 1) from the Toolkit to focus efforts and measure progress. Once these metrics were identified, CH conducted ‘gap analyses’ of their current care processes to identify areas of need, then designed and implemented institution-specific quality improvement plans. During the evaluation phase, the CH continued implementation of quality improvement processes and received feedback from Michigan Peer Review Organization on 7-day follow-up and 30-day readmissions. Further information on the See You in 7 structure is contained in *Supplementary Table 1* and in a recently published manuscript describing the Collaborative process.(8)

The pre-specified evaluation metrics for the See You in 7 Collaborative were changes between the pre-intervention period (May 1, 2011 through April 30, 2012), and the intervention period (May 1, 2012 through April 30, 2013) in 7-day follow up and unadjusted 30-day readmission rates for HF patients discharged from the CH. Preliminary results for these metrics have recently been reported.(8) For this study, we also calculated and examined changes in mean risk-standardized 30-day all-cause readmission rates (RSRR), and then evaluated differences in these rates between CH, non-participating hospitals, and matched non-participating hospitals (see below for information on matching). We also compared unadjusted 30-day readmission rates and mean RSRR for patients with and without 7-day follow up visit.

Outcome Definitions and Data Acquisition

We linked Medicare FFS Standard Analytic Inpatient and enrollment files to outpatient claims using beneficiary health insurance identification codes to identify eligible discharges, determine 7-day follow up rates, and calculate all cause 30-day readmission rates for the period of May 1, 2011 through April 30, 2013. Eligible discharges were defined as those with diagnosis of HF as determined by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. ICD-9-CM codes were identical to

those used by the Centers for Medicare and Medicaid Services Hospital Compare public reporting program for HF (9). We included all Medicare fee-for-service and dual eligible claims. Provider Certification Numbers were used to extract and aggregate 7-day follow up and 30-day readmission rates. We used patient-level Medicare payment data to estimate the HF-related costs at CH and NPH.

A 7-day follow up visit was defined as claims identified for any physician outpatient visit within 7 days of discharge for HF patients regardless of provider type. All-cause 30-day readmission was defined as eligible discharges that readmitted to the same or different hospital for any diagnosis within 30-days of discharge. Multiple readmissions within 30 days were captured in this measure as each readmission counted as an index admission, and a subsequent admission within a 30-day period was counted as a readmission for the previous claim. Admissions involving beneficiaries who expired during inpatient hospitalization, were readmitted for rehabilitation services, had less than 30-day Medicare fee-for-service enrollment post inpatient discharge, or were transferred on the day of discharge to another acute care or critical access hospital were excluded from analysis.

Analysis Methods

Descriptive statistics were used to describe demographic characteristics and key clinical variables of the sample. The chi-square test was conducted to test for changes in 7-day follow up and unadjusted 30-day readmission rates between the pre-intervention and intervention periods for the CH and NPH. The within-group RSRR was compared between pre-intervention and intervention using paired *t*-tests. The inter-group RSRR was compared between collaborative hospitals and non-participating hospitals using 2-sample *t*-tests. Throughout the analyses, the .05 level on a 2-sided design-based test represented the cut-off value for assessing statistical significance. All analyses were conducted with SAS 9.13 (SAS Institute Inc., Cary, NC).

The HF cohorts were risk-standardized using the Centers for Medicare and Medicaid Services claims-based model used for public reporting of RSRR. This hierarchical logistic regression modeling strategy accounts for within-hospital correlation of the observed readmission rates and reflects the assumption that after adjustment for patient risk and sampling variability, remaining variation is due to hospital quality. The RSRR were obtained as the ratio of the number of “predicted” to “expected” readmissions, multiplied by the Michigan unadjusted readmission rate for the time period in question. The predicted number of readmissions for each hospital was estimated using the risk model given its own patient mix and with its own hospital-specific intercept. The expected number of readmissions for each hospital was estimated with its own patient mix and the average hospital-specific intercept based on all hospitals in our sample (9, 10).

