STS Quality Webinar Series: Readmission after CABG

May 18, 2016

Welcome

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Henry Ford Hospital
Cardiac Surgery
Chair, STS Task Force on Quality Initiatives

Presented by the STS Task Force on Quality Initiatives

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Kris George	Syma Prince	Dave Wormuth

Presenters

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William T. Caine, MD

Readmissions

David M. Shahian, MD

Vice President, Center for Quality and Safety, Massachusetts General Hospital
Professor of Surgery, Harvard Medical School

Chair, STS Council on Quality, Research, and Patient Safety Operating Board
Chair, STS Quality Measurement Task Force

Disclosures

- None


JUNE 2007

REPORT TO THE CONGRESS

Promoting Greater Efficiency in Medicare

CHAPTER 5

Payment policy for inpatient readmissions

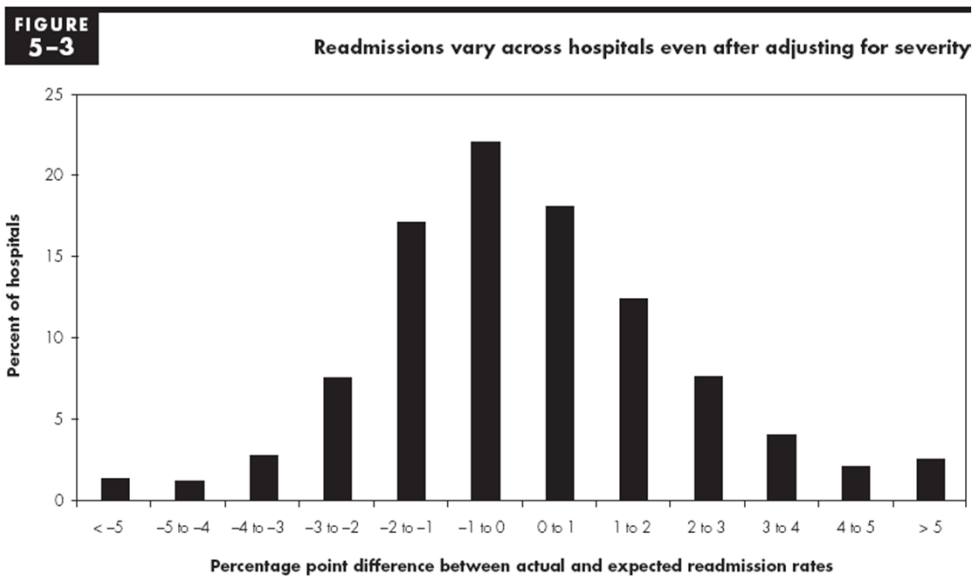
Chapter summary

Hospital readmissions are sometimes indicators of poor care or missed opportunities to better coordinate care. Research shows that specific hospital-based initiatives to improve communication with beneficiaries

In this chapter

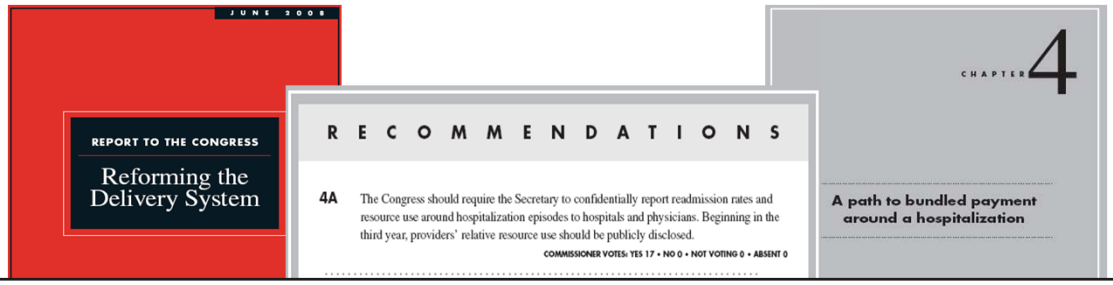
- Why focus on readmissions?
- How common are readmissions?

- "Hospital readmissions are sometimes indicators of poor care or missed opportunities to better coordinate care."
- "..failure to adequately attend to the care transition at discharge from the hospital results in additional Medicare spending; 17.6 percent of admissions result in readmissions within 30 days of discharge, accounting for $15 billion in spending. Not all of these readmissions are avoidable, but some are."



Note: Expected rates are based on the average rate of readmission across all hospitals, controlling for all patient refined diagnosis related group and severity class of patients. Readmissions are identified using 3M's software that defines potentially preventable readmissions.

Source: 3M analysis of 2005 Medicare discharge claims data.



"The Congress should require the Secretary to confidentially report readmission rates and resource use around hospitalization episodes to hospitals and physicians. "

"To encourage providers to collaborate and better coordinate care, the Congress should direct the Secretary to reduce payments to hospitals with relatively high readmission rates."

Rehospitalizations among Patients in the Medicare Fee-for-Service Program

Stephen F. Jencks, M.D., M.P.H., Mark V. Williams, M.D., and Eric A. Coleman, M.D., M.P.H.

ABSTRACT

BACKGROUND

Reducing rates of rehospitalization has attracted attention from policymake
way to improve quality of care and reduce costs. However, we have limited in
tion on the frequency and patterns of rehospitalization in the United States
in planning the necessary changes.

METHODS

We analyzed Medicare claims data from 2003–2004 to describe the pattern
hospitalization and the relation of rehospitalization to demographic charact
of the patients and to characteristics of the hospitals.

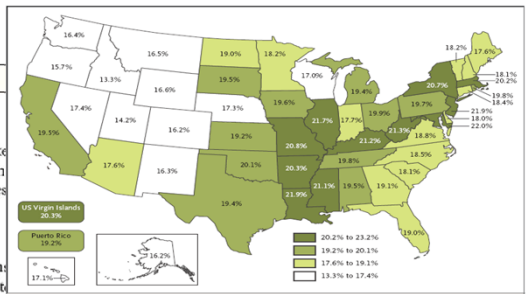


Figure 1. Rates of Rehospitalization within 30 Days after Hospital Discharge.
The rates include all patients in fee-for-service Medicare programs who were discharged between October 1, 2003, and September 30, 2004. The rate for Washington, DC, which does not appear on the map, was 23.2%.

"Almost one fifth (19.6%) of the 11,855,702 Medicare beneficiaries who had been discharged from a hospital were rehospitalized within 30 days, and 34.0% were rehospitalized within 90 days…..In the case of 50.2% of the patients who were rehospitalized within 30 days after a medical discharge to the community, there was no bill for a visit to a physician's office between the time of discharge and rehospitalization."

NEJM, 2009

410 *Circ Cardiovasc Qual Outcomes* September 2009

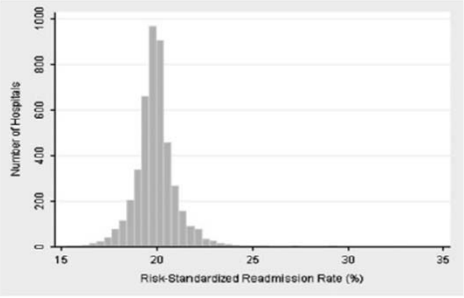


Figure 3. Acute myocardial infarction 30-day RSRR distribution.

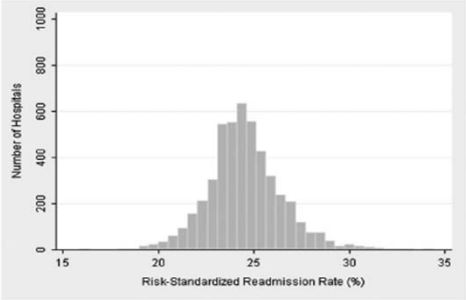
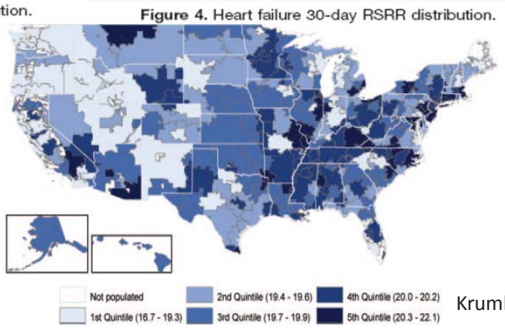


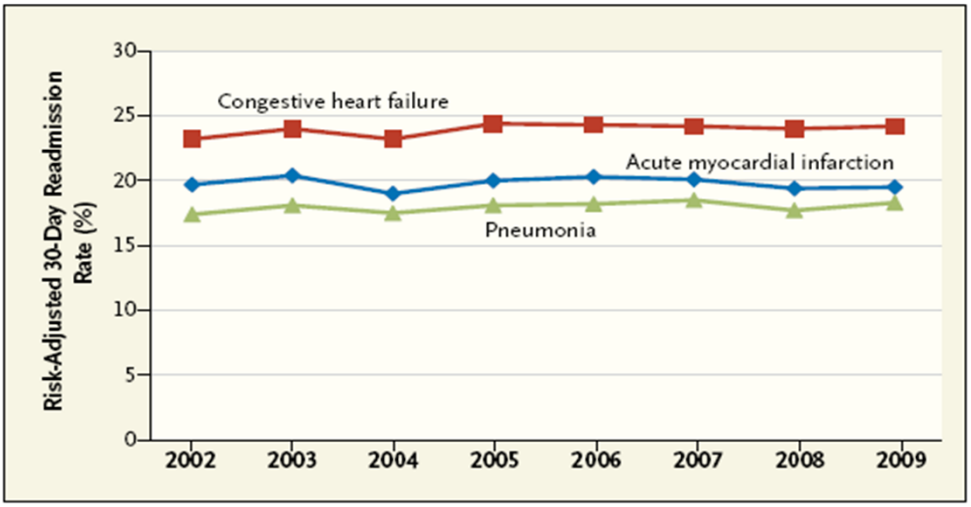
Figure 4. Heart failure 30-day RSRR distribution.

Similar variation in CV readmissions



Krumholz et al, 2009

Readmission Rates Have Not Improved Over Time



National Trends in 30-Day Readmission Rates, 2002–2009.

Rates are authors' calculations based on Medicare data.

Section 3025 of Affordable Care Act

Public Law 111–148
111th Congress

An Act

Entitled The Patient Protection and Affordable Care Act.

Mar. 23, 2010
[H.R. 3590]

Patient Protection and Affordable Care Act.
42 USC 18001 note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Patient Protection and Affordable Care Act".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sec. 1. Short title; table of contents.

TITLE I—QUALITY, AFFORDABLE HEALT

Subtitle A—Immediate Improvements in Healt

Sec. 1001. Amendments to the Public Health Se

SEC. 3025. HOSPITAL READMISSIONS REDUCTION PROGRAM.

(a) IN GENERAL.—Section 1886 of the Social Security Act (42 U.S.C. 1395ww), as amended by sections 3001 and 3008, is amended by adding at the end the following new subsection:

IOSPITAL READMISSIONS REDUCTION PROGRAM.—

(1) IN GENERAL.—With respect to payment for discharges an applicable hospital (as defined in paragraph (5)(C)) ring during a fiscal year beginning on or after October 12, in order to account for excess readmissions in the tal, the Secretary shall reduce the payments that would wise be made to such hospital under subsection (d) (or n 1814(b)(3), as the case may be) for such a discharge amount equal to the product of—

"(A) the base operating DRG payment amount (as efined in paragraph (2)) for the discharge; and

"(B) the adjustment factor (described in paragraph 3)(A)) for the hospital for the fiscal year.

(2) BASE OPERATING DRG PAYMENT AMOUNT DEFINED.—

"(A) IN GENERAL.—Except as provided in subparagraph B), in this subsection, the term 'base operating DRG payment amount' means, with respect to a hospital for a fiscal ear—

"(i) the payment amount that would otherwise be made under subsection (d) (determined without regard to subsection (o)) for a discharge if this subsection

CMS.gov
Centers for Medicare & Medicaid Services

Readmissions Reduction Program

Hospital Readmission Reduction Program

- Hospital reimbursement for all its discharges will be reduced if hospital's readmission rate for AMI, heart failure, and pneumonia exceed predicted
- Program begins in 2013 with a maximum 1% reduction, increasing to 2% in 2014 and 3% in 2015
- Beginning in 2015, the number of diagnoses for which readmission rates will be monitored will expand, now including chronic obstructive lung disease and joint replacement--in 2017, CABG.

Report to Congress

National Strategy for Quality Improvement in Health Care

March 2011

Part of the HHS National Quality Strategy

3. Promoting Effective Communication and Coordination of Care

When all of a patient's health care providers coordinate their efforts, it helps ensure that the patient gets the care and support he needs and wants, when and how he needs and wants it. Effective care coordination models have begun to show that they can deliver better quality and lower costs in settings that range from small physician practices to large hospital centers.

Health care systems need to encourage coordination and help providers care for patients with chronic diseases so they get the kind of seamless care that is most effective. Gaps and duplication in patient care delivery can be reduced or eliminated through proven technologies such as electronic health records, e-prescribing, and telemedicine. Hospitals and long-term care

and rehabilitation facilities, along with physicians, nurses, and other clinicians working together, are helping recently discharged patients avoid unnecessary rehospitalization. All too often, however, the way health care is paid for does not foster coordination but instead pays more to providers for doing more instead of working together. Policies advanced by the National Quality Strategy will help change that.

Issues with Readmission Penalties

- To be readmitted, you first have to survive!
- What is a preventable readmission
- What is excess readmission (requires "Expected" value, which is problematic)
- Include SES factors?
- How much is controllable by hospital
- Unintended negative consequences
  - Penalizing safety net and other hospitals serving disadvantaged populations
  - Discouraging appropriate, early readmissions that may prevent more serious problems

Preventable Readmissions

- Most credible determinations of readmission preventability come from chart reviews by expert clinicians
- Chart review typically reveals lower rates of preventability than those determined from automated algorithms (e.g., 3M)
- Clinician review not feasible to scale
- For profiling purposes, risk-adjusted, automated, rate-based approaches will be required

Estimating Expected Readmission Rates

- Compared with mortality risk estimation, broader and more complex range of risk factors for readmission, some not under control of index hospital
  - Patient characteristics and illness severity on admission
  - Quality of care during the index admission (failure to adequately treat and resolve the original condition, complications of care)
  - Discharge and transition planning (inadequate prep of patient/family, poor communication with PCP's)
  - Local environmental factors (inadequate community healthcare resources to support patients post-discharge)
  - SES factors (risk adjust or stratify)
  - Recurrence of the original chronic condition
  - Development of an unrelated new condition
  - Discretionary, local threshold to admit

Readmission Risk Models

- Readmission risk models have mediocre performance
- Hospitals do not receive credit for some of the most important risk factors for readmission
- Suboptimal models, high stakes: increased potential for adverse unintended consequences
  - Denial of care to patients at high risk of readmission
  - Excessive penalties for hospitals serving disadvantaged populations ("take from the poor, give to the rich")
  - Reluctance to readmit patients who should be readmitted

Unintended Negative Consequences

RESEARCH LETTER

Characteristics of Hospitals Receiving Penalties Under the Hospital Readmissions Reduction Program

To the Editor: The federal Hospital Readmissions Reduction Program (HRRP) took effect on October 1, 2012, the first day of fiscal year
data from July 2008 th
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to quantify care provided for the poor). We compared the readmission penalties for these hospitals with other types of institutions. Subsequently, we used multinomial logistic regression analyses to calculate the odds of receiving high vs no penalties and low vs no penalties for each hospital type of interest.

We considered a 2-tailed *P* value of less than .05 as significant. Analyses were performed using Stata version 12.1

Larger teaching hospitals and safety net hospitals most likely to be penalized.

Table. Hospital Characteristics by Penalty Group[a]

	High Penalties (n = 1097)[b]			Low Penalties (n = 1092)[c]			No Penalties, Unadjusted Rates, No. (%) (n = 1093)[d]
	Unadjusted Rates, No. (%)	Multivariate-Adjusted OR (95% CI)	*P* Value	Unadjusted Rates, No. (%)	Multivariate-Adjusted OR (95% CI)	*P* Value	
Size of hospital							
Large (≥ 400 beds)	178 (40)	1.98 (1.44-2.74)	<.001	158 (36)	2.07 (1.50-2.87)	<.001	108 (24)
Medium (200-399 beds)	622 (35)	2.09 (1.73-2.53)	<.001	659 (37)	2.43 (2.01-2.94)	<.001	482 (27)
Small (<200 beds)	296 (28)	1 [Reference]		275 (26)	1 [Reference]		503 (47)
Teaching hospital							
Major	118 (44)	1.56 (1.04-2.32)	.03	102 (38)	1.46 (0.98-2.19)	.07	50 (19)
Not major	979 (33)	1 [Reference]		990 (33)	1 [Reference]		1043 (35)
Safety-net hospital							
Yes	337 (44)	2.38 (1.91-2.96)	<.001	275 (36)	1.83 (1.46-2.29)	<.001	157 (20)
No	760 (30)	1 [Reference]		817 (33)	1 [Reference]		936 (37)

Joynt and Jha, JAMA 2013

CABG Readmission

- CABG readmissions: a marker of care quality and an opportunity to improve care
  - Most CABG readmissions unplanned--result from delayed occurrence or recognition of complications
  - Not a result of shorter LOS initiatives
  - High mortality in readmitted patients
  - Readmission and mortality rates are complementary performance measures

CABG Readmission

- Frequency and financial impact of CABG readmissions
- If count ED visits, doubles # of "returns" to hospital
- Ascertainment issues: 50% CABG readmissions to other than index hospital
- Lack of improvement in CABG readmission rates
- Significant inter-hospital variation in rates
- CMS adding CABG as readmission target

CABG Readmission

- Feasible opportunities for improvement
  - Proactively address common readmission causes before discharge
  - Educate patients, families, cardiologists, and PCPs
  - Always contact original surgeon before readmission
  - Outpatient visits by NPs, PAs; Smartphone pix, videos; earlier return visits

READMISSION AFTER CARDIAC OPERATIONS: PREVALENCE, PATTERNS, AND PREDISPOSING FACTORS

Richard S. D'Agostino, MD
Jerilynn Jacobson, MA
Mindy Clarkson, RN
Lars G. Svensson, MD, PhD
Christina Williamson, MD
David M. Shahian, MD

Objectives: This study was undertaken (1) to determine the prevalence of hospital readmission within 1 month of discharge after cardiac operations, (2) to categorize diagnoses responsible for readmission, and (3) to examine predischarge patient factors that influenced readmission. *Methods:* Data at 1 month after discharge were obtained for 1665 (98.4%) of 1692 patients who underwent cardiac operations between January 1996 and July 1998. *Results:* Two hundred twenty-five patients (13.5%) were readmitted to a hospital within a 1-month period after discharge. Forty-eight percent of readmissions were to other hospitals. The most common readmission problems were congestive heart failure (15.6%), atrial fibrillation (12.9%), chest pain (12.0%), wound problems (10.2%), and gastrointestinal problems (8.0%). Hospital discharge on or before the fifth postoperative day was associated with a lower prevalence of subsequent readmission. The independent predictors of a readmission for congestive heart failure were postoperative stay longer than 5 days, diabetes, New York Heart Association functional class IV, preoperative congestive heart failure, total blood product use, the need for postoperative inotropes, body mass index greater than 28 kg/m^2, and reoperation for bleeding. *Conclusions:* The prevalence of rehospitalization during the first month after discharge is not trivial. Other than postoperative atrial fibrillation, readmission is probably the single most likely adverse event to befall a patient in the early postoperative period. Patients who are discharged early do not appear to be at increased risk. Patterns in readmission diagnoses suggest opportunities for preventive strategies. (J Thorac Cardiovasc Surg 1999;118:823-32)

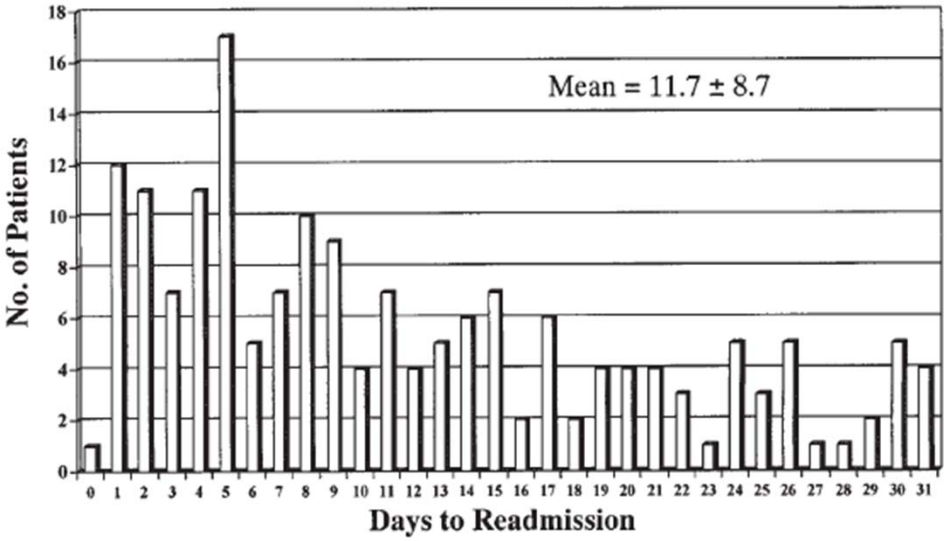

Fig 2. Distribution of time (in days) to patient readmission (n = 175).

Most Readmissions Early = Opportunity

Risk factors for early hospital readmission after cardiac operations

Victor A. Ferraris, MD, PhD,
Suellen P. Ferraris, PhD
R. Christopher Harmon, BS,
Boyd D. Evans, BS

Objective: Early hospital readmissions after cardiac procedures are both costly and harmful to patients. We investigated the factors that predispose to readmission to develop strategies to minimize this problem.

Methods: As part of a prospective data collection, patients having cardiac procedures at our institution are routinely tracked for 30 days after their discharge from the hospital. We reviewed 2650 patients in our cardiac database who underwent operations over the past 5 years. We used univariate and multivariate statistical techniques to identify risks for readmission.

Results: Of 2574 discharged patients, 252 (9.8%) required readmission. The most common causes of readmission are cardiac (42%), pulmonary (19%), gastrointestinal (10%), extremity complications (6.7%; deep vein thrombophlebitis, peripheral arterial vascular disease, and saphenous vein harvest site problems), sternal wound problems (7.5%), and metabolic problems (4%). Of more than 70 variables studied, only 6 are significant multivariate predictors of readmission: female sex ($P = .002$); diabetes ($P = .001$); chronic lung problems ($P = .011$); increased distance between home and hospital ($P > .001$); preoperative atrial fibrillation ($P = .002$); and preoperative chronic renal insufficiency ($P = .002$). Type of operation, redo procedures, and other intraoperative and postoperative variables are not important multivariate predictors of readmission. Prolonged hospital length of stay for the initial procedure did not cause more frequent readmission. The costs of initial hospitalization (operating room costs combined with postoperative in-hospital costs) were not significantly increased in those patients who required readmission.

Conclusions: The high-risk patient for readmission is a woman with diabetes, chronic lung disease, renal insufficiency, and preoperative atrial fibrillation who lives at a distance from the hospital. Readmission does not depend on periprocedural variables (eg, cardiopulmonary bypass time) or on postoperative complications. High procedural costs from the initial hospitalization do not predispose to readmission. These results suggest interventions that may reduce readmission.

From the Division of Cardiothoracic Surgery, University of Kentucky, Chandler Medical Center, Lexington, Ky, the Department of Cardiovascular Services, Marshall University School of Medicine, Huntington, WVa, and St Mary's Regional Heart Center, Huntington, WVa.

This work was supported in part by an unrestricted grant from the Bayer Corporation, West Haven, Conn.

Read at the Twenty-sixth Annual Meeting of The Western Thoracic Surgical Association, The Big Island, Hawaii, June 21-24, 2000.

Received for publication June 12, 2000; revisions requested Sept 6, 2000; revisions

TABLE 1. Causes of READMIT after cardiac procedur

Readmission cause (% of total patients)	No. of patie
Cardiac (42%)	105
Angina	22
CHF	22
Rhythm problems	30
Heart block-bradycardia	7
Rapid atrial arrhythmias	21
Vasovagal syncope	1
Pacemaker exit block	1
SEMI/AMI	19
Atypical chest pain	3
Dressler	4
Pericardial effusion	5
Pulmonary (19%)	49
Pleural effusion	31
Pneumonia-bronchitis	12
COPD exacerbation	5
Pulmonary embolus	1
GI/GU (10%)	26
UGI bleed-ulcer	11
SBO	3
Gastroenteritis-abdominal pain	3
Perirectal abscess	1
C. diff. colitis	1
Pancreatitis	1
Ischemic bowel	1
Ruptured appendix	1
Progression of renal failure	3
UTI	1
Sternal wound problems (7%)	18
Deep sternal infection	13
Sterile sternal dehiscence	5
Extremity complications (6.7%)	17
Saphenous vein harvest site cellulitis-infection	7
DVT	9
Thrombosed femoral-popliteal graft	1
Metabolic disturbances (4%)	11
Dehydration	7
Hyponatremia	1
Ketoacidosis	2
Hypoglycemia	1
Neuropsychiatric (3.6%)	9
Stroke-TIA	8

Readmissions After Cardiac Surgery: Experience of the National Institutes of Health/Canadian Institutes of Health Research Cardiothoracic Surgical Trials Network

10-Center Prospective Observational Cohort Study

Alexander Iribarne, MD, MS, Helena Chang, MS, John H. Alexander, MD, A. Marc Gillinov, MD, Ellen Moquete, RN, John D. Puskas, MD, Emilia Bagiella, PhD, Michael A. Acker, MD, Mary Lou Mayer, RN, T. Bruce Ferguson, MD, Sandra Burks, RN, Louis P. Perrault, MD, Stacey Welsh, RN, Karen C. Johnston, MD, MS, Mandy Murphy, RN, Joseph J. DeRose, MD, Alexis Neill, RN, Edlira Dobrev, MS, Kim T. Baio, MSN, Wendy Taddei-Peters, PhD, Alan J. Moskowitz, MD, and Patrick T. O'Gara, MD

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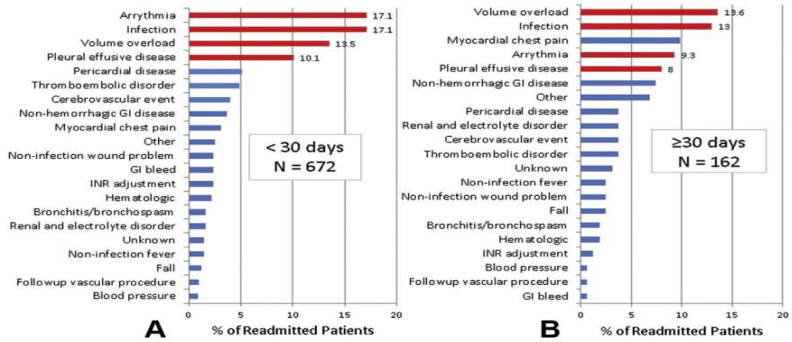


Table 2. Risk Factors Associated With Readmission

Variable	HR (95% CI)	*p* Value
Female	1.35 (1.16 to 1.57)	<0.001
Diabetes mellitus, yes/no	1.35 (1.15 to 1.59)	<0.001
COPD, yes/no	1.42 (1.19 to 1.68)	<0.001
Creatinine	1.10 (1.05 to 1.15)	<0.001
Hemoglobin	0.91 (0.88 to 0.95)	<0.001
Duration of operation, h	1.15 (1.10 to 1.20)	<0.001
Procedure (ref: CABG)		
Valve	1.33 (1.11 to 1.60)	0.002
CABG + valve	1.52 (1.23 to 1.88)	<0.001
LVAD/transplant	3.36 (2.34 to 4.84)	<0.001
Thoracic aortic	1.40 (1.06 to 1.85)	0.017
Other	1.41 (1.06 to 1.89)	0.019

Mortality and readmission rates are measuring different aspects of quality

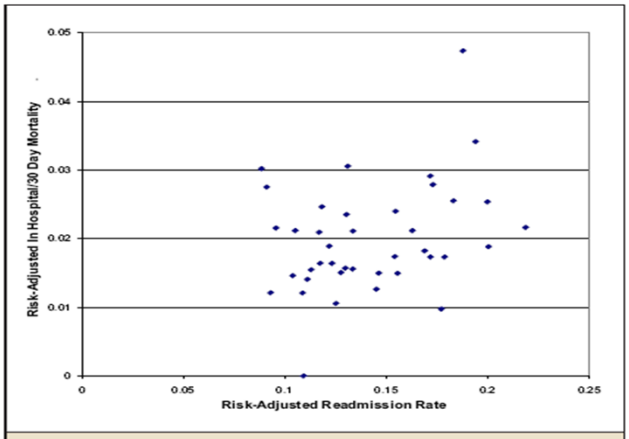


Figure 2. Hospital Risk-Adjusted In-Hospital/30-Day Mortality Rate Versus Hospital Risk-Adjusted 30-Day Readmission Rate

Scatterplot was used to access the strength of relationship between risk-adjusted in-hospital/30-day mortality rate and 30-day readmission rate in-hospital level. Each **blue diamond** represents 1 hospital. Statistical analysis showed that the Pearson Correlation Coefficient for the 2 rates is 0.32 ($p = 0.047$). It implies that correlation between the hospital risk-adjusted in-hospital/30-day mortality rate and hospital 30-day readmission rate was weak.

Hannan et al, 2011

ADULT CARDIAC

Reliability of Readmission Rates as a Hospital Quality Measure in Cardiac Surgery

Terry Shih, MD, and Justin B. Dimick, MD, MPH
Center for Healthcare Outcomes and Policy, University of Michigan, Ann Arbor, Michigan

Background. Recent policy interventions have reduced payments to hospitals with higher-than-predicted risk-adjusted readmission rates. However, whether read-
mission rates reliably disc
quality is uncertain. We
ability of 30-day readmiss
as a measure of hospital
effect of hospital caseload
Methods. We examine
ciaries undergoing coron
tions for 2006 to 2008 (n
hospitals). First, we pe
regression examining pat
adjusted readmission ra
used hierarchical modeli
this quality measure for
mined the proportion of to
factors: true signal, statist
Results. A median of
range, 79 to 265) coronary
per hospital during the 3-year period. The median risk-adjusted 30-day readmission rate was 17.6% (25% to 75% interquartile range, 14.4% to 20.8%). Of the variation

"A median of 151 (25% to 75% interquartile range, 79 to 265) coronary artery bypasses were performed per hospital during the 3-year period. The median risk adjusted 30-day readmission rate was 17.6% (25% to 75% interquartile range, 14.4% to 20.8%). Of the variation in readmission rates, 55% was explained by measurement noise, 4% could be attributed to patient characteristics, and the remaining 41% represented true signal in readmission rates. Only 53 hospitals (4.4%) achieved a proficient level of reliability exceeding 0.70. To achieve this reliability, 599 cases were required during the 3-year period. In 33.7% of hospitals, a moderate degree of reliability exceeding 0.5 was achieved, which required 218 cases."

Health Services and Outcomes Research

Development of a Clinical Registry-Based 30-Day Readmission Measure for Coronary Artery Bypass Grafting Surgery

David M. Shahian, MD; Xia He, MS; Sean M. O'Brien, PhD; Frederick L. Grover, MD; Jeffrey P. Jacobs, MD; Fred H. Edwards, MD; Karl F. Welke, MD; Lisa G. Suter, MD; Elizabeth Drye, MD, SM; Cynthia M. Shewan, PhD; Lein Han, PhD; Eric Peterson, MD, MPH

Background—Reducing readmissions is a major healthcare reform goal, and reimbursement penalties are imposed for higher-than-expected readmission rates. Most readmission risk models and performance measures are based on administrative rather than clinical data.

Methods and Results—We examined rates and predictors of 30-day all-cause readmission following coronary artery bypass grafting surgery by using nationally representative clinical data (2008–2010) from the Society of Thoracic Surgeons National Database linked to Medicare claims records. Among 265 434 eligible Medicare records, 226 960 (86%) were successfully linked to Society of Thoracic Surgeons records; 162 572 (61%) isolated coronary artery bypass grafting admissions constituted the study cohort. Logistic regression was used to identify readmission risk factors; hierarchical regression models were then estimated. Risk-standardized readmission rates ranged from 12.6% to 23.6% (median, 16.8%) among 846 US hospitals with ≥30 eligible cases and ≥90% of eligible Centers for Medicare and Medicaid Services records linked to the Society of Thoracic Surgeons database. Readmission predictors (odds ratios [95% confidence interval]) included dialysis (2.02 [1.87–2.19]), severe chronic lung disease (1.58 [1.49–1.68]), creatinine (2.5 versus 1.0 or lower:1.49 [1.41–1.57]; 2.0 versus 1.0 or lower: 1.37 [1.32–1.43]), insulin-dependent diabetes mellitus (1.45 [1.39–1.51]), obesity in women (body surface area 2.2 versus 1.8: 1.44 [1.35–1.53]), female sex (1.38 [1.33–1.43]), immunosuppression (1.38 [1.28–1.49]), preoperative atrial fibrillation (1.36 [1.30–1.42]), age per 10-year increase (1.36 [1.33–1.39]), recent myocardial infarction (1.24 [1.08–1.42]), and low body surface area in men (1.22 [1.14–1.30]). C-statistic was 0.648. Fifty-two hospitals (6.1%) had readmission rates statistically better or worse than expected.

Conclusions—A coronary artery bypass grafting surgery readmission measure suitable for public reporting was developed by using the national Society of Thoracic Surgeons clinical data linked to Medicare readmission claims. (***Circulation*. 2014;130:399-409.**)

Key Words: coronary artery bypass ■ patient readmission ■ registries ■ risk adjustment

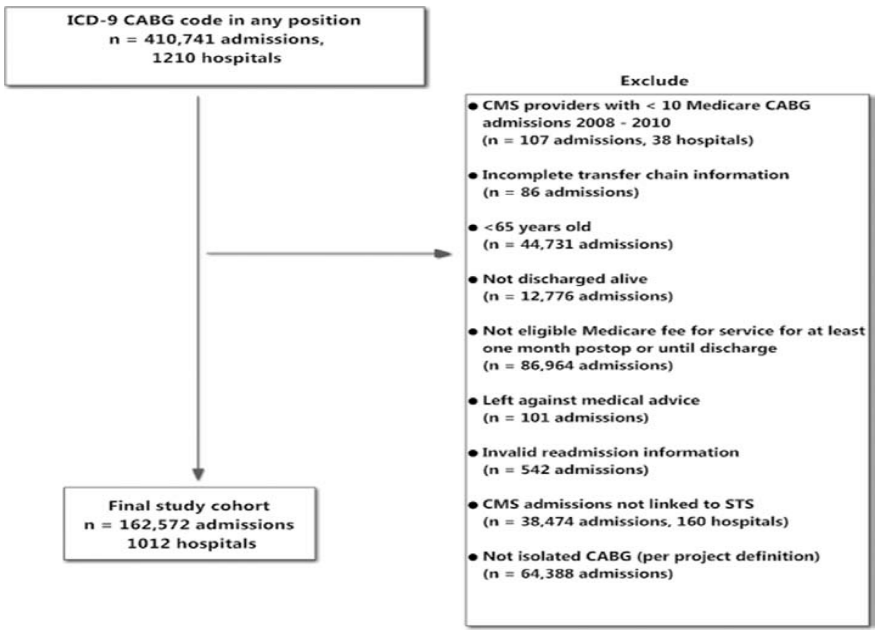
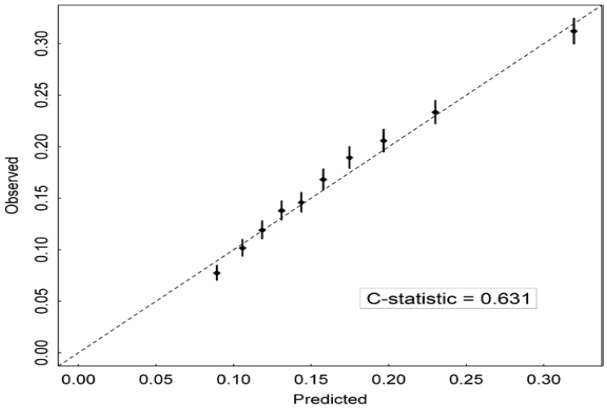
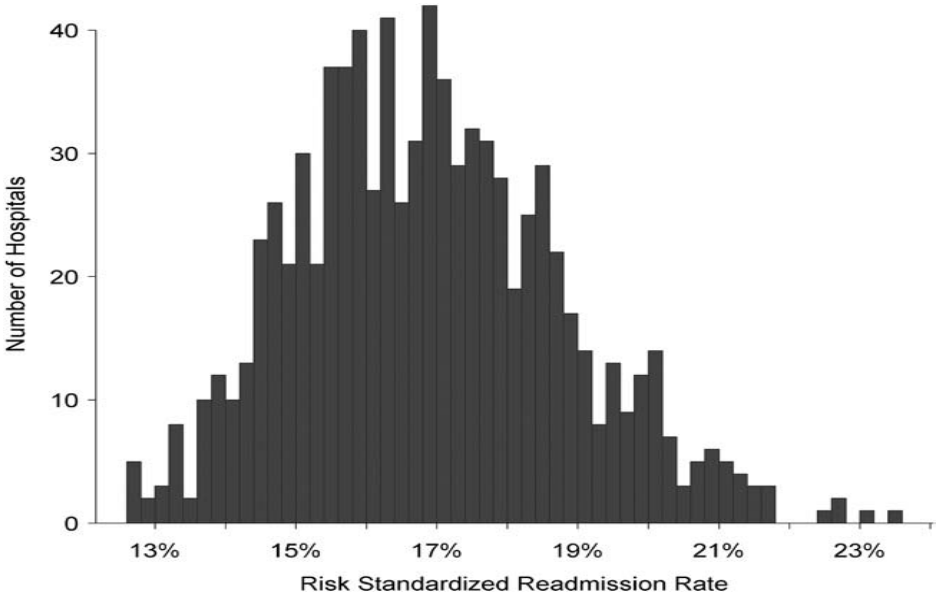


Table 2. Estimated Odds Ratios (95% Confidence Intervals) From Final Marginal Model (Estimated From 2008–2010 Data)

Effect	OR (95% CI)	*P* Value
Ejection fraction per 10 U decrease	1.07 (1.05–1.09)	<0.0001
Preoperative atrial fibrillation	1.36 (1.30–1.42)	<0.0001
Unstable angina (no MI ≤ 7 days)	1.05 (1.01–1.08)	0.0059
Congestive heart failure	1.17 (1.13–1.22)	<0.0001
Age per 10-y increase	1.36 (1.33–1.39)	<0.0001
Dialysis and creatinine*	—	—
Dialysis vs no dialysis and creatinine = 1.0 or lower	2.02 (1.87–2.19)	<0.0001
Creatinine 1.5 vs ≤1.0	1.27 (1.22–1.32)	<0.0001
Creatinine 2.0 vs ≤1.0	1.37 (1.32–1.43)	<0.0001
Creatinine 2.5 vs ≤1.0	1.49 (1.41–1.57)	<0.0001
Status (vs elective)	—	—
Urgent	1.09 (1.05–1.13)	<0.0001
Emergent/emergent salvage	1.17 (1.08–1.27)	0.0002
Female (at BSA=1.8) vs male (at BSA=2.0)	1.38 (1.33–1.43)	<0.0001
Reoperation (vs no previous operation)	—	—
≥1 previous operation	1.14 (1.07–1.22)	<0.0001
Chronic lung disease (vs none)	—	—
Mild	1.21 (1.17–1.26)	<0.0001
Moderate	1.35 (1.28–1.42)	<0.0001
Severe	1.58 (1.49–1.68)	<0.0001
Diabetes mellitus (vs no diabetes mellitus)	—	—
Noninsulin diabetes mellitus	1.11 (1.07–1.14)	<0.0001
Insulin diabetes mellitus	1.45 (1.39–1.51)	<0.0001
Preop IABP or inotrope	1.08 (1.02–1.14)	0.0073
Immunosuppressive treatment	1.38 (1.28–1.49)	<0.0001
Peripheral vascular disease	1.20 (1.16–1.24)	<0.0001
MI (vs MI > 21 days or no MI)	—	—
1–21 days	1.14 (1.10–1.19)	<0.0001
> 6 and < 24 h	1.11 (1.02–1.21)	0.0216
≤ 6 h	1.24 (1.08–1.42)	0.0022
BSA†	—	—
1.6 vs 2.0 in male	1.22 (1.14–1.30)	<0.0001
1.8 vs 2.0 in male	1.04 (1.02–1.07)	0.0011
2.2 vs 2.0 in Male	1.07 (1.05–1.09)	<0.0001
1.6 vs 1.8 in female	0.99 (0.96–1.01)	0.3060
2.0 vs 1.8 in female	1.13 (1.10–1.16)	<0.0001
2.2 vs 1.8 in female	1.44 (1.35–1.53)	<0.0001
Surgery date per half-year increase	0.99 (0.98–0.99)	0.0010
Cerebrovascular disease	1.14 (1.11–1.18)	<0.0001
Hypertension	1.07 (1.02–1.12)	0.0025
PCI ≤ 6 h	1.10 (0.94–1.29)	0.2166
Left main disease	0.97 (0.94–0.99)	0.0163

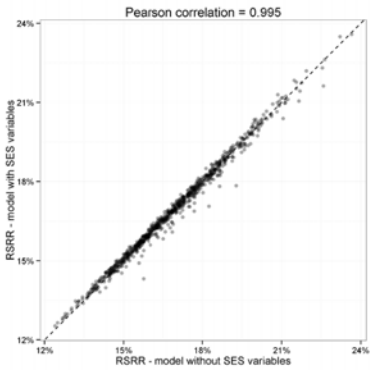
Based on preop factors only, and no SES





STS/NQF Sociodemographic Factors Study

	Number of readmissions	*Readmission rate*	*Number of patients*
Ethnicity			
Non-Hispanic	26,042	16.7%	155,780
Hispanic	1,143	19.1%	5,982
Race categories			
1 - Black	1,576	20.2%	7,792
2 - Asian	410	18.0%	2,277
3 - Native American	94	20.5%	459
4 - Pacific Islander	39	16.6%	235
5 - Other	627	17.6%	3,554
6 - Caucasian	24,287	16.6%	146,625
7 - Multiracial	152	18.5%	820
Payor categories			
1 - Medicare+Medicaid dual eligible	2,143	22.9%	9,347
2 - Medicare+Commercial without Medicaid	12,885	15.9%	80,966
3 - Medicare without Medicaid/Commercial	12,157	17.0%	71,449
Overall	27,185	16.8%	161,762



Pearson correlation coefficient 0.995

Only 8 of 846 hospitals changed classification

		Model with SDS factors (race/ethnicity and payor)		
		Better than expected	**As Expected**	**Worse than expected**
Model without SDS factors	**Better than expected**	20	3	0
	As expected	2	795	2
	Worse than expected	0	1	23

Better than expected = 95% interval estimate of RSRR entirely below population aggregated rate
Worse than expected = 95% interval estimate of RSRR entirely above population aggregated rate
As expected = 95% interval estimate of RSRR neither entirely above nor entirely below population aggregated rate

The outlier status based on the two models agreed for 99.1% (838/846) of all hospitals.

Readmission

- Major national concern
- Inter-hospital variation exists
- Readmission prediction models, including CABG, perform poorly compared with mortality or morbidity models
- SES factors do not change CABG performance classification for vast majority of hospitals
- For CABG, potential exists to mitigate likelihood of readmission

Reducing Readmissions after Isolated CABG: Guidelines for Perioperative Care

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Disclosures

- None

General Considerations

- Risk factors for surgical morbidity and mortality are not the same as those for hospital readmission.
- Reducing readmission rates for CABG patients requires a “bundled” approach
  - Multiple unrelated causes of readmissions with a low incidence
  - Some causes are unavoidable complications of surgery
  - Socioeconomic and insurance coverage factors are unchangeable

Strategies to Reduce Readmission Rates after CABG

- Provide better peri-operative care
  - Strict glycemic control
  - Prevent Retained Blood Syndrome
- Completely resolve post-operative issues
  - Atrial fibrillation – rate control and anti-coagulation
  - Congestive heart failure – appropriate medication regimen
  - Pleural effusions – early thoracentesis
- Proactively identify patients "At Risk" for readmission
  - Better management of co-morbidities
  - Plan enhanced post-discharge follow-up

Summary of Primary Reasons for Readmission

Administrative Reviews

Reasons	Range
Surgical site infection	12 – 17%
CHF	10 – 13%
Pleural effusion	3 – 4%
Chest pain	3 – 5%
Atrial fibrillation	3 – 6%

Clinical Reviews

Reasons	Range
Surgical site infection	10 – 17%
CHF	7 – 15%
Pleural effusion	12 – 15%
Chest pain	8 – 12%
Atrial fibrillation	5 – 13%

1. Glycemic Control

The effectiveness of tight glycemic control on decreasing surgical site infections and readmission rates in adult patients with diabetes undergoing cardiac surgery: A systematic review

Lyn Boreland, MSN, RN, FNP-BC, DNPc, Marcia Scott-Hudson, MSN, RN, FNP-BC, DNPc,

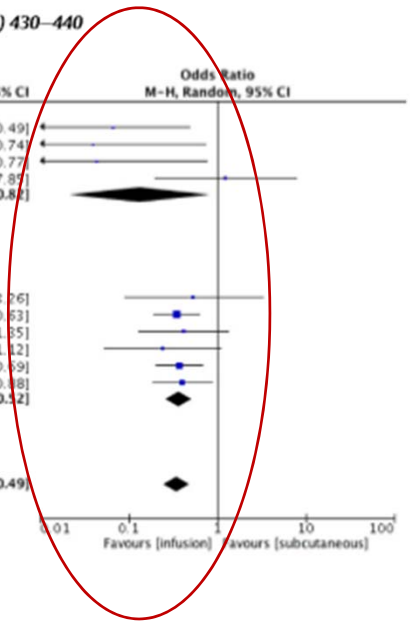
- Review identified 11 studies of isolated CABG patients
- 4 were randomized control trials of strict glucose management in known diabetics with insulin infusion vs subcutaneous insulin injections on a sliding scale
- 7 were cohort studies with prospective comparison of IV vs subcutaneous insulin for glycemic control

Boreland L et al Heart & Lung 2015

L. Boreland et al. / Heart & Lung 44 (2015) 430–440

Study or Subgroup	Insulin infusion Events	Total	Subcutaneous Insulin Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
1.2.1 Randomized Controlled Trials						
de Barcellos, et al., 2007	3	12	10	12	2.9%	0.07 [0.01, 0.49]
Emam, et al., 2010	0	80	5	40	1.4%	0.04 [0.00, 0.74]
Lazar, et al., 2004	0	72	9	69	1.4%	0.04 [0.00, 0.77]
Li, et al., 2006	3	51	2	42	3.4%	1.25 [0.20, 7.8[illegible]]
Subtotal (95% CI)		**215**		**163**	**9.2%**	**0.13 [0.02, 0.8[illegible]]**
Total events	6		26			

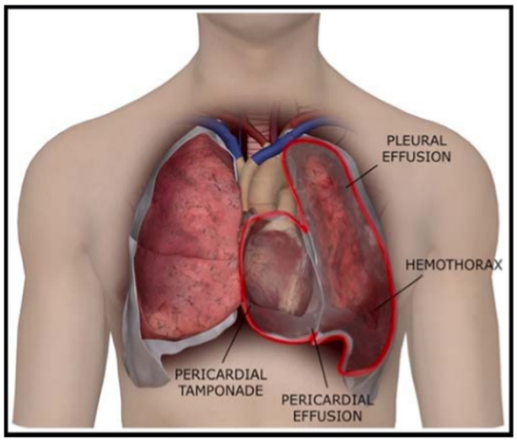
Heterogeneity: Tau² = 2.00; Chi² = 7.28, df = 3 (P = 0.06); I² = 59%

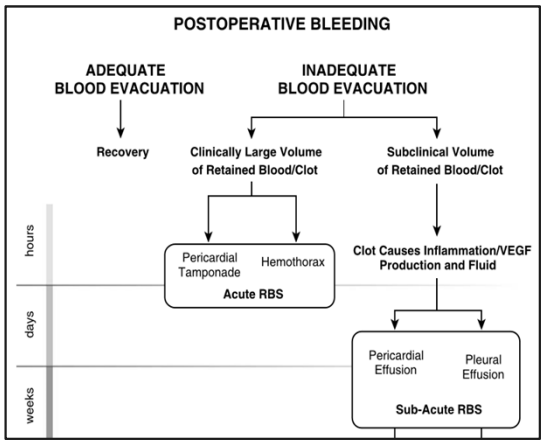


- 10 out 11 studies show significant reduction of sternal and leg wound infections
- Best results with insulin infusion beginning pre-op through POD 3 with target glucose ≤ 200
- Readmission reduction specifically demonstrated in 2 studies

Boreland L et al Heart & Lung 2015

2. Prevention of Retained Blood Syndrome (RBS)





- Retained blood is believed to be root cause for persistent and recurrent fluid collections

Boyle EM et al, Innovations 2015

Preventing Retained Blood Syndrome

- Eliminate agents that produce coagulopathy prior to surgery
- Meticulous hemostasis
- Satisfactory chest tube drainage
- Re-exploration and washout for excessive bleeding (early)
- Pre-discharge thoracentesis for pleural effusions > 25% of hemi-thorax volume

Complete Resolution of Post-operative Issues

CHF – Optimal Medication Management

1. **HFrEF (LVEF < 40%)**
   - Diuretics
   - ACE inhibitors titrated to effect
   - Aldosterone antagonists
   - Avoid calcium channel blockers
2. **HFpEF (LVEF ≥ 40%)**
   - Diuretics for fluid overload
   - Anti-hypertensives to modulate BP and prevent SBP "spikes"
   - Beta blockers to prevent tachycardia
   - Aldosterone antagonists

Complete Resolution of Post-operative Issues

New Onset Atrial Fibrillation

1. **Incidence and Time Course**
   - 95% of cases occur within 3 days of surgery
   - Incidence: 15 – 40%
   - Self-limited: 80% terminate within 24 hours of onset
2. **Prevention of Post-op AF**
   - Beta blockers reduce incidence of NOAF by 30%
   - Amiodarone lowers the incidence of NOAF by 50%, but has more adverse cardiac events (bradycardia requiring temporary pacing – 5.7%)

Complete Resolution of Post-operative Issues

New Onset Atrial Fibrillation

3. **Treatment**
   - Rate Control with beta blocker, amiodarone and/or cardiazem to achieve resting HR < 90 and 6MWT HR < 125
   - Cardiovert:
     - if symptomatic and rate control difficult
     - LVEF < 40%
4. **Anticoagulation**
   - Indicated for multiple episodes of AF or one episode > 24 to 48 hours
   - Warfarin without bridging heparin to achieve INR of 2.5 to 3.0
     - Unless prior history of thromboembolic complications of AF
   - Maintain anticoagulation for 4 weeks from onset of AF

Complete Resolution of Post-operative Issues

Pleural Effusions

1. **Natural History**
   - 10% develop effusion that occupies > 25% of hemi-thorax within 30 days
   - Only half of these patients require thoracentesis
2. **Evaluation**
   - Pleural ultrasound to differentiate fluid from atelectasis
   - Post-cardiotomy syndrome work-up if progressive enlargement > 2 weeks
3. **Treatment**
   - Medical management (diuresis ± NSAIDs)
   - Pre-discharge ultrasound-guided thoracentesis if > 25% hemithorax

Risk Factors for Readmission

STS National Cardiac Database 2008 – 2010

162,572 Isolated CAB patients

Risk Factor	Odds Ratio	Risk Factor	Odds Ratio
ESRD on hemodialysis	2.02	Immunosuppression	1.38
Severe COPD	1.58	Pre-op atrial fibrillation	1.36
IDDM	1.45	Age (10 year increments)	1.36
Obesity (woman)	1.44	Recent MI	1.24
CKD – creatinine > 2.5	1.40	BMI < 21 (males)	1.22

Shahian DM et al, Circulation 2014

Benefits of Recognizing *"At Risk"* Patients for Readmission

- Conscientious guideline implementation
  - Adjust for co-morbidities
- Higher index of suspicion for complications
  - Infections and borderline cardiopulmonary function
- Plan post-discharge resources for frailty support
  - PT and nursing care to facilitate full recovery
- Avoid post-surgical variant of "post-hospital syndrome"
  - Urgent surgery challenges pre-hospital compensation

Discharge Checklist

- No signs of wound infection
- Resolution of any post-op complications
- Glycemic control
- Absence of heart failure
  - No ankle swelling
  - CXR – no pulmonary congestion
  - Medication review for proper regimen (HFpEF vs HFrEF)
- Stable heart rhythm
  - If AF, resting HR < 90 and exertional HR < 130
- Sustainable pulmonary status
  - CXR clear or < 25% pleural effusion
  - Bronchodilator therapy for COPD
  - Independent ambulation
- Disposition appropriate and discharge summary complete

Readmission Strategies & Outcomes

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Disclosures

- None

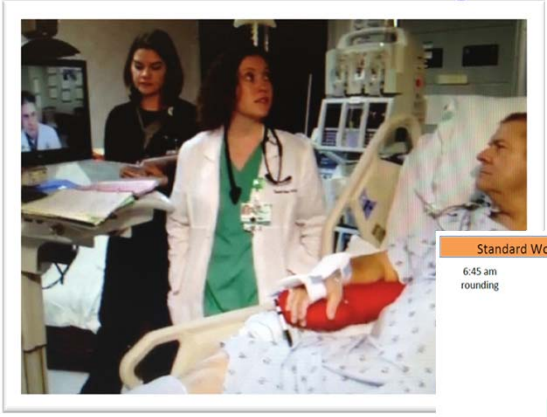
Quality Improvement Program (QIP)

2004-Present

- Common Aspiration Goals
  - Mortality
  - Major Morbidity
  - LOS
  - Readmissions
  - Cost/case
- Alignment of Guiding Coalition
  - Leaders
  - Managers
  - Multidisciplinary, expert 'teaming'
- Accountability
- Learn Quickly & Continuously Improve
  - Real time data management, analysis, and reporting

QIP - People & Process Highlights

Admissions, Monitoring, and Multidisciplinary Rounds

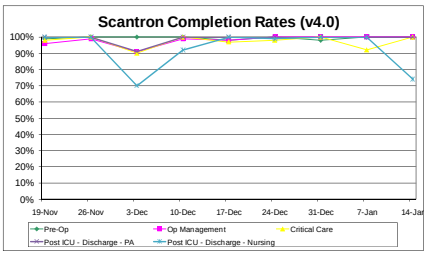


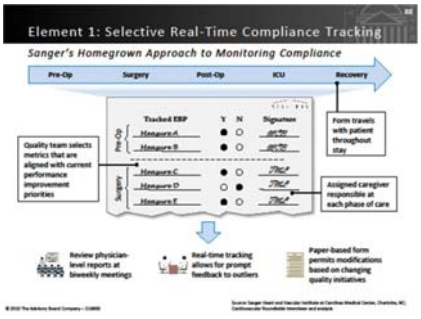
Goal Sheets

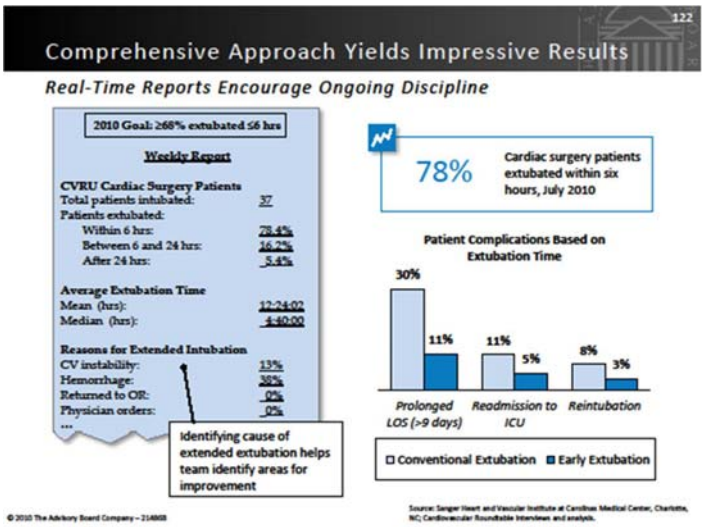
Multidisciplinary Rounds

QIP - Process Highlights

Checklists

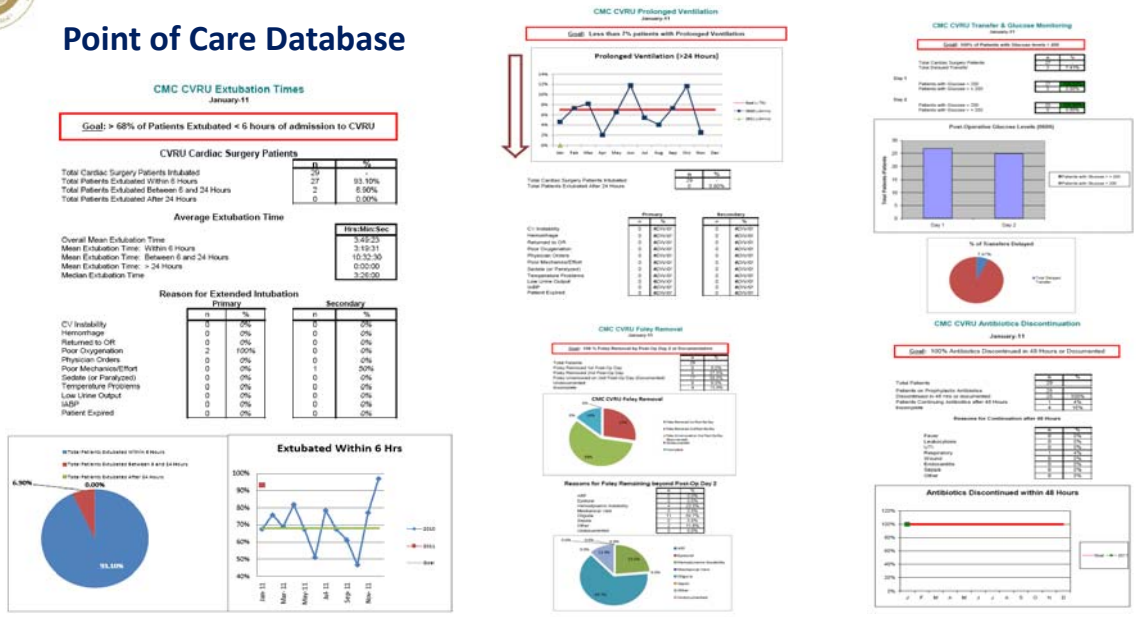






QIP-Technology

Point of Care Database



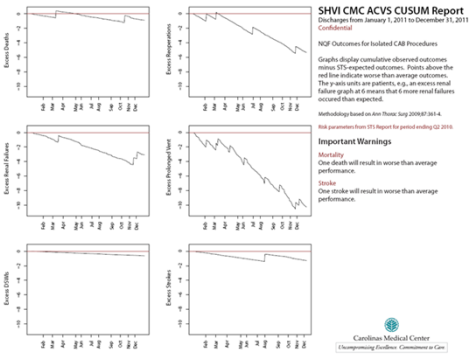
QIP - Accountability

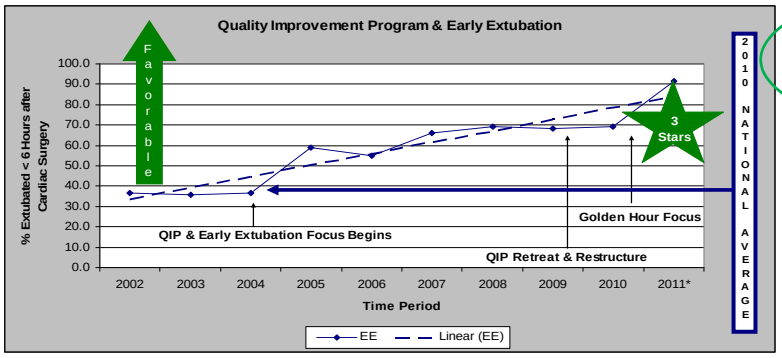
Process Compliance

Issue	Owner	Corrective Actions Taken / Planned	Measure of Success			historic Data	Status YTD	Comparison to Last Month		
			MTD	YTD	GOAL	2010		Oct	Nov	Jan
Preop / Discharge Working Group										
Preop Beta Blocker	M. Sullivan	Pre-Op Beta Blocker	89%	81%	100%	No Data		↑	↑	↓
Renal Failure	M. Sullivan	High Risk RF patient: Nephrology consulted	100%	100%	100%	No data		↑	↑	↑
Antimicrobial	L. Davis	Preop nasal bactroban	99%	98.9%	100%	97%		↑	↓	↑
	L. Davis	Preop hibiclens shower/bath	99%	98.7%	100%	97%		↑	↓	↑
	M. Sullivan	High risk antibiotic perop regimen	100%	99%	100%	97%		↑	↑	↑
DC order by 0900	L. Davis	DC order by 0900	74%	82%	75%	66%		↑	↓	↑
DC by Noon	L. Davis	DC by Noon	29%	32%	22%	No data		↑	↓	↑
Review of Core Measures	L. Davis	Review of Core Measures	99%	99%	100%	96%		↓	↑	↑
Reaew of NQF Process Measures	M. Sullivan	Review of NQF Process Measures	93%	99%	100%	95%		↑	↓	↓
Intraop Working Group										
Hemodilution Calculation	A. Perez	Hemodilution Calculation Rate	99%	99.9%	100%	No Data		↑	↑	↓
RAP	A. Perez	RAP Done (based on cases except OP CABG)	99%	99%	90%	97%		↑	↑	↓
TEG and Coags	H. Geller	TEG reviewed prior to leaving OR	65%	64%	100%	No data		↑	↑	↓
Medications	H. Geller	Fentanyl Total (ml) %<30ml	96%	92%	85%	88%		↓	↑	↓
	H. Geller	Versed Total (mg) %<10mg	90%	78%	85%	83%		↑	↓	↑
Cardiac Index	H. Geller	>=2.2 L/min/m2 (Last - Prior to CVRU)	92%	92%	100%	75%		↑	↓	↑
Critical Care Working Group										
Cardiac Index	K. Twogood	>=2.2 L/min/m2 (within 30 min. in CVRU)	99%	98%	**	No data		↑	↑	↑
Hourly Review	L Lilley	Hour One, Hour Three, Hour Five reviewed	98%	99.3%	100%	No data		↓	↑	↓
Early Extubation***	K. Winn	Early Extubation (<6hrs)	82.0%	85.9%	>68%	69%		↑	↓	↑
Prolonged Ventilation***	K. Winn	Prolonged Ventilation (> 24hrs)*	0.0%	2.1%	<7%*	6%		↑	↓	↑
Prophylactic Antibiotics	L Lilley	Prophylactic Abx DC'd within 48 hrs	99%	100.0%	100%	No data		↑	↑	↓
Blood Sugars	L Lilley	POD #1 0600<200mg/dL	100%	100%	100%	97%		↑	↑	↑
		POD #2 0600<200mg/dL	99%	99%	100%	93%		↑	↑	↓
Urinary Catheter Removal	L Lilley	Foley DC'd at 48 hours (or documentation to continue)	97%	99%	100%	No data		↑	↑	↓

MTD: Month to Date (11/13/11-01/14/2012)
YTD: Year to Date (01/01/11-01/14/2012)
* *Initial CVRU admission*
***Monitoring for baseline data*
****Data from Previous Month*

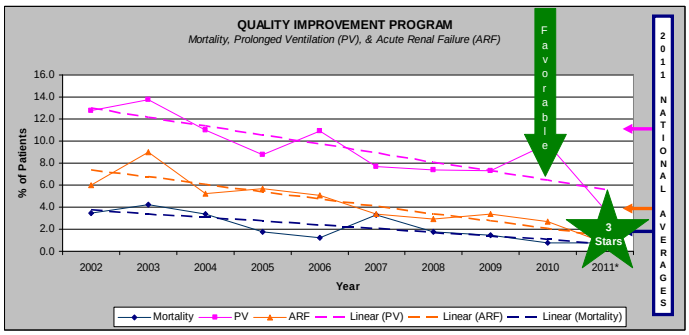
Red = not meeting goal
Yellow = on target to achieving
Green = meeting goal





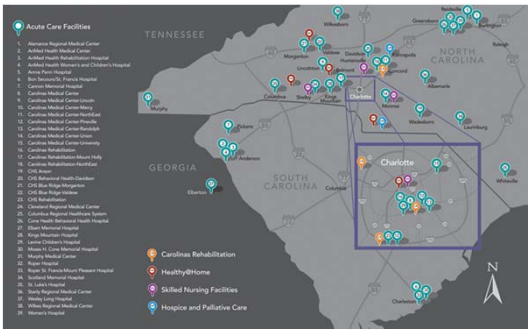
3 Stars 5/11 Periods @ CMC
3 Stars @ CMC-NE
3 Stars @ CMC-M

40% Reduction in Mortality



Readmission Reduction

1. Risk Assessment
2. Clinical Care Management
3. Transitions
4. SNF and Home Health Community Collaborative



CHS Graph (Home) | Metro Group ▼ | Regional Group ▼ | PSC Graph | Email Portal Team

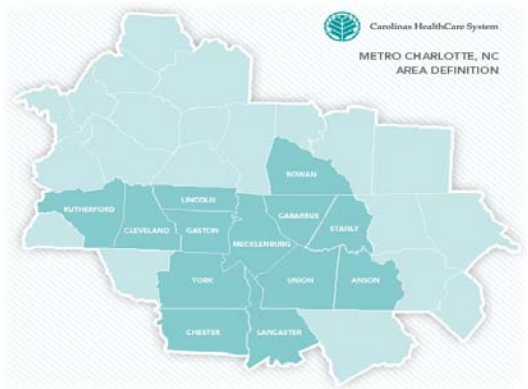
Metro Group
Quality and Service Metrics 2015

	Base	Target	Stretch	May2014 - Apr2015	YTD*	Num	Den
Acute Care Patient Safety Composite (Rolling Year)	0.832	0.762	0.725		0.698	.	.
Acute Care Mortality O/E	0.807	0.733	0.664		0.673	967	1,437
Acute Care Unplanned Readmissions O/E	0.969	0.918	0.868		0.853	1,832	2,148
Acute Care Length of Stay O/E	1.169	1.078	1.019		1.120	174,599	155,906
Likelihood to Recommend	78.49	78.53	79.53		74.113	.	2,356

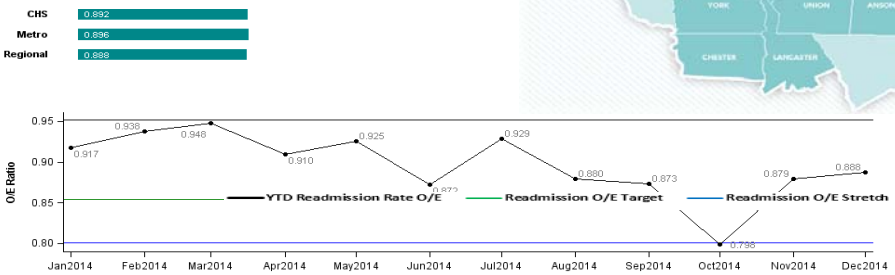
* Click on YTD metric to navigate to details.
** Cut off date for readmissions is March 12, 2015 to reduce effect of incomplete data.
*** Likelihood to Recommend pull date from Press-Ganey is May 10, 2015.

YTD Colors: No Goals Set | Below Base | Below Target | Above Target | Above Stretch

2014 Charlotte Metro Readmissions



Metro Group
Hospital-Wide 30 Day Readmissions O/E



Readmission Reduction

Charter & Structure

BACKGROUND:

Hospital readmissions remain one of the costliest potentially avoidable outcomes in the healthcare continuum and improvement in this area requires the effective partnering of many different groups and functions across the care continuum.

As CHS addresses this strategic imperative as part of the Integrated System of Care (ISOC) work, it is useful and important to optimize the structure and positioning of leadership groups to effect change throughout the organization.

It is recognized that many of the 2015 strategic priorities, particularly ISOC, require that clinicians work together in new and seamless ways to create (1) the best analysis of the complex current state and (2) the platform on which to execute action plans synergistically.

PRIMARY PURPOSES:

To serve as the integration/coordination of clinical and operational input to strategic development and execution for CHS Readmissions work

To serve as a repository of data and activity around readmissions work across the System

To understand the variability and create standardization

To set objectives for the 2015 and 2016 work

To provide feedback and direction to the Strategy Team

To provide overall oversight and issues resolution to ensure successful outcomes

To provide guidance, education and communication to CHS leaders regarding Readmissions strategies

To advocate for appropriate resources and ensure the work remains a priority focus

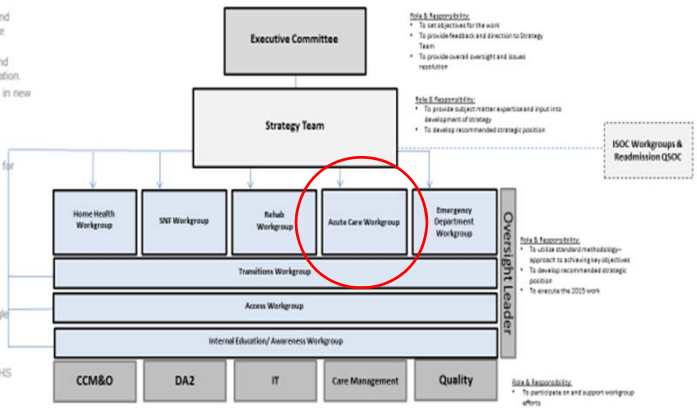
To focus the organized work in the Metro region and share learnings as rapidly as possible and promulgate single unified enterprise thinking throughout the CHS clinical enterprise

SCOPE:

The Readmission Executive Committee will be focused on Readmission analysis and intervention across the CHS Primary Enterprise.

EXECUTIVE COMMITTEE MEMBERSHIP:

Co-Leadership



13

Readmission Risk Assessment

Existing Models

Several Risk Stratification Models Substituting in Absence of Perfect Algorithm

While the search for the perfect risk stratification model continues, many Roundtable members have adopted predictive models that have been widely published on, adapting the formula to meet the needs of their particular organizations.

A sample of models used by CV programs include the Lace Index, the Philbin Tool, and the Krumholz model. Though variations exist between each, certain factors such as hospital visits within the past 30 days, insurance status, and other demographics tend to appear time and again.

Hospitals Adapting Models to Suit Patient Cohort

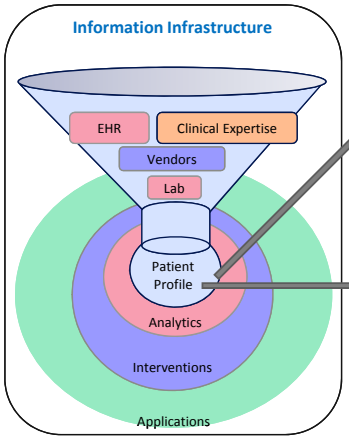
Commonly Used Risk Stratification Tools

Tool	Description
LACE Index	Predicts risk of readmission based on length of stay, acute (emergent) admission, comorbidities, and ED visits during previous six months.
Philbin Tool	Factors including race, insurance status, discharge disposition, diagnosis, and interventions performed during index admission; patient is assigned score of 0 to 15.
Krumholz Model	Online calculator using risk-standardized, 30-day all-cause readmission rates for Medicare HF patients. Takes into account demographics, occurrence of in-hospital cardiac arrest, medical history, and diagnostics (such as SBP, HR, creatinine, LVEF).

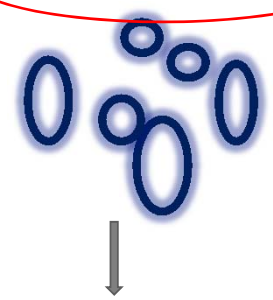
CHS Risk Model Development

30-day, Patient Specific, & Dynamic

Leverage our information infrastructure



Build highly predictive model



Within & out of hospital:
Improve care quality
Increase coordination
Target resources on high risk patients

Readmission Risk (& LOS)

Key Variables

Demographics

Age
Race Code
Insurance
Hospital Name
Service Provided
Admission Type
Transfer Type

Co-morbidities

Primary Diagnosis
Any Malignancy
Cerebrovascular Disease
Charlson Comorbidity Score
Chronic Pulmonary Disease
>9 Meds and >9 Problems
End Stage Renal Disease
Cancer Cohort
Myocardial Infarction
Number of diagnoses in the problem list
Number of orders
Pulmonary Disorder
Solid Tumor without Metastasis

Psychosocial

Clinical Nutrition Consult
Living Situation
Need Transportation Assistance
Physical Therapy Consult

Utilization

Days since last discharge (w/in 6 months)
Number of Inpatient visits in the last 6 months
Number of ED visits in the last 6 months
Number of Transfers
Discharged to home in the last 30 days

Readmission Risk (& LOS)

Key Variables

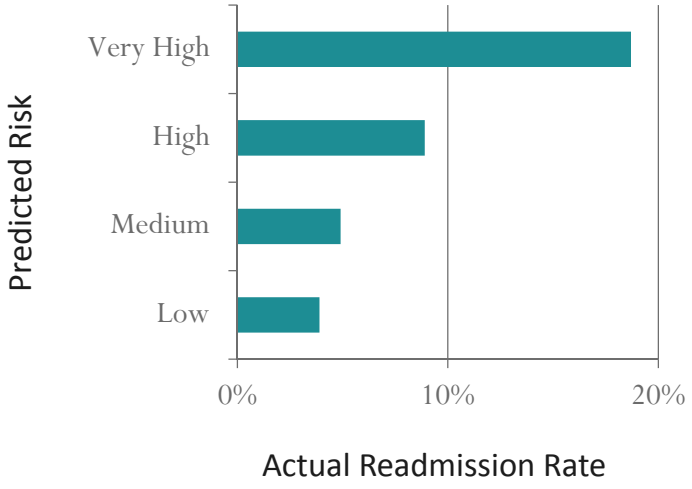
Labs/Vitals/Meds

Recorded/Home Meds
Meds in the last 24 Hrs
Albumin Level
Ammonia level
Arterial Lactate
Blood Transfusion
BNP
BMI
Braden Skin Score
Cardiac Rhythm
Edema
Fall Risk Score
Gastrointestinal Normal
Glomerular Filtration Rate
Feeding Tube
Hemoglobin
HGB A1C
Inability to Verbalize Needs
Musculoskeletal Normal
Neurological Normal
Nutrition Braden Score
O2 saturation
Proton Pump Inhibitor
Orientation
Oxygen Flow Rate
Oxygen Improved Status
Oxygen Therapy Type
Pain Intensity
Radiology Count
Respiratory Braden Score
Respiratory Normal
Respiratory Rate
Safety and Judgment
Scooting
Sit to Stand
Sit to Supine
Skin Description
Systolic BP
Toilet Use Mobility
Tracheal Post Treatment
Venous Lactate

Readmission Risk Model

- Model Accuracy: C-stat = 0.77
- CHS Readmission model is better than any other predictive models found in published literature

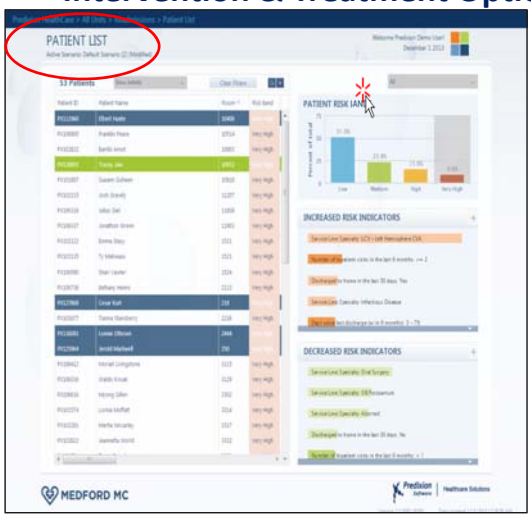
Validation of Readmission CHS Risk Model

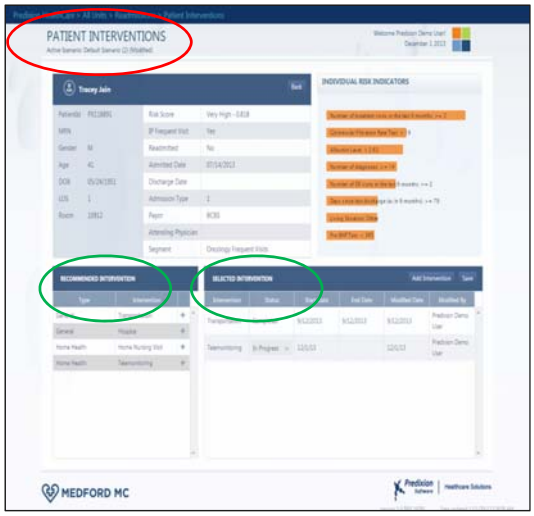


Clinical Care Management View

Individual Patient Risks

Intervention & Treatment Options





Clinical Care Management

Patient Risk Assessment

Then	Now
Done After EMR and Patient Review Care managers need to review the patient's chart and examine the patient prior to assessing risk	**Done Prior to Seeing Patient** Allows care managers to work more effectively by prioritizing their workflow and more efficiently through automating the risk assessment.
Limited Capability Care managers assign risk based on a a few simple criteria that group patients into two buckets: low risk and high risk	**Done Prior to Seeing Patient** Allows care managers to work more effectively by prioritizing their workflow and more efficiently through automating the risk assessment.
Case Manager Variation Care manager ability to find and assess risk factors varies	**Automation Decreases Variation** Patient risk is automatically calculated for the care managers
Done at Admission Care managers only have capacity to assess patient risk at admission	**Updated Hourly** A patient's condition and likelihood for readmission can change throughout a hospital stay; our tool captures these changes hourly as clinical data change

Clinical Care Management

Interventions

Difficult to Hardwire
Care managers required to recognize a certain patient type and remember what interventions are to be assigned to the patient

Recommendations Assigned Automatically
Patients automatically assigned interventions based on their personal characteristics

Difficult to Measure Interventions
Current care management tools do not allow for evaluation of intervention efficacy; limits our ability to leverage our System

Measure Efficacy Interventions
Capture of interventions and data around outcomes will allow us to measure the efficacy of interventions and determine patients who optimally benefit

Clinical Workgroup

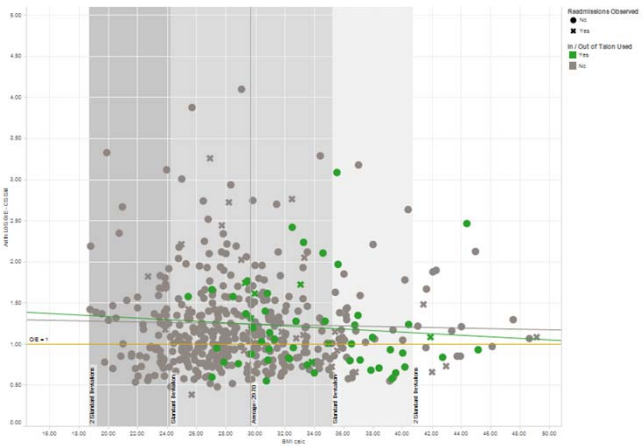
Clinical Effectiveness (LOS & Readmissions) & Clinical Optimization (Value)

Clinical Database: STS-NCD (QIP)

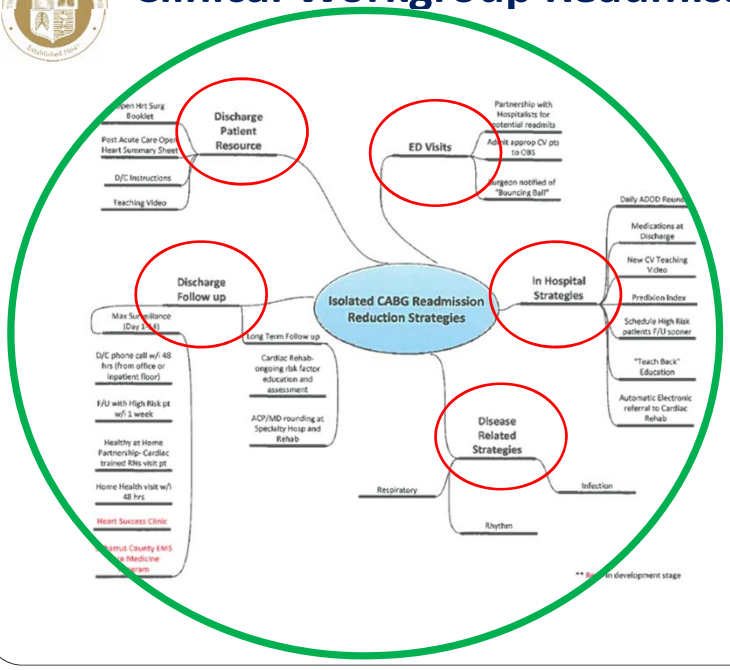
Admin Database: Premier

Readmissions: Predixion

Clinical Optimization: Tableau



Clinical Workgroup Readmission Reduction Strategies



Program in Brief: Carolinas HealthCare System, Sanger Heart & Vascular Institute

Description: Health care system across North and South Carolina, with three hospitals in the Charlotte, NC region part of Sanger Heart & Vascular Institute

CV Physician Affiliation: CV physicians are employed, integrated into leadership throughout the Heart & Vascular Institute

Procedural Volumes: ~1,250 open heart cases annually (CABG, valve, thoracic, aortic, VAD, transplant; excluding general thoracic)

Background on Readmissions Initiative:

- Launched Cardiac Surgery Continuum of Care Committee in Fall 2014 to oversee system-wide readmission reduction efforts
- Meet monthly in person and through video conference
- Each of the three SHVI hospitals with a cardiac surgery program has a workgroup to enact initiatives developed by the system Committee

Key Stakeholders Involved: Committee includes ~20 participants from across the continuum (e.g., cardiac rehab, home health, ambulatory clinics, inpatient units)

Key Procedural Readmission Reduction Strategies:

Reducing risk of post-procedure complications:

- Retrospective analysis of CT surgery readmissions to identify key root causes
- Risk stratification of all cardiac surgery patients for risk of renal failure, stroke, and pulmonary complication
- High-risk inpatient care pathways for aforementioned complications, included on pocket cards for surgery, post-op care team
- Hardwired fast-track extubation (<8 hours) through setting extubation goals at ICU admission and nurse-led weaning protocol
- Real-time monitoring and feedback of adherence to evidence-based ICU protocols (high-risk pathways, early extubation)

Coordinating care across patient recovery:

- Homegrown CT surgery readmission assessment performed for all patients upon admission to cardiac floor
- Risk score displayed in patient chart and discussed during daily rounds among care team and patients/family

Enabling patients to self-manage:

- Patient-friendly cardiac surgery post-discharge "roadmap" simplifies complex discharge instructions for patients, clearly displaying most important steps in transition of care post-discharge
- Post-discharge education frontloaded to begin prior to surgery

Optimizing the transitional care team:

- Acute Illness Management (AIM) team provides intense transitional care support for highest risk, comorbid patients to transition them to long-term physician care management
- AIM trigger built into CV care pathways (e.g., ACS/MI) to ensure high-risk patients are referred

Maximizing transition clinics for high-risk procedural patients:

- "Heart Success" high-risk transition clinic expanded from just HF to include CABG and valve patients, with intention to expand to COPD, AMI in 2016
- Cardiac surgery care pathway for Heart Success clinic

Ensuring appropriate cardiac rehab utilization:

- Automatic referral to cardiac rehab for all CV procedural patients
- Monthly review of cardiac rehab referral adherence, patient attendance, to target efforts to improve attendance

Coordinating with providers delivering ongoing care:

- Cross-continuum ACS pathway used by cardiologists and PCP's, reducing care variation for MI and interventional patients
- Privileges for CV APP's and cardiac surgeons to round on cardiac surgery patients in inpatient cardiac rehab

Impact of initiatives: Decreased rolling year 30-day isolated CABG readmissions rate to any site from 15.3% in Q2 2014 to 5.8% in Q2 2015; HF year-to-date readmission rate (same-site, Carolinas Medical Center) decreased from 17% in 2010 to 11.73% in 2015

Advisory Board

QIP-Risk Assessment & Mitigation Strategies

Stroke, Prolonged Ventilation, and Renal Failure

Phase-of-Care Approach

High Risk Readmission Criteria- moderate or greater
(Mark All That Apply)

1. Post-Operative Afib
2. Reduced EF/Heart Failure (<40%) or on a LifeVest
3. Uncontrolled Diabetes
4. Pleural Effusion
5. Wound concerns
6. Patient Refuses Home Health
7. High/Very High Predixion Score
8. Medium/High Grace Score
9. Other _____

If patient High Risk for Readmission follow up appt arranged within 1 week post discharge

1 Yes 2 No 3 N/A

Sanger Heart & Vascular Institute
Heart & Lung Surgery Recovery Guide

PATIENT NAME: _____

This guide will help you and your family or caregivers understand what happens after you leave the hospital. Your nurse will review this with you. Not everything on this list will apply to you or your care, so some things will not be marked with a check mark. Please make sure to ask your nurse any questions you have.

This is Information You Might Receive Before You Leave the Hospital

☐ A Helpful Video _____

Your surgeon may have given you a video during your office visit or before your surgery. This video will tell you what to expect from your surgery. We would like you to review the information on:

- What to expect and what to do when you go home from the hospital.
- Nutrition and cardiac rehab

This same information is also offered in a printed brochure. If you have not received a video or a brochure, please ask your nurse to provide one.

☐ Paperwork and Instructions for Leaving the Hospital (This process is called discharge.) _____

Your nurse will review a folder of information you will need, including:

- Doctors' appointments you will have after you leave the hospital.
- The medications you will take at home, including when to take your next dose and any possible side effects of the medication.
- Information about your diagnosis and the conditions you may have been treated for while you were in the hospital.

You will want to show your home health nurse this information.

☐ Medications After You Leave the Hospital _____

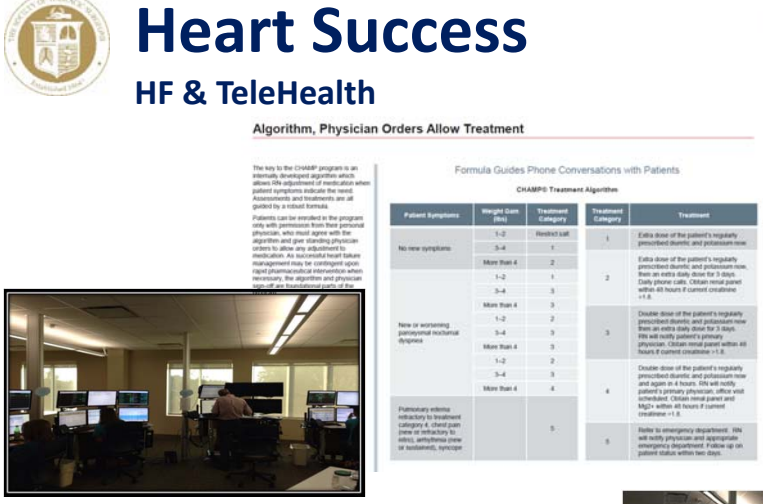
Your nurse will review your medicines.

- You will be asked which pharmacy you would like to use to fill your prescriptions. They will be sent electronically to your pharmacy so you can pick them up without waiting.
- Medications used to control pain may be given to you as a paper prescription. You can then take the prescription to the pharmacy and wait for it to be filled.

In some cases, your medicines may be available to take home with you on the day you leave. Please talk with your nurse about this option.

Heart Success

HF & TeleHealth


Algorithm, Physician Orders Allow Treatment

The key to the CHAMP program is an internally developed algorithm which allows RN adjustment of medication when patient symptoms indicate the need. Assessments and treatments are all guided by a robust formula.

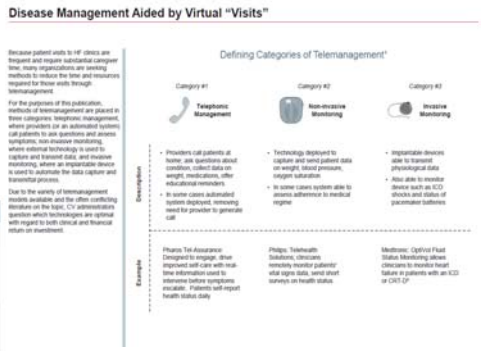
Patients can be enrolled in the program only with permission from their personal physician, who must agree with the algorithm and give standing physician orders to allow any adjustment to medication. As successful heart failure management may be contingent upon rapid pharmaceutical intervention when necessary, the algorithm and physician sign-off are foundational parts of the

Formula Guides Phone Conversations with Patients

CHAMP® Treatment Algorithm

Patient Symptoms	Weight Gain (lbs)	Treatment Category
No new symptoms	1–2	Restrict salt
	3–4	1
	More than 4	2
New or worsening paroxysmal nocturnal dyspnea	1–2	1
	3–4	3
	More than 4	3
	1–2	2
	3–4	3
	More than 4	3
	1–2	2
	3–4	3
	More than 4	4
Pulmonary edema refractory to treatment category 4, chest pain (new or refractory to nitro), arrhythmia (new or sustained), syncope		5

Treatment Category	Treatment
1	Extra dose of the patient's regularly prescribed diuretic and potassium now.
2	Extra dose of the patient's regularly prescribed diuretic and potassium now, then an extra daily dose for 3 days. Daily phone calls. Obtain renal panel within 48 hours if current creatinine >1.8.
3	Double dose of the patient's regularly prescribed diuretic and potassium now then an extra daily dose for 3 days. RN will notify patient's primary physician. Obtain renal panel within 48 hours if current creatinine >1.8.
4	Double dose of the patient's regularly prescribed diuretic and potassium now and again in 4 hours. RN will notify patient's primary physician, office visit scheduled. Obtain renal panel and Mg2+ within 48 hours if current creatinine >1.8.
5	Refer to emergency department. RN will notify physician and appropriate emergency department. Follow up on patient status within two days.


Disease Management Aided by Virtual "Visits"

Because patient visits to HF clinics are frequent and require substantial caregiver time, many organizations are seeking methods to reduce the time and resources required for those visits through telemanagement.

For the purposes of this publication, methods of telemanagement are placed in three categories: telephonic management, where providers (or an automated system) call patients to ask questions and assess symptoms; non-invasive monitoring, where external technology is used to capture and transmit data; and invasive monitoring, where an implantable device is used to automate the data capture and transmittal process.

Due to the variety of telemanagement models available and the often conflicting literature on the topic, CV administrators question which technologies are optimal with regard to both clinical and financial return on investment.

Defining Categories of Telemanagement*

Category #1: Telephonic Management
Category #2: Non-invasive Monitoring
Category #3: Invasive Monitoring

Description:
- Providers call patients at home; ask questions about condition, collect data on weight, medications, offer educational reminders.
- In some cases automated system deployed, removing need for provider to generate call.
- Technology deployed to capture and send patient data on weight, blood pressure, oxygen saturation.
- In some cases system able to assess adherence to medical regime.
- Implantable devices able to transmit physiological data.
- Also able to monitor device such as ICD shocks and status of pacemaker batteries.

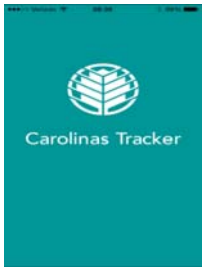
Examples:
- Pharos Tel-Assurance: Designed to engage, drive improved self-care with real-time information used to intervene before symptoms escalate. Patients self-report health status daily.
- Philips: Telehealth Solutions, clinicians remotely monitor patients' vital signs data, send short surveys on health status.
- Medtronic: OptiVol Fluid Status Monitoring allows clinicians to monitor heart failure in patients with an ICD or CRT-D*.

Readmission Reduction

Transition Clinic and Digital Health

Dysrhythmia

Fluid Overload

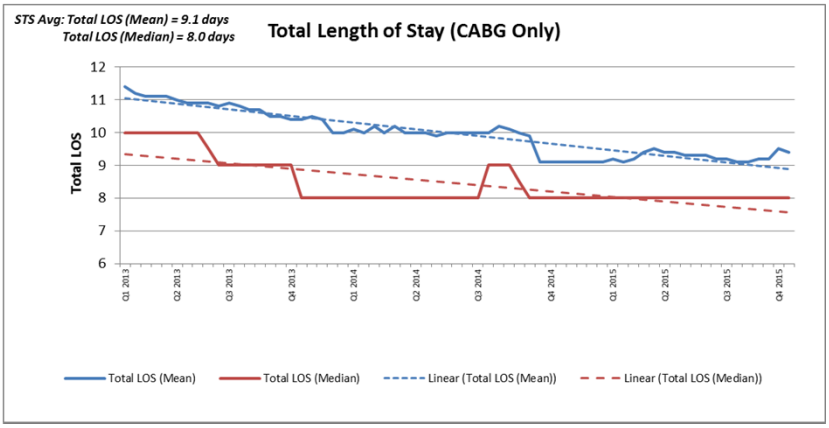


Future
Biomarkers

Clinical Effectiveness

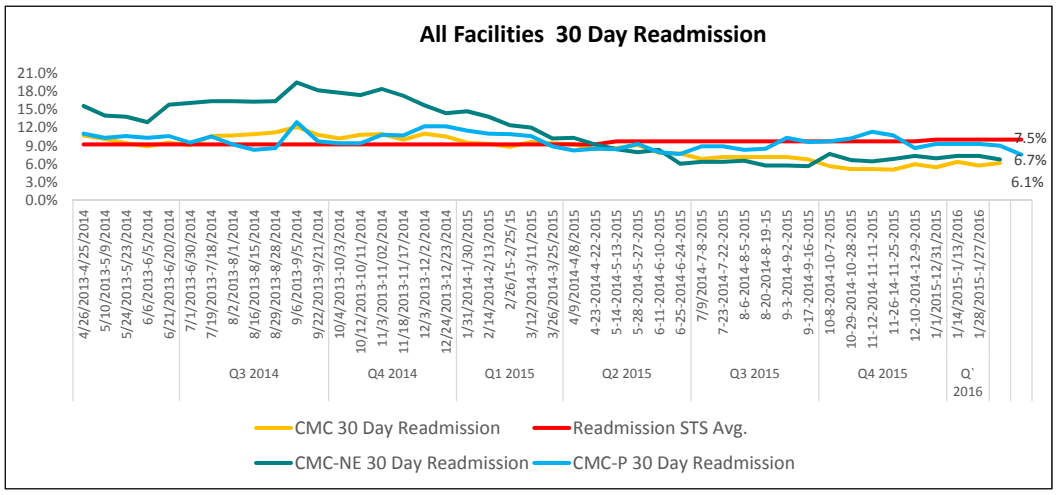
CAB-only LOS

2015	CMC	STS Ave
Op Mort %	1.8	2.2
Major Morb %	10.2	12.2
PV %	8.6	7.9
LOS		
Mean d	6.6	6.9
Median d	6.0	6.0
Short <6d	41.6	46.8
Readmission %	6.3	10



Clinical Effectiveness

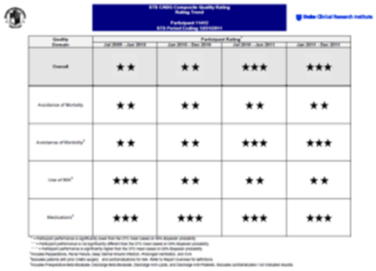
CAB-only Readmissions



Lessons Learned

"Success often comes from doing common things uncommonly well"

1. Teamwork makes the dream work
2. Keep score
3. Learn quickly
4. Continuously Improve
5. Tell the world about it
6. Upward Spiral of Success



Reducing Readmission

William T. Caine, MD

Intermountain Heart Institute
Cardiothoracic Surgery
Intermountain Medical Center

Disclosures

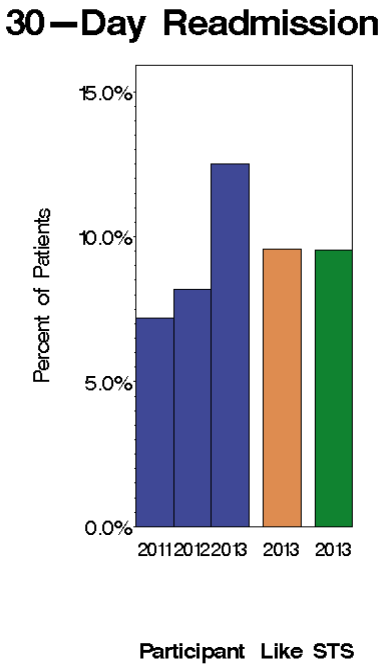
- None

The Readmission Problem

- Current 30-day readmission rate in the STS Adult Cardiac Surgery Database is ~10%
- Avoidable readmission is associated with
  - Opportunities to improve transition of care strategies
  - Significantly increased healthcare costs
- Readmission rates are increasingly scrutinized and reported, and will increasingly impact reimbursement

Once again, reviewing our STS data helped us recognize an area where we could improve our quality of care

CAB (2013-H3)

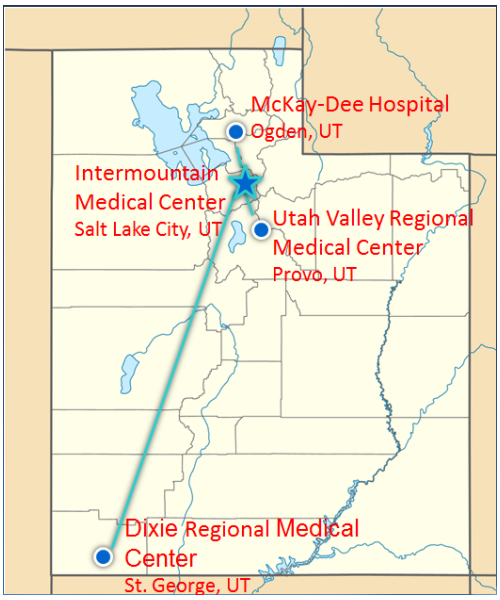


How Can We Intervene to Prevent Readmission?

- Multiple risk factors for Readmission have been outlined in the medical literature
- CMS has published a Readmission prediction model based on claims data, much of which isn't available until after patient discharge
- What can Intermountain's STS patient data tell us about how to predict which patients are at highest risk for readmission?

Intermountain Healthcare Cardiac Surgery

- Four programs throughout Utah



Intermountain Readmission Data

- Study patient population:
  - 1,607 patients who underwent isolated coronary artery bypass surgery
  - Includes patients operated at all four of Intermountain's cardiac surgical hospitals
- Data set
  - All STS database v. 2.73 registered patients
  - 59 easily obtainable *pre-operative* data elements were analyzed.

Intermountain Readmission Data

- Of 1,607 isolated CABG patients, 147 (9.15%) were readmitted
- Multi-variate analysis identified five variables that were significantly predictive of 30-day Readmission:

1. **Age (OR 1.027, p=0.004))**
2. **Heart failure symptoms within 2 weeks of admission (OR 1.547, p=0.02)**
3. **Low serum albumin level (OR 1.454, p=0.021)**
4. **Previous MI (OR 1.442, p=0.05)**
5. **Diabetes (OR 1.543, p=0.015)**

C-statistic = 0.63, which is comparable to the CMS readmission prediction model

Intermountain Readmission Data

- Validation
  - The model was validated prospectively with 539 CABG patients
  - Readmitted patients were compared with those who were not
  - The predicted risk of readmission was significantly higher among readmitted CABG patients ($F = 4.67$, $p = 0.031$)

What do we now do with these data?

The Key to Success of all Quality Improvement Initiatives:

A Multi-disciplinary Monthly Process Improvement Meeting

Process Improvement Involves Every Team Member

- Surgeons
- Anesthesiologists
- Cardiovascular Critical Care Physicians
- OR Nursing
- ICU Nursing
- Acute Care Nursing
- Perfusion
- Respiratory Therapists
- Physical Therapists
- Occupational Therapists
- Speech Therapists
- CT Surgery Physician Assistants
- Case Managers
- Infection Control

Cardiac Surgery
Is a
Team Sport!

Identify High Risk Patients Preoperatively

- Diabetics
- Patients with CHF symptoms in the past two weeks
- Patients who have suffered a prior MI
- Patients with poor nutritional status

Also:

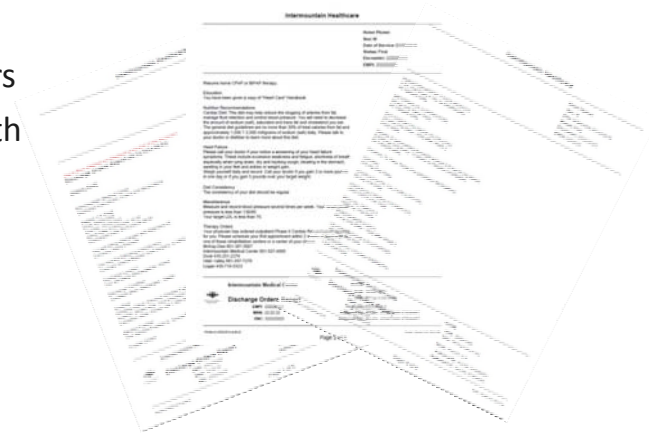
- Patients who are deconditioned
- Patients who have poor family/social support
- Patients with frailty

Preoperative Identification Is Only The First Step

- The rest of the hospitalization should be spent preventing readmission.
  - Discharge needs are reassessed throughout the hospital stay
  - All caregivers focus on ensuring safe transitions of care
  - APCs are empowered to arrange early follow-up in high risk patients which may include:
    - Early telephone calls to patients following discharge
    - Home health nursing visits
    - Early clinic follow-up visits
  - CV surgeon is contacted for all post-discharge ED visits

Detailed, Clear Instructions at Discharge

- Clear list of diagnoses
- List of medications
- Follow-up phone numbers
- Follow-up office visits with
  - Primary Care Provider
  - Cardiologist
  - Cardiac Surgeon



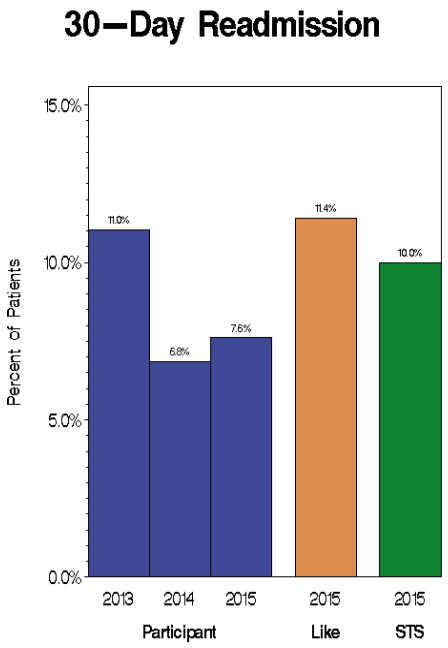
Home Health Visits

- Visit patients after discharge within 3 – 4 days
- Review medications
- Watch for common problems
  - Volume overload
  - Arrhythmias
  - Infections
- Have a clear point of contact when problems are identified

Skilled Nursing Facilities

- Must be used with care
- Recent studies suggest patients discharged to a Skilled Nursing Facility are >50% *more* likely to require readmission
- Intermountain has a new pilot program to work with SNFs to recognize problems early and reduce readmissions

CAB (2015-H3)



Questions

Please direct questions, comments and feedback to Sydney Clinton, STS Quality Metrics & Initiatives Coordinator, at sclinton@sts.org.

Thank you for viewing the
STS Readmission after CABG Webinar.

Please note that webinar slides and other materials are posted on the STS website.