Final Progress Report

Project Title: Yale Center for Healthcare Innovation, Redesign, and Learning (CHIRAL)
PI: Sarwat I. Chaudhry
Yale University
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The following is a summary of the work performed by CHIRAL Center, cores, and projects.

CHIRAL Center

Goals & Accomplishments

The accomplishments addressed in this section pertain to progress made by the center. Each CHIRAL project and core has made individual contributions, which are detailed in their respective sections. CHIRAL is committed to better understanding and creatively improving transitions of care for patients hospitalized at Yale New Haven Hospital (YNHH). Toward this end, the following center goals were developed to carry out objectives addressed in the Funding Opportunity Announcement (FOA):

GOAL 1) Refine infrastructure and resources, which will enable investigators to conduct high-quality, impactful research projects. Staff from the three projects are cross-trained to promote effective use of team resources and cross-pollination of knowledge and ideas. The center developed and implemented SOPs and other tools to aid in organized and effective management of the three projects and cores. CHIRAL has obtained stakeholder feedback on processes and deliverables.

GOAL 2) Support research teams as they develop and iteratively test innovative solutions designed to mitigate threats to patient safety during transitions into, within, and out of YNHH. During problem analysis and design, implementation, and evaluation stages, the center serves in a resource and advisory capacity, supporting research teams that are carrying out the work on the ground. The teams have engaged in intense collaborative design activities aimed at developing a shared vision for intervention development, developing a list of potential interventions and prioritizing these based on study findings and stakeholder feedback, and performing rapid cycle testing of each intervention, using simulation as appropriate. The center facilitated monthly meetings at which teams could share ideas, present their work and findings, and seek feedback from peers. The center facilitated meetings between the research teams and cores or YNHH leadership, clinicians, and staff. Center leadership provided direction and templates to facilitate documentation of methods, findings, and outcomes.

GOAL 3) Develop and nurture partnerships with YNHH. CHIRAL seeks to integrate research and design principles into existing quality improvement programs at YNHH. CHIRAL team members have continued their work as active members of several YNHH-based quality and safety work groups (Figure 1). CHIRAL representation within these groups allows the center to have an intimate understanding of these groups' efforts and provides an opportunity for collaboration.

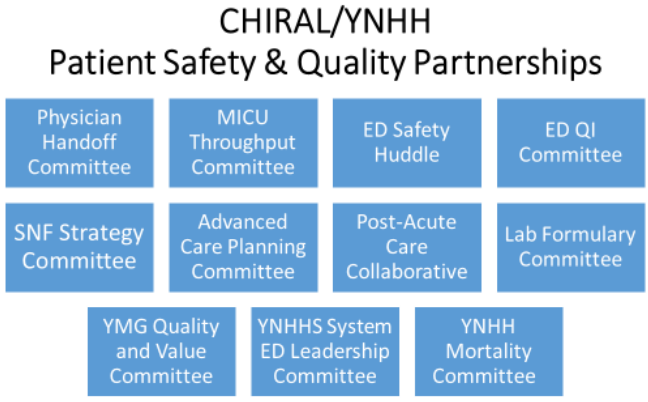

Figure 1. CHIRAL Team Members are active members of these YNHH-based committees and work groups.

GOAL 4) Promote team engagement and a collegial work environment. CHIRAL leadership has created a positive, engaging work environment. Staff are encouraged to develop skills, especially related to care transitions and mixed methods research.

Leadership has maintained effective communication with the CHIRAL team regarding center progress and goals. On an ongoing basis, CHIRAL has solicited team feedback on project methodology and next steps. The research teams participated in regularly scheduled team meetings, at which PIs and research staff met to discuss accomplishments to date, challenges, lesson learned, and planned activities. Local experts with backgrounds in human factors, qualitative research, performance improvement, data management, and biostatistics have often joined this meeting and led or participated in the conversation.

GOAL 5) Enhance the impact of QI scholarly activity through training, mentorship, dissemination, and publications. CHIRAL seeks to create opportunities for YNHH clinicians to engage in scholarly activity through collaboration, development of a Projects in Progress program, and mentorship. The CHIRAL team mentors students, fellows, and post docs by encouraging and overseeing collaborative work. Center leadership ensures team representation at local and national meetings. The center provides education and training through coursework, presentations, and in-services. CHIRAL staff have been mentored in developing abstracts and manuscripts to share findings. Staff participated in a variety of patient safety and quality trainings, such as the IHI course, "Better Quality Through Better Measurement," and a mixed methods symposium, entitled "Conducting Rigorous Mixed Methods Research."

CHIRAL PIs and staff have provided mentorship to Yale students, fellows, and early-stage investigators. Mentees include medical student and residents, graduate-level public health students, Emergency Department Administration Fellows, graduate and PhD-level nursing students, and a National Clinician Scholars Program (NCSP) Postdoctoral Fellow.

CHIRAL Administrative and Operations Core

Goals & Accomplishments

This core serves as the organizing center and hub for CHIRAL projects**.** The aim of the Administrative and Operations Core is to establish a shared infrastructure at YNHH for organizational learning around safety, design, engineering, and quality improvement. This core's goals are:

1) Direct Center and project operations. The Administrative & Operations Core provides management and operational assistance for projects. This core is responsible for overseeing administrative aspects of the center, such as staffing (e.g., hiring, staff development, payroll), budgetary oversight, invoicing, and resource use and sharing. The Administrative and Operations Core manages, trains, and develops staff members who support, operationalize, and manage the research being carried out by the three projects and the work of the center overall.