In order to estimate the economic impact of See You in 7 Collaborative participation, we defined the total number of readmissions prevented for each hospital by multiplying the absolute percentage reduction in 30-day readmissions between the pre-intervention and intervention periods by the total number of eligible HF discharges during the intervention period. We calculated cost savings related to readmission via multiplying the average Medicare payment per HF hospitalization by the number of readmissions prevented at that

hospital during the intervention period. To evaluate outpatient costs at each hospital, we derived the change (between the pre-intervention and intervention periods) in average Medicare outpatient payments over the first 30 days after hospital discharge. We multiplied this change in outpatient payments by the total number of eligible HF discharges at that hospital during the intervention period.

Additional Analyses

We performed several additional analyses to clarify our results. First, while Hospital-to-Home recommends follow-up within 7 days of hospital discharge, follow-up within 14 days is also associated with reduced 30-day readmission rates.(6, 8) We obtained 14-day follow-up rates for all hospitals and evaluated associations with 30-day readmission rates as above. Hospitalized older adults have high risk for adverse events that could be reduced through hospital-wide efforts to improve care transitions regardless of admitting diagnosis (11). Therefore, we evaluated if See you in 7 Collaborative participation, a HF patient-specific hospital-wide effort, affected readmission rates for non-HF diagnoses.

Finally, we re-analyzed HF outcomes at the CH and 1:1 matched NPH, using Blue Cross Blue Shield hospital peer group categories to match hospitals within the same geographic region having similar size, teaching status, patient demographics, and HF patient volume. We compared 7-day follow up rates, unadjusted 30-day readmission rates, and RSRR between CH and matched NPH as described above.

RESULTS

Descriptive Characteristics

Approximately 20% of statewide 30-day HF readmissions at baseline were from the CH, indicating a prime opportunity to make an impact on readmission reduction. Each collaborating hospital chose at least two “See You in 7” Toolkit process goals (*Table 1*), with the overall breakdown as follows: scheduling 7-day follow up visits, 9 hospitals; providing 7-day follow up appointment documentation, assessing and addressing barriers to 7-day follow up, and confirming that 7-day follow up appointment was attended, 6 hospitals each; making discharge summaries available to outpatient providers, 5 hospitals; identification of HF patients early in the hospital stay, 4 hospitals.

Table 2 contains information on the eligible HF discharges and patient exclusions for the study sample at CH and NPH during both study periods. Of note, in-hospital mortality did not significantly change between the pre-intervention and intervention time periods. For the 10 CH, the number of eligible HF discharges ranged from 1203 to 4359 and in the 10 matched NPH, from 1046 to 6636. The range of unadjusted 30-day readmission rates during the pre-intervention period was similar for CH and matched NPH (25.5% to 32.7% vs. 24.8% to 34.2%). *Table 3* shows key demographic and clinical characteristics for the CH and NPH. On average, the CH cared for an older patient population than the NPH, with slightly higher proportion of female and minority patients. Additional information on HF patient comorbidities and clinical characteristics relevant to the RSRR risk model is contained in *Supplementary Table 2*.

7-Day Follow Up and 30-day Readmission Rates

The primary findings of the study are shown in *Table 4*. The See You in 7 Collaborative's primary process goal was to improve 7-day follow up rates between the pre-intervention and intervention periods. Modest but statistically significant increases in 7-day follow up, as well as in 14-day follow up, occurred in both the CH and the NPH during the intervention time period.

In the CH, unadjusted 30-day readmissions were substantially more common than in the NPH during the pre-intervention period ($X^2=72.57$; $p<0.001$) but similar to those in matched NPH ($X^2=3.56$; $p=0.06$). The unadjusted 30-day readmission rate in HF patients significantly decreased during the intervention period in CH ($p<0.001$) and statewide NPH ($p=0.004$), but not in matched NPH ($p=0.06$). 30-day readmission rates were lower in non-HF patients and decreased similarly in all three hospital groups during the intervention period (CH: 18.8 to 18.1%, NPH 17.4 to 16.8%, matched NPH 19.6% to 18.9%).

Hospital 30-day Risk Standardized Readmission Rates

The overall discrimination of the RSRR model was similar to that in the original derivation cohort, with c-statistic of 0.60 for 30-day readmission in both time periods at CH and NPH. Again, results are shown in *Table 4*. As with unadjusted 30-day readmission rates, RSRR in CH were higher at baseline than in the NPH, but comparable to those in matched NPH. The mean RSRR for the CH decreased significantly during the intervention period (relative improvement ratio/RIR=8.3%; $p < .001$). In NPH, the mean RSRR also improved slightly during the intervention period (RIR=2.5%; $p=0.02$), but significantly less so than in the CH ($p=0.015$). Mean RSRR did not significantly decline during the intervention period in matched NPH (RIR=3.6%, $p=0.32$)

When mean RSRR was weighted by each contributing hospital's number of eligible HF discharges, during the intervention period the RSRR 'gap' between CH and NPH narrowed, and that between collaborating and matched NPH further widened (*Table 4*). The *Figure* demonstrates that RSRR decreased in all collaborative hospitals during the intervention period. Individually, the NPH had variable changes in the RSRR.

Relationship between follow-up and 30-day readmission

As seen in *Table 4*, unadjusted 30-day readmission rates for patients with 7-day follow up were significantly higher than those who did not attend 7-day follow up appointments. However, risk-standardization eliminated these baseline readmission rate differences between patients with and without 7-day follow up in all three hospital groups. Moreover, within each hospital group, improvements in mean RSRR during the intervention period were nearly identical whether or not patients attended 7-day follow up visits. Results were similar for 14-day follow up, i.e. baseline RSRR and reductions in RSRR during the intervention were unrelated to whether or not patients attended 14-day follow up appointments.

Medicare Payments for Care

Total Medicare payments for acute HF care and post-discharge outpatient care decreased substantially between the pre-intervention and intervention periods at the 10 CH, with overall reduction of \$4.5M (\$451,000 per hospital). In the much larger group of 82 NPH, Medicare payments decreased \$5.8M (\$70,000 per hospital) over the same time period. The average decrease in Medicare payment per discharged Medicare HF beneficiary was \$182 at CH and \$63 at NPH.

DISCUSSION

The Southeast Michigan See you in 7 Collaborative aimed to increase rates of early outpatient follow-up after HF hospital discharge, and reduce 30-day readmission rates in Medicare HF patients. In our analysis, See You in 7 Collaborative participation was associated with only modest improvement in early post-discharge follow up rates. Both CH and NPH reduced readmissions during the intervention period, likely influenced by federal financial penalties for excessive readmissions that took effect in 2013. However, 30-day readmission rates and overall Medicare payments for HF care decreased substantially more in CH than statewide non-participating hospital comparators.

In recent years, national trends toward shorter hospital length of stay in complex patients with multi-morbidity illness have been associated with increased 30-day all-cause readmission rates (12). Recently implemented financial penalties for excessive readmissions have focused attention on preventable causes of rehospitalization. According to the American Heart Association and the American College of Cardiology, an early post-acute follow up visit following an inpatient HF discharge can reduce preventable readmissions (13). However, even at higher-performing hospitals the majority of Medicare HF patients are not evaluated by a physician within 7 days of hospital discharge (7).

The regional See You in 7 Collaborative effort engaged providers from neighboring, and often directly competing, health systems serving HF patients at several levels of care. The collaborative created a multidisciplinary learning and action network designed to test best practices, quantify findings, share information, and spread evidence. In spite of these extensive efforts, 7-day follow up rates at CH during the intervention period remained below the national median of 38%, and increases in 14-day follow up were similarly small (7). Our observations clearly illustrate the significant challenge of coordinating early post-acute care follow-up. We speculate that inter-hospital collaboration did not produce the desired improvements because individual hospitals can face entirely different barriers to 7-day follow up (e.g. insufficient outpatient provider availability, communication with and between multiple separate outpatient practice settings, different patient and community characteristics).

Prior root-cause analysis among the Southeast Michigan recruited communities has identified several obstacles to timely follow-up care following HF hospitalization. Individual and system barriers in this region include lower health care access (14), lack of transportation, and poorer patient activation, all underlying determinants of poor health. The Medicare patient mix in the CH includes a larger proportion of dual-eligible beneficiaries

compared to the state as a whole. Hospitals in this area also serve more patients with complex healthcare and socio- economic needs. Other causes include clustering of multiple health systems within close proximity yet poor designation of primary care providers and access to specialists. Patients in this region often bounce between hospitals, increasing the likelihood of poor care coordination after hospital discharge. These same challenges to 7-day follow up also increase the risk for 30-day readmission (15).

By working to address the Hospital to Home ‘See You in 7’ toolkit process goals in an iterative and collaborative manner, CH self-identified deficient areas, learned potentially useful strategies from peer hospitals, and appointed champions to implement and evaluate solutions in the context of a multidisciplinary team. For example, the collaborating hospital established methods to prospectively identify hospitalized patients with HF early in the hospital stay, e.g. by tracking admitting diagnosis of shortness of breath and administration of diuretics in the emergency department or during the first hospitalization day, obtaining updates from regular case management meetings, and incorporating multi-disciplinary rounds. After identifying patients, the collaborative hospitals worked to increase direct interaction between outpatient team members, patients and families during the hospital stay in order to assess barriers to early follow-up. Many CH incorporated discharge summaries into the electronic medical records, and patients were provided copies of their discharge summaries to take with them to their first outpatient appointment. A designated staff member at collaborating hospital followed up with the patients and outpatient providers to document successful 7-day follow up visits or investigate reasons why the appointment did not take place. Overall, this process engaged patients and caregivers, and helped both sides better understand barriers to care and address them prior to and following discharge. These efforts likely enhanced care coordination for the medically and socioeconomically vulnerable Medicare HF patients served by the CH, and may have contributed to the observed decreases in 30-day readmission.

One additional finding of our analysis merits further discussion. Early post-discharge follow-up is described by Hospital to Home as an evidence-based strategy to reduce readmissions.(6) While hospitals in the highest quartile of 7-day follow up rates tend to have lower 30-day readmission rates,(7) no prior multicenter studies have reported the direct effects of early follow-up on RSRR. Previous work by others suggests that the timing of early post-discharge outpatient visits is confounded by severity of illness (16). Indeed, we observed consistently higher unadjusted 30-day readmission rates in patients presenting for 7-day follow up than in those who did not have early follow up.

Reductions in 30-day readmission rates could occur without substantially increasing the number of 7-day follow up visits if higher-risk HF patients were specifically targeted for early discharge follow-up. Recognizing that post-discharge resources are limited, Amarasingham and colleagues recently reported impressive results with this strategy (17). In our study, CH used a variety of methods to identify high-risk HF patients who might benefit from 7-day follow up, including previously published instruments such as the BOOST (Better Outcomes for Older adults through Safe Transitions) tool, previously associated with readmission reduction in a multi-hospital collaborative (18). However, following risk standardization with the model currently used for public reporting, 30-day readmission rates

were identical pre-intervention and decreased identically during the intervention regardless of whether or not patients attended a 7-day follow up visit. This finding was remarkably consistent across CH, NPH and matched NPH (*Table 4*), suggesting that other aspects of care beyond simply attending a 7-day follow up appointment contributed to readmission reduction at CH.

Limitations

Administrative data sets were used to calculate the outcomes of interest: 7-day follow up, 30-day readmission, and cost. Administrative data does not provide information on the functional status of beneficiaries, severity of illness, or the quality of care delivered by the post-hospital care provider(s). We did not have financial data beyond Medicare payments, and our analysis therefore does not include non-Medicare related expenditures by hospitals aimed at HF readmission reduction.

The limitations of observational analyses must be considered, including bias due to unmeasured confounding variables and lack of random assignment for the intervention and comparison groups. These limitations are similar to other observational studies. In order to reduce these biases as much as possible, we also evaluated outcomes at closely matched NPH. We compared multiple outcomes between hospital groups, making a type I error (incorrect rejection of the null hypothesis) more probable. However, given the consistent nature of the observed differences between hospital groups across these outcomes (*Table 4*), type I error seems unlikely to completely explain our findings.

The open recruitment nature of the project introduced selection bias. Recruited hospitals that chose not to participate cited competing priorities, reduced revenue, and limited staff and time as barriers to participation. As seen in the baseline data, CH presented higher baseline early follow up rates and 30-day readmission rates compared to the NPH. As such, the CH may be characterized as highly motivated and possessing increased readiness to address the problem compared to other hospitals. In addition, higher baseline rates present an opportunity for regression to the mean rather than true improvement. However, 1:1 matched NPH in the same geographic region had similar baseline 7-day follow up, unadjusted 30-day readmission rates, and RSRR but did not experience similar declines in readmission during the intervention period.

Given the observational nature of the study, we cannot confirm that improvements in 7-day follow up or 30-day readmission rates directly resulted from See You in 7 Collaborative participation. As each hospital created an individualized plan based on gap analysis of shortcomings and resources, we are unable to formally report the degree of exposure of the intervention components in the collaborative hospitals. Our results may not be generalizable to hospitals outside of the study sample.

Clinical Implications

Despite an intensive and sustained multidisciplinary effort, the Southeast Michigan See You in 7 Collaborative only modestly improved 7-day follow up rates for hospitalized Medicare HF patients beyond secular trends. These disappointing results do not support inter-hospital

collaboration focused specifically on this goal. However, Collaborative data on readmission rates were more promising, as the absolute decrease in 30-day RSRR during the intervention period was four times greater in CH than NPH and twice as great at CH as in closely matched NPH. Reductions in RSRR in all hospital groups were unrelated to whether or not patients had 7-day follow up, suggesting that other improvements in care coordination were responsible. Further study is needed to clarify the most helpful aspects of inter-hospital collaboration, assess the sustainability of readmission reduction following participation, and understand the optimal resource allocation to 7-day follow up vs. other aspects of the post-discharge transition.

CONCLUSIONS

Hospital participation in the Southeast Michigan See You in 7 Collaborative was associated with substantial reductions in 30-day readmission rates and Medicare payments related to HF care. Increases in post-discharge 7-day follow up were modest, but associated processes aimed at this goal may have improved the overall transition from inpatient to outpatient care. Our study suggests that regional hospital collaboration to share best practices can be an effective strategy to reduce HF readmissions and associated costs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

CH	collaborating hospitals
HF	heart failure
NPH	non-participating hospitals
RIR	relative improvement ratio
RSRR	risk-standardized 30-day readmission rate

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CLINICAL PERSPECTIVES

Clinical Competencies: An inter-hospital collaborative approach only modestly increased early post-discharge follow-up from heart failure hospitalization, but was associated with substantial reductions in 30-day readmission rates and Medicare payments. Collaborating hospitals performed system-specific gap analysis to identify challenges and limitations in processes related to transitions of care, then implemented and evaluated quality improvement measures recommended by the national Hospital-to-Home initiative.

Transitional Outlook: Each collaborating hospital developed its own targets and strategies for improvement based on its specific needs and resources. Further study is needed to determine which aspects of the collaborative process would be helpful in other regions and patient populations.

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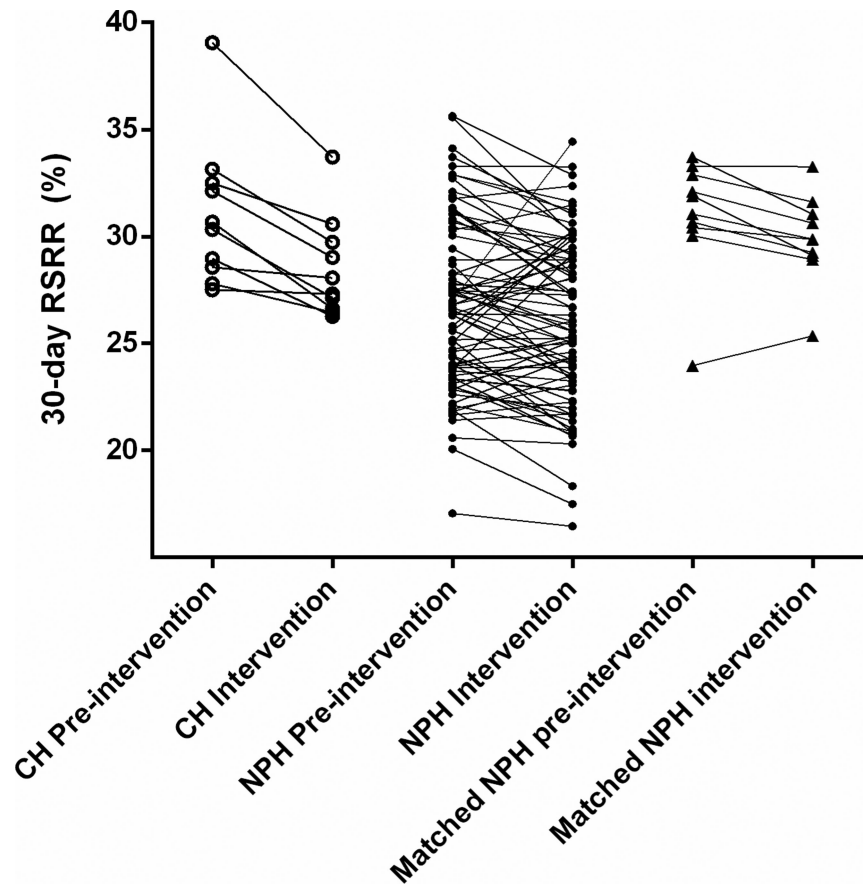


Figure.
 Changes in risk-standardized 30-day readmission in collaborating vs. non-participating hospitals
 Abbreviations: CH, collaborating hospitals; NPH, non-participating hospitals; RSRR, risk-standardized 30-day readmission rate

Table 1

Southeast Michigan See You in 7 Collaborative Time Periods, Methods, Tools, and Evaluation Plan

Focus	Methods/Tools	Evaluation Plan	Meetings
Pre-Implementation period May - July 2013	Hospitals: Establish collaborative partnerships among hospitals serving Southeast Michigan beneficiaries Hospital-to-Home "SY7" Toolkit Planning Team Activity Pre-Implementation Data Submission CH Selection of "See You in 7" Process Measures	Gap analysis	Kickoff Meetings 2 Conferences Calls/Webinars
Test- Intervention period Aug - Jan 2013	SY7 Toolkit process goals: Identify HF patients prior to discharge: Schedule and document a follow-up visit with cardiologist or PCP that takes place within 7 days of discharge. Provide all patients with documentation of the scheduled follow-up appt. Identify and address barriers to keeping appointment. Ensure all HF patients arrive at scheduled appointment within 7 days of discharge Make discharge summary available to follow-up health care providers for all HF patients. Planning Team Activity Collaborative hospitals shared best practices. Quarterly Progress Reports	Proportion of HF patients identified prior to discharge Proportion of discharges with scheduled 7-day follow-up visit with Cardiologist or PCP Proportion of patients with documentation of 7-day follow-up appointments Follow-up phone calls or risk assessments conducted to identify barriers Proportion of patients who had 7-day follow-up appointments scheduled Proportion of patients who kept scheduled 7-day follow-up appointments. Proportion of discharge summaries transferred to PCP within 24 hours of discharge.	2 Quarterly Meetings 4 Conferences Calls/Webinars
Evaluation period Feb – April 2013	Data and Information - Medicare fee-for-service claims data, aggregate and hospital level descriptive readmission and 7-day follow-up reports Policy - Hospital Compare Reporting, Hospital-wide Lessons learned shared among CH Quarterly Progress Report Post-Implementation Data Submission	Continued assessment and improvement based on rates of 7-day follow-up.	2 Conferences Calls/Webinars 1 Quarterly Meeting

Abbreviations: CH, collaborating hospitals; HF, heart failure; PCP, primary care provider

Table 2

Eligible heart failure discharges at collaborating and non-participating hospitals

Hospital group/time interval	Total Sample with HF						Final Sample	
	# of hospitals	Total patients	Age<65 y	In-Hospital Deaths	Transfers Out	Discharge AMA	N	%
CH Pre-Intervention	10	28238	14.98%	3.63%	1.39%	0.59%	26744	94.7
CH Intervention	10	26358	14.89%	3.91%	1.56%	0.56%	24849	94.3
NPH Pre-Intervention	82	100866	16.68%	4.30%	2.12%	0.64%	93928	94.5
NPH Intervention	82	99391	16.60%	4.42%	2.14%	0.62%	92321	92.9
Matched NPH Pre-Intervention	10	28722	16.64%	3.79%	1.55%	0.61%	27049	94.2
Matched NPH Intervention	10	27350	16.03%	3.74%	1.62%	0.59%	25709	94.0

Abbreviations: AMA, against medical advice; CH: collaborating hospitals; HF: heart failure; NPH: non-participating hospitals

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Table 3

Selected demographic and clinical characteristics at collaborating and non-participating hospitals

Population Segment		CH Total Discharges Eligible for Readmission				NPH Total Discharges Eligible for Readmission			
		Pre-intervention		Intervention		Pre-intervention		Intervention	
		N	%	N	%	N	%	N	%
Race	White	19,617	73.35	17,999	72.43	72,709	77.41	71,451	77.39
	Black	6,677	24.97	6,294	25.33	19,115	20.35	18,724	20.28
	Other	450	1.68	556	2.24	2,104	2.24	2,146	2.32
Age	<65	3,974	14.86	3,687	14.84	15,559	16.56	15,201	16.47
	65-74	6,333	23.68	6,164	24.81	23,868	25.41	24,186	26.20
	>75	16,437	61.46	4,511	27.44	54,501	58.02	52,934	57.34
Gender	F	15,474	57.86	14,145	56.92	52,122	55.49	50,853	55.08
	M	11,270	42.14	10,704	43.08	41,806	44.51	41,468	44.92
Length of Index Admission	< 4 days	9,264	34.64	8,712	35.06	33,667	35.84	32,915	35.65
	4-8 days	12,297	45.98	11,441	46.04	41,399	44.08	41,372	44.81
	> 8 days	5,183	19.38	4,696	18.9	18,862	20.08	18,034	19.53
# of Admits in prior 3 months	0	13,808	51.63	13,335	53.66	51,502	54.83	51,531	55.82
	1	7,433	27.79	6,902	27.78	25,396	27.04	24,883	26.95
	2	3,439	12.86	2,948	11.86	10,721	11.41	10,338	11.20
	>2	2,064	7.72	1,664	6.7	6,309	6.72	5,569	6.03
Total		26,774		24,849		93,928		92,321	

Abbreviations: CH, collaborating hospitals; NPH, non-participating hospitals

Table 4

Follow-up and 30-day readmission rates in collaborating, non-participating, and matched non-participating hospitals

Rates	CH		NPH		Matched NPH	
	Pre-intervention	Intervention	Pre-intervention	Intervention	Pre-intervention	Intervention
<i>Post-discharge follow-up</i>						
7-day follow-up [†]	31.1%	34.4% ^{***}	30.2%	32.6% ^{***}	31.5%	33.8% ^{***}
14-day follow-up [†]	47.2%	50% ^{***}	46.3%	47.9% ^{***}	47.3%	48.7% ^{**}
<i>Overall 30-day readmission</i>						
Unadjusted 30-day readmission [†]	29.0%	27.3% ^{***}	26.4%	25.8% ^{**}	29.8%	28.9% ^{**}
Mean 30-day RSRR [§]	31.1%	28.5% ^{***}	26.7%	26.1% [*]	31.0%	29.9%
Weighted 30-day RSRR [†]	30.7%	28.2%	28.5%	27.4%	31.1%	29.9%
<i>Readmission by follow-up status</i>						
Mean RSRR, with 7-day follow-up [§]	31.1%	28.5%	26.7%	26.1%	31.0%	29.9%
Mean RSRR, no 7-day follow-up [§]	31.1%	28.5%	27.0%	26.0%	31.0%	29.9%
Mean RSRR, with 14-day follow-up [§]	31.1%	28.5%	26.7%	26.1%	31.0%	29.9%
Mean RSRR, no 14-day follow-up [§]	31.1%	28%	27.0%	26.0%	31.0%	29.9%
<i>Inter-group comparison</i>						
Pre-post mean RSRR [‡]	0.0259		0.0065 [*]		0.0112 [*]	
Pre-post mean RSRR, with 7-day follow-up [‡]	0.026		0.0064 [*]		0.0111 [*]	

Abbreviations: CH, collaborating hospitals; NPH, non-participating hospitals; RSRR, risk-standardized readmission rate

Note:

Pre-post comparison

inter-group comparison:

* p < .05

** p < .01

*** p < .001

[†] for χ^2

[§] for 2-sample t-test

[‡] for 2-sample t-test comparison with CH group