This core brings together and manages the use of national experts who provide guidance and feedback to the three project teams. CHIRAL has assembled and engaged a group of nationally recognized experts with skills and experience relevant to the work being carried out by CHIRAL projects. Meetings are conducted with this group to update them on project progress, vet the methodological approaches, and engage in dialogue as to project direction and next steps. CHIRAL consultants included Vineet Arora, MD; Frank Davidoff, MD; Eric M. Eisenberg, PhD; Leora Horwitz, MD, MHS; Grace Jenq, MD; Julie Johnson, PhD; Alexandra Murphy, PhD; Emily Patterson, PhD; Mary D. Patterson, MD, MEd; and Matthew Press, MD, MSc.

2) Support CHIRAL's role as a home for interprofessional dialogue and cross-fertilization of ideas. This core provides opportunities for knowledge sharing around safety, design, engineering, and quality improvement, such as:

- Facilitated collaborations between CHIRAL teams and other individuals, committees, and services at YNHH committed to patient safety;
- Regularly scheduled meetings, at which PIs and research staff meet to discuss accomplishments to date, challenges, lesson learned, and planned activities.

Local experts with backgrounds in human factors, qualitative research, performance improvement, data management, and biostatistics often join this meeting and lead or participate in the conversation.

- CHIRAL Projects in Progress Seminar Series. In October 2016, CHIRAL implemented this monthly seminar series program. Each month, a different YNHH quality and safety project is presented at this meeting, which serves as a venue for University and YNHH researchers and clinicians to present their work and receive substantive feedback from attendees. Twelve 1-hour presentations have been held (Figure 2), all of which were well attended and led to engaging dialogue.

SEMINAR SERIES TITLE	*PRESENTER*
Patient Transfers into, within, and out of YNHH: Findings to Date	The CHIRAL Team
Resident-Driven Academic Detailing to Improve the Value of Emergency Care	Jessica Walrath, MD Yale Department of Emergency Medicine
Readmissions to the YNHH Medical Intensive Care Unit (MICU)	YNHH MICU Throughput Team
A Warm Handoff Intervention to Improve Adherence to Childhood Cancer Survivorship Care	Nina Kadan-Lottick, MD, MSPH Pediatric Oncologist, Associate Professor
Comprehensive Laboratory Test Optimization at YNHH	L. Scott Sussman, MD Director of Quality, YNHH Hospitalist
Organizational Recovery Orientation in VA Inpatient Psychiatric Units: Development of a Measure	Hayley Germack, PhD, BSN, RN Fellow National Clinician Scholars Program, Yale University School of Medicine
Handoff 30 Redesign: Engaging Staff to Optimize an Electronic Handoff Tool	Sharon Smyth, MSN, RN, HVC Clinical Program Director Inpatient Services, Yale New Haven Hospital; Marc Shapiro, MD, Medical Director at Yale New Haven Hospital St. Raphael Campus Emergency Department; and Kathryn Uricchio, RN, Nursing Resource Pool Services, Yale New Haven Hospital
Improving care of infants withdrawing from opiate addiction	Matt Grossman, MD Children's Hospital Safety Officer, YNHH Assistant Professor of Pediatrics
Implementation and measurement of effectiveness of a resident elective rotation in Hospital Medicine at a tertiary academic medical center	Christopher Sankey, MD, FACP, SFHM Academic Hospitalist, Yale School of Medicine
Post-Acute Care Program for Seniors	Patrick Coll, MD Medical Director for Senior Health, UCONN Health, Center on Aging
Developing, Executing and Publishing a High-Impact Resident or Student Quality Improvement Project *(*TWO SESSIONS*)*	Arjun Venkatesh, MD, MBA, MHS Assistant Prof of Emergency Medicine Scientist, Center for Outcomes Research & Evaluation (CORE) Director, ED Quality and Safety Research and Strategy

CHIRAL Seminar Series Presentations, October 2016-May 2018

3) Ensure the integration of quality improvement scholarship into clinical improvement activities throughout YNHH. This core developed a compendium of quality and safety education and training resources found within and outside of Yale University and Yale New Haven Health System (YNHHS). Core team members performed a lit review and internet-based search and found that this type of resource did not exist. They then researched and summarized educational opportunities, such as training, certification, and degree-granting programs. This information, including hyperlinks to the programs, was reviewed for completeness by patient safety and quality leaders from the Yale School of Medicine and YNHH. The final product is displayed on the CHIRAL website (http://medicine.yale.edu/chiral/education/ynhhsres.aspx).

CHIRAL PIs and staff have provided mentorship to Yale students (Figure 3), fellows, and early-stage investigators. This core coordinates onboarding of mentees and management of administrative aspects of their role.

Mentee(s)	*Description*
Medical Student and Residents	Project 1 is supported by two Emergency Medicine resident physicians and one senior medical student who are interested in quality improvement and implementation science. Project 1 PI and co-investigators provided guidance and mentorship to these trainees as they work to advance the aims of CHIRAL.
Graduate-level Nursing Students	Project 1 PI and co-investigators provided mentorship and guidance to four graduate-level nursing students who have an interest in quality improvement. These students played an integral role in the execution of the feasibility pilot of a real-time survey.
Graduate-level Public Health Students	Projects 1 & 2 were each supported a graduate-level Master of Public Health (MPH) student who performed a practicum in Health Management.
Emergency Department Administration Fellows	Project 1 PI and co-investigators are providing guidance to two ED Administration Fellows who, through their work with CHIRAL, are creating healthcare IT tools for qualitative and quantitative measurement and care transition evaluation.
PhD Nursing Student	With CHIRAL mentorship, a nursing PhD student completed a qualitative analysis examining clinician perspectives on goals of care (GoC) conversations for hospitalized patients discharged to SNFs. She considered how clinicians view GoC conversations and how those conversations influence subsequent care at the SNF. This work resulted in a manuscript: Feder SL, Campbell Britton M, Chaudhry SI. "They need to have an understanding of why they're coming here and what the outcomes might be." Clinician perspectives on goals of care for patients discharged from hospitals to skilled nursing facilities. Journal of Pain and Symptom Management. 2018 Mar; 55(3): 930-937.
National Clinician Scholars Program (NCSP) Postdoctoral Fellow	CHIRAL investigators and staff are providing mentorship to a NCSP Postdoctoral Fellow completing a sub-analysis of the Project 2 dataset of coded qualitative interviews. The focus is to understand the multiple levels of cooperation and conflict during patient transfers within the hospital and how these key themes work as barriers and facilitators to the patient transfer process within the hospital. This work resulted in a presentation: Germack HD. The Interplay of Conflict and Cooperation in Intra-Hospital Care Transitions: How Senders and Receivers Navigate a Complex System. Presented at National Clinician Scholars Program Annual Meeting; 2017; Nov 14-16; New Haven, CT, and a manuscript under review.

4) Provide communication to YNHH, Yale University, and New Haven community about the work of CHIRAL.

The Administrative and Operations Core led efforts to expand the CHIRAL website to include pages detailing CHIRAL projects and partners, opportunities to collaborate, patient safety and quality resources, and publications that are relevant to CHIRAL's work. The expanded website also includes a series of pages dedicated to opportunities for education and training in patient safety and quality.

This core led efforts to develop a presence on social media. CHIRAL established a Twitter handle (@yale_chiral) and rolled out a presence on Twitter. The goal with this account is to disseminate the work of CHIRAL, share issues and articles relevant to patient safety and quality, and connect with other individuals and groups with similar interests.

GOAL 5) Provide professional development opportunities for CHIRAL team members, students, and fellows.

This core promotes and tracks team member professional development. Examples of team member's recent professional development activities include:

- One team member attended the 1-day, in-person Institute for Healthcare Improvement (IHI) course, "Better Quality Through Better Measurement."
- The IHI/National Patient Safety Foundation (NPSF) annual meeting was held on May 23-25, 2018, in Boston. Two research staff members attended the meeting and presented posters.
- A Project 2 team member participated in online courses, entitled "Tips from the Experts: Fast-track Your Data Analysis with Basic Macros in Minitab" and "Managing Your References with EndNote." These courses were offered through Yale University's online subscription to Lynda.com, which includes a library of high-quality instructional videos taught by recognized industry experts.

CHIRAL Informatics Core

Goals & Accomplishments

The Informatics Core serves as the informatics home for CHIRAL projects and faculty. Its objective is to enhance Yale's infrastructure for implementation and quality research by giving investigators ready access to informaticists, programmers, and clinicians with real-world experience in the design and implementation of IT solutions. To achieve this objective, CHIRAL's Informatics Core has assembled a highly interactive team of experts who work collaboratively with the learning laboratory. The core's goals are:

1) Provide CHIRAL consultative services in design, programming, and implementation. The informatics team supports the project's quantitative research needs with their statistical, programming, and data management services.

2) Provide expertise around Epic data. CHIRAL projects primarily use data from Epic (the YNHH EHR) for quantitative analyses. CHIRAL team members are skilled researchers but have less experience with the abstraction of Epic data. Through the CHIRAL Informatics Core, CHIRAL researchers have access to an Epic database super-user and an Epic Analyst who both support and carry out the Epic data acquisition and report writing. This expertise in Epic report writing, and Epic data in general, has been instrumental in facilitating quantitative analysis of EHR data.

3) Bring together investigators and clinical informaticists from across the medical center. The Informatics Core director engaged in many discussions that explored opportunities for CHIRAL to interface with Mobile Heartbeat and Yale JDAT, the Joint Data Analytics Team. Other discussions, facilitated by Informatics Core team members and YNHH analysts, resulted in improvements to Epic-based metrics.

CHIRAL Simulation Core

Goals & Accomplishments

The Simulation Core is supported by Yale New Haven Health System's SYN:APSE Center for Learning, Transformation, and Innovation, a Society for Simulation in Healthcare-accredited simulation center. The Simulation Core has responded to specific needs and timelines of each project by supporting process analysis and synthesis of findings, developing models of transitions based on process analysis, and prototyping process improvements. The core's goals are to:

1) Apply the Simulation Core's collective expertise and experience in healthcare simulation, teamwork training, patient safety, human factors, workflow analysis, education, and technology to each project. Core members attend CHIRAL meetings and advise on use of simulation and human factors research as they relate to intervention development, implementation, and evaluation.

During these meetings, this team provides consultative advice on issues involving methodologies, tools, tool development, data collection, and use of simulation. The Simulation Core has used its team's diverse experience and backgrounds to support and enhance the CHIRAL projects as they executed intervention design, rollout, and evaluation in their respective units of study.

2) Provide an "innovation greenhouse" for process summary and prototyping. The Simulation Core offers a discrete physical space designed to foster rapid prototyping, creativity, collaboration, and "out-of-the box" thinking. This core has provided their experience in these areas as the research teams design, test, implement, and evaluate interventions.

3) Use Simulation Core equipment and expertise with in situ simulation to facilitate testing and implementation of solutions in the real clinical environment. Project 1 and the Simulation Core team collaborated to conduct a phone-based simulation project. The objective of the project was to simulate the transfer of a patient into YNHH from an outside hospital and examine known and unknown challenges associated with the existing process. Team members observed the inter-hospital transfer coordination center staff. Then, they developed a simulation script and debrief guide that would be used with case studies. Six simulated session were conducted in total, each resulting in iterations to the case scenarios and debrief guides based on participant feedback. These simulation sessions identified numerous potential solutions for known challenges to the process of transfering patients into YNHH from outside facilities.

Project 1

Structured Abstract

Purpose: Patients with nontraumatic intracranial hemorrhage diagnosed at community hospitals often require inter-hospital transfer (IHT) for neurocritical care. Though necessary, IHT introduces unique risks through multiple handoffs and potential delays in care. Project objectives were twofold: 1) define the baseline IHT process for these patients and 2) develop and implement an intervention to standardize care processes and enhance communication to reduce safety threats and improve clinical outcomes.

Scope: Every month, referring community hospitals transfer around 20 patients with nontraumatic intracranial hemorrhage to our receiving hospital. In 2015, our hospital experienced two contemporaneous patient encounters that highlighted latent safety threats during IHT in this patient population. These cases triggered institution-wide root cause analysis investigations that revealed a limited appreciation of the complex IHT process and initiated this multidisciplinary quality improvement (QI) project to improve IHT for this patient population. To uncover all barriers to safe care transitions for nontraumatic intracranial hemorrhage patients, we developed a comprehensive mixed methods problem analysis plan, a critical first step to systems-based QI, with stakeholders from all involved roles in all involved service lines within our hospital, at referring hospitals, and in transport teams. Problem analysis identified common threats to quality and safety within the baseline IHT process, which were addressed with a multi-modal intervention.

Methods: This mixed methods study involved two phases: problem analysis and intervention. We began by building a multidisciplinary team, including stakeholders from the emergency department (ED), neurointensive care unit (NICU), neurosurgery, and the IHT coordination center. We utilized six methodologies for problem analysis: direct observations (n=4 hours), chart review (n=3501 records), process mapping (n=17 participants, seven sessions), semi-structured interviews (n=32 subjects), real-time surveys (n=115 providers), and IHT request content analysis (n=26 requests). Our multi-modal care process redesign intervention was developed and vetted with stakeholders. The intervention includes a re-engineered IHT acceptance process, patient arrival notification alerts, local and statewide clinical practice guideline dissemination, and electronic health record (EHR) improvements.

Continuous evaluation includes an EHR-based dashboard, case-by-case audit, and content analysis of IHT requests.

Results: We identified three baseline challenges: gaps in clinical practice; insufficient communication; and inadequate IHT structure. Specifically, ED-based care missed timeliness benchmarks; 19% of providers surveyed felt they received an inadequate handoff; also, the ED and IHT accepting service did not communicate before patient arrival. After intervention, ED throughput improved, with length of stay reduced from 300 minutes to 150 minutes; furthermore, the proportion of IHT involving communication between a neuroscience specialist and the ED before patient arrival increased from 40% (May 2017) to 91% (March 2018). Qualitative feedback also indicated overall intervention success.

Keywords: Facilitate transitions; Inter-hospital transfer; Nontraumatic intracranial hemorrhage; Quality improvement/patient safety

Purpose

The objectives of CHIRAL Project 1 are as follows:

- Define the baseline IHT process for patients with nontraumatic intracranial hemorrhage
- Develop and implement an intervention to standardize care processes, enhance communication, reduce safety threats, and improve clinical outcomes

Scope

Our study was based at Yale New Haven Hospital, an urban, northeastern academic medical center. Project investigators represented the ED, Neuro ICU, neurosurgery, and the IHT coordination center. Additional project partners included diagnostic radiology, blood bank, pharmacy, bed management, IT/communications, air and ground transport teams, and referring hospitals.

Methods

Problem Analysis Methods	Intervention Methods: Design	Intervention Methods: Evaluation
Chart review (N=3501)	New IHT acceptance process	EHR-based dashboard
Process mapping (N=7)	Patient arrival notification system	Case-by-case audit and feedback
Semi-structured interviews (N=32)	Local clinical practice guideline dissemination	In-person meetings
Real-time surveys (N=115)	EHR improvements	
Content analysis of IHT requests (N=26)	Auto-protocol of imaging studies	
Observations (N=4 hours)	Phone-based simulation	

Our interventions focused on the following collaborative efforts:

1) **New IHT acceptance process**: At baseline, the IHT acceptance process began with whichever service line the referring hospital physician requested; once the receiving physician accepted the patient, other providers were often not notified of the incoming patient. The re-engineered process steps are as follows: the IHT coordinator requests that referring hospital imaging be sent immediately via electronic, cloud-based transfer and then connects the referring hospital physician with the neurovascular surgery and NICU attending physicians. Upon acceptance of patient and providing sending hospitals with clinical guidance, the NICU attending shares a proactive plan of care, expected admitting service, and attending contact information with an ED attending, who enters the details into the EHR for ready access on patient arrival. In addition, the neurovascular surgery and NICU attendings notify in-house residents for each service.
2) **Patient arrival notification system**: Upon patient arrival, either an ICH or SAH Alert is called, notifying resident physicians, the radiology team (including both technologists and physicians), NICU fellows, NICU and SWAT nurses, stroke physicians, and relevant research staff.

3) **Local clinical practice guideline dissemination**: Baseline data collection indicated uncertainty around best clinical practices for this patient population, especially around blood pressure goals and anticoagulant reversal. As such, the NICU and neurosurgery teams created clinical management guidelines, which have been disseminated both internally, through an EHR-based order set (more detail below), and externally on pocket cards shared with referring hospitals statewide.
4) **EHR improvements**: Two improvements were made to the EHR. First, we designed a new call-in template, for which ED attendings enter information about incoming patients shared by the referring physician, that was redesigned based on human factors expertise to ensure simplicity, saliency, and completeness. Second, we created a 'Head Bleed' order panel for ED providers. This is based on the clinical management guidelines discussed above and allowed ED providers to order all relevant labs, imaging, etc., while also seeing best practices for blood pressure management, anticoagulant reversal agents, and antiepileptic drugs.
5) **Auto-protocol of imaging studies**: After two separate cases in which imaging was delayed unnecessarily, diagnostic radiology agreed to auto-protocol imaging studies for patients with confirmed nontraumatic intracranial hemorrhage.
6) **Phone-based simulation**: Early intervention evaluation identified ongoing challenges with adoption of specific aspects of the intervention as well as secondary challenges that developed as a result of the intervention. As such, the project team partnered with hospital and university simulation resources to develop a phone-based simulation project designed to address these challenges. The simulation calls were held in November and December 2017, with all essential service lines participating. Each call included a simulated transfer and a debrief session to discuss the identified challenges and ideas for solutions. Feedback from this simulation project was highly positive.

Study limitations include a small sample size due to a relatively infrequent diagnosis and institutional policies and procedures that may limit the generalizability of our findings.

Results

Problem analysis highlighted three major challenges in the baseline IHT process:

1) **Gaps in clinical practice**: Baseline data identified concerns about care delivered at the community hospitals as well as in our receiving hospital's ED. Clinical concerns revolved around clinical management of blood pressure and timely reversal of anticoagulants. While our receiving hospital ED offers benefits including faster access to imaging and labs, ED-based care is also limited in terms of staffing resources and providers' relatively limited familiarity with specifics of neurocritical care.
2) **Insufficient communication**: Communication was found to be lacking in three ways: between hospitals, between services at the same hospital, and within the same service. Regarding communication between hospitals, clinical guidance provided by the receiving to the referring hospital was often lacking. In addition, multiple receiving hospital participants described cases in which they received an incomplete picture from the referring hospital, and the patient's presentation at arrival was much different than expected. For communication between services, all three services involved in direct patient care (ED, NICU, and neurosurgery) identified communication gaps: the ED and NICU wanted more information from neurosurgery, and NICU and neurosurgery felt that the ED's documentation was lacking. Last, in terms of communication within the service, the major issue identified was that a neurosurgery attending who accepted a patient for IHT did not notify their team of the incoming patient.
3) **Inadequate IHT structure**: Though having two consult services (NICU and neurosurgery) is necessary for appropriate care of this patient population, this feature of patient care contributes to greater confusion during the IHT process. For patients transferred via the ED, ED providers were unsure of which consult service to call upon patient arrival, and the lack of clarity around which service would ultimately admit the patient could delay the patient receiving critical interventions and reaching ICU-level care. Overall, clear accountability for these patients, prior to reaching ICU-level care, was lacking.

Intervention evaluation indicates improvements in outcomes in two main areas:

Patient throughput:

Outcome	Pre-intervention (02/01/17-05/09/17) N=65	Post-intervention (12/21/17-06/30/18) N=114	Percent change	p-value
Median ED length of stay (LOS), in minutes	300	150	↓ 49.9%	0.00
Median ED time to admit order, in minutes	66	33	↓ 50.0%	0.01
Median ED boarding, in minutes	223	93	↓ 58.3%	0.00

Clinical outcomes

Outcome	Pre-intervention (02/01/17-05/09/17)	Post-intervention (12/21/17-03/31/18)	Percent change	p-value
In-hospital mortality	0.29 (N=72)	0.17 (N=134)	↓ 41.5%	0.22
Median time to anti-coagulant reversal in ED, in minutes	218 (N=65)	121 (N=114)	↓ 44.6%	0.36
Effective BP treatment in ED	0.29 (N=65)	0.63 (N=114)	↑ 118.8%	0.31
Hypotension in ED	0.22 (N=65)	0.14 (N=114)	↓ 33.0%	0.42

Discussion

This work highlights the strengths and limitations of different quantitative and qualitative data collection methods and reinforces the benefits of multimodal study designs, continuous evaluation, and engagement of a multidisciplinary team for improving high-risk care transitions. IHT exposes patients to unique risks, which can be mitigated through communication improvements, IHT process standardization, and closing gaps in clinical practice.

Our work demonstrates a consistent directional benefit to re-engineering clinical pathways to reduce latent safety threats through both qualitative and quantitative outcome measures. Though some quantitative improvements cannot be described as statistically significant due to the small sample size of a rare disease, all metrics showed directional improvement of clinical significance.

Conclusions, Significance, and Implications

In conclusion, as critical care becomes increasingly regionalized, the rate of IHT is expected to continue to grow. Although necessary for specialized critical care, IHT introduces unique risks to already critically ill patients. A multimodal intervention developed by a diverse group of stakeholders can be effective in improving the quality and safety of these high-risk transfers. Implications of this work include the following: 1) there exists a broad need for teamwork focused on care coordination as opposed to narrow clinical details; 2) through the provision of proactive care planning and communication, the establishment of accountability, and the alignment of resources to population needs, it is possible to reduce the threats inherent in complex care transitions.

List of Publications and Products

1. Emily Finn; Arjun Venkatesh; John Sather; Vivek Parwani; Andrew Ulrich; Beth Hodshon; Sarwat Chaudhry. Yale Center for Healthcare Innovation, Redesign and Learning (CHIRAL) Project 1: Improving the Safety and Quality of Transitions into YNHH. Joseph A Zaccagnino Patient Safety and Clinical Quality Conference; 2016 May; Bridgeport, CT.
2. Emily Finn; John Sather; Vivek Parwani; Andrew Ulrich; Kevin N. Sheth; Charles Matouk; Laura Pham; Darcé Costello; Judy Petersen; Evadne Marcolini; Meredith Campbell Britton; Alana Rosenberg; Shelli Feder; Ross Littauer; Michael Yip; Craig Rothenberg; Sarwat Chaudhry; Beth Hodshon; Arjun Venkatesh. A Closer Look at Inter-Hospital Transfer to YNHH for Atraumatic Intracranial Hemorrhage: Areas for Quality and Safety Improvement. Joseph A Zaccagnino Patient Safety and Clinical Quality Conference; 2017 May; New Haven, CT.
3. Michael F. Yip; John E. Sather; Kevin N. Sheth; Charles C. Matouk; Ross Littauer; Emily B. Finn; Craig M. Rothenberg; Darcé Costello; Vivek Parwani; Arjun K. Venkatesh. Inter-hospital Transfer is Not a Predictor of In-Hospital Mortality for Patients with Nontraumatic Intracranial Hemorrhage. American College of Emergency Physicians Sceitnfici Assembly. 2017 October. Washington, DC.
4. Emily B. Finn, John Sather, Andrew Ulrich, Vivek Parwani, Kevin N. Sheth, Charles Matouk, Laura Pham, Sarwat Chaudhry, Beth Hodshon, Arjun Venkatesh. Improving Inter-Hospital Transfer for Critically Ill Patients. 10th Annual Conference on the Science and Dissemination and Implementation in Health; 2017 December; Arlington, VA.
5. Lord K, Parwani V, Ulrich A, Finn EB, Rothenberg C, Emerson B, Rosenberg A, Venkatesh AK. Emergency department boarding and adverse hospitalization outcomes among patients admitted to a general medical service. Am J Emerg Med. Manuscript in press, 2018.
6. Ross Littauer; Michael Yip; John Sather; Craig Rothenberg; Emily B. Finn; Charles Matouk; Laura Pham; Kevin N. Sheth; Andrew Ulrich; Vivek Parwani; Arjun K. Venkatesh. Inter-hospital Transfer is not a Predictor of In-Hospital Mortality in Patients with Non-traumatic Intracranial Hemorrhage. Society for Academic Internal Medicine, 2018 May, Indianopolis, IN.
7. Kito Lord, Vivek Parwani, Andrew Ulrich, Emily B. Finn, Craig Rothenberg, Beth Emerson, Alana Rosenberg, Arjun K. Venkatehs. Emergency Department Boarding and Adverse Hospitalization Outcomes among Patients Admitted to a General Medical Service. Society for Academic Internal Medicine, 2018 May, Indianopolis, IN.
8. Samah Fodeh, Emily Finn, Michael Yip, Ross Littauer, John Sather, Kevin Sheth, Charles Matouk, Vivek Parwani, Andrew Ulrich, Arjun Venkatesh. Identification of patients with atraumatic intracranial hemorrhage: Novel Applications for Machine Learning. Society for Academic Internal Medicine, 2018 May, Indianopolis, IN.
9. John Sather. Improving the Safety of High Risk Inter-hospital Transfer: A Roadmap for Researchers and Administrators. Society for Academic Internal Medicine, 2018 May, Indianopolis, IN.
10. Emily B. Finn, John Sather, Andrew Ulrich, Vivek Parwani, Kevin N. Sheth, Charles Matouk, Laura Pham, Sarwat Chaudhry, Beth Hodshon, Arjun Venkatesh. Improving the quality and safety of inter-hospital transfers for critically ill patients. IHI/NPSF Patient Safety Congress, 2018 May, Boston MA.
11. Sather J, Venkatesh AK, Finn EB, Littauer R, Yip M, Rothenberg C, Ulrich A, Parwani V, Sheth KN, Pham L, Chaudhry S, Hodshon B, Matouk C. Inter-hospital transfer is not a predictor of in-hospital mortality in patients with atraumatic intracranial hemorrhage. Digital poster. College of Neurological Surgeons 2018 Annual Meeting. October 2018. Houston, TX.
12. Venkatesh AK, Sather J, Finn EB, Ulrich A, Parwani V, Sheth KN, Pham L, Chaudhry S, Hodshon B, Matouk C. Improving the quality and safety of inter-hospital transfers for critically ill neurologic patients. Poster presentation. College of Neurological Surgeons 2018 Annual Meeting. October 2018. Houston, TX.

13. Venkatesh A, Sather J, Finn E, Ulrich A, Parwani V, Sheth K, Pham L, Chaudhry S, Hodshon B, Matouk C. Improving the quality and safety of inter-hospital transfers for critically ill patients. Congress of Neurological Surgeons 2018 Annual Meeting. October 2018.
14. Sather J, Venkatesh A, Finn E, Littauer R, Yip M, Rothenberg C, Ulrich A, Parwani V, Sheth K, Pham L, Chaudhry S, Hodshon B, Matouk C. Inter-hospital Transfer is not a Predictor of In-hospital Mortality in Patients with Atraumatic Intracranial Hemorrhage. Congress of Neurological Surgeons 2018 Annual Meeting. October 2018.
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Project 2

Structured Abstract

Purpose: When patients are transferred from one setting to another or one team to another, they are at increased risk for a host of adverse outcomes. Research conducted to date has focused on handoffs when looking for issues that may be adversely impacting intra-hospital care transitions. The purposes of this project were to study the process of transitioning patients from the Emergency Department (ED) and Medical Intensive Care Unit (MICU) to General Medicine (GM), identify challenges and opportunities for improving shared sense-making, and develop interventions to reduce adverse patient events and increase staff satisfaction.

Scope: Intra-hospital transitions, or the movement of patients between hospital units, include a change in physical location and responsible care team that can be disruptive to continuity of care. These transitions occur frequently and put patient safety at risk by leading to delays in care, medication errors, and inappropriate unit placement. We completed a thorough problem analysis to better understand the perspectives of sending clinicians, receiving clinicians, quality improvement leadership, and ancillary staff who support intra-hospital transitions. Stakeholders from various backgrounds were essential in developing a framework of systems-level factors impacting transition processes.

Methods: Hospital study units included the MICU and those that represent general medicine services at an urban, northeastern teaching hospital. Data were collected through observations (N=16), semi-structured interviews (N=29), process mapping (N=4), clinician surveys (N=2), feedback workshops, and extraction from the electronic health record (EHR). Interventions aimed at improving the quality and safety of these care transitions were developed and redesigned with input from stakeholders, including end users. These interventions included implementation of a verbal handoff for patients with special circumstances and staff survey as well as a facilitated workshop attended by staff nurses from different units of study. Intervention evaluation occurred via staff experience, intervention feasibility, and patient outcomes.

Results: Problem analysis data informed the development of a taxonomy of intra-hospital transitions that includes five domains: disposition, notification, preparation, communication, and coordination. These identified domains led to the development of a survey to assess staff experience with transitions. Based on nursing input, an intervention was developed in collaboration with hospital stakeholders that included a verbal nursing handoff for patients with special circumstances transferring from the MICU to GM. Our efforts showed some improvement in clinician perceptions about intra-hospital transitions as well as a decrease in adverse events.

Keywords: intra-hospital transition, handoff, hospital, quality improvement (QI)

Purpose

The objectives of CHIRAL Project 2 are as follows:

- Examine and reduce failures in shared sense-making affecting the safe transitions of patients.
- Examine and reduce latent conditions affecting the safe transition of patients.
- Evaluate the impact of interventions to improve patient safety during intra-hospital transitions.

Scope

Project 2 was based at Yale New Haven Hospital (YNHH), an urban, northeastern academic medical center. Study units included the YNHH general medicine service, including hospitalist units and teaching services, and the MICU.

Methods

Problem Analysis Methods	Intervention Methods	Intervention Methods: Evaluation
Stakeholder meetings	Surveys of sending and receiving clinicians (N=2)	Pre and post evaluation of staff experience
Ethnographic observations (N=16)	Verbal handoff from MICU to GM	Process observations and staff interviews
Qualitative interviews with hospital clinicians, leadership and ancillary staff (N=29)	Interactive staff workshop to develop priority areas for behavioral health patients	
Process mapping sessions (N=4)	Quantitative analyses of EHR data	
Feedback sessions to share findings/brainstorm		

Our interventions focused on the following collaborative efforts:

1. **Verbal handoff:** Before patient discharge from the MICU, a sending nurse calls the receiving GM nurse to give a short report with pertinent information needed to continue caring for patients with special circumstances (e.g., patients in restraints, patients with complicated MICU stays, patients with GI bleeds). Interventions included the development of a brief script to guide the call, as well as staff education and on-unit visual reminders.
2. **Staff Experience survey:** This survey assessed MICU, ED, and GM clinicians' experiences with sending and receiving patients, including disposition, notification, preparation, communication and coordination. The post-intervention survey repeated the questions asked in the pre-intervention survey to detect any changes in the staff experience of patients transferring from the MICU to the General Medicine floor. The results established the level of staff satisfaction with transfer processes at baseline and post-intervention. To further support this intervention and identify areas for targeted improvement, the Project 2 team completed 4 days of process observations and conducted 25 staff interviews to gather data about adherence to the intervention and suggestions for improvement.
3. **Facilitated Workshop:** ED and GM nurses along with bed management staff participated in a collaborative session to discuss challenges for transferring behavioral health patients and brainstorm improvement ideas. A report was developed for stakeholders to help leadership identify targeted areas of opportunity. Engagement in this workshop module was rated highly by staff for engagement, cross-unit team work, and creative problem solving.

Limitations of this work include the single-center and process-specific nature of the improvement work undertaken.

Results

During problem analysis, observations and participants' responses centered on five domains of intra-hospital transitions:

- **Disposition:** Participants discussed the importance of determining the correct unit and bed for patients transferring from the ED or MICU to GM. Clinicians expressed that finding the correct match was instrumental to successful transitions of care. GM staff sometimes felt less control in this process because ED clinicians at the study site can admit patients directly to GM.
- **Notification:** Physicians and nurses reported that notifying sending and receiving staff of patients' assignment, departure, and arrival was necessary for necessary preparation and continuity of patient care. One reoccurring circumstance posed challenges for hospitalists who were assigned to ED patients still waiting to be admitted after 4 hours. Logistics made it difficult for hospitalists to care for patients at separate locations.
- **Preparation:** Clinicians referred to workload demands when expressing concerns about adequate preparation to send and receive patients. In general, receiving nurses felt the least prepared when dealing with incomplete clinical and charting tasks prior to patients arriving on GM.
- **Communication:** The EHR had replaced the verbal handoff between sending and receiving units in most cases. Many receiving nurses expressed desire for verbal handoffs as a better communication tool.
- **Coordination:** To ensure that transfers occur smoothly, participants spoke about the sequential transfer steps that were necessary: patient assessment, disposition decisions, preparing the patient for transfer, bed management, locating a receiving bed, cleaning the room, transporting the patient, and preparation on the receiving end to care for the patient. Lack of coordination at any step could cause delays or disruptions in continuity of care.

The evaluation plan included examining the impact of CHIRAL efforts on rapid response team (RRT) calls, mortality, elevation of care, and sending and receiving clinicians' satisfaction scores.

Adverse Events within 48 hours post-transfer to medical unit				
	Pre-CHIRAL N=21,150	Post-CHIRAL N=19,954	Difference	p-value
RRT calls	1.48%	1.31%	-11.3%	0.149
Mortality	0.40%	0.34%	-16.5%	0.270
Elevation of care	2.56%	2.34%	-8.9%	0.136
Any of the above	3.65%	3.29%	-10.1%	0.042*

The rates of adverse events before and after CHIRAL interventions were compared. Pre and post periods are 12 months. N is the number of patient encounters representing a transfer from MICU/SD/ED to GM.

Survey Results: Percent of Problematic or Neutral Responses of Senders and Receivers								
	SENDING CLINICIANS				RECEIVING CLINICIANS			
	Pre-test N=158	Post-test N=237	Difference	p-value	Pre-test N=273	Post-test N=171	Difference	p-value
Disposition	4.43%	4.22%	-4.74%	0.919	38.10%	31.58%	-17.11%	0.163
Communication	9.49%	5.49%	-42.15%	0.128	11.36%	7.60%	-33.10%	0.198
Notification	38.61%	36.29%	-6.01%	0.640	63.00%	66.08%	4.89%	0.510
Coordination	76.58%	68.78%	-10.19%	0.091	78.39%	82.46%	5.19%	0.297
Preparation	39.68%	35.48%	-10.58%	0.561	70.94%	50.00%	-29.52%	0.003*
Handoff	26.32%	19.05%	-27.62%	0.272	46.52%	41.52%	-10.75%	0.302
Teamwork	32.91%	29.54%	-10.24%	0.477	28.21%	18.71%	-33.68%	0.024*
Hospital culture	24.05%	18.14%	-24.57%	0.154	22.71%	12.87%	-43.33%	0.010*

The Staff Experience survey was administered at baseline in spring 2016 and as a follow-up in spring 2017.

Survey Response Rates		
Year	SENDING CLINICIANS	RECEIVING CLINICIANS
2016	158/755 (21%)	273/518 (53%)
2017	237/708 (34%)	171/520 (33%)

Discussion

This project employed a stepwise approach utilizing careful process analysis followed by system-oriented improvement. The clinical "learning laboratory" included patients being transferred to a general medicine unit from an intensive care unit or emergency department. Overall, we identified low rates of adverse events at our institution but demonstrated reduction in pooled outcome incidence within 48 hours of transfer. The overall low frequency of adverse events affected our ability to detect significant change and encouraged us to evaluate alternative measures of process improvement and intervention success.

We identified five domains that impact intra-hospital transitions: disposition, notification, preparation, communication, and coordination. Overall, success within these domains was found to positively impact patient safety and outcomes in the transfer process. Future interventions aimed to improve transfers in the healthcare setting can apply this framework to ensure that the implementation is context specific.

This taxonomy framed our intervention development and led to the creation of a new survey to measure staff experience of transfers. Staff engagement provided resiliency to the transfer process, and our successful efforts depended upon the continuous collaboration we fostered with stakeholders at our study site. In sum, our work demonstrates the importance of including human factors in process design.

Conclusions, Significance, and Implications

Intra-hospital transfers put patients at increased risk for adverse events. Collaborative interventions developed by a diverse group of stakeholders are effective in supporting positive system change. Implications include a taxonomy of intra-hospital transfers and an associated staff experience survey that can be used to benchmark and measure the success of quality improvement initiatives. Specifically, this work describes the improvement process used for intra-facility transfers at a single institution, while providing a framework to consider staff engagement and context in guiding work in other settings.

List of Publications and Products

1. Rosenberg A, Chaudhry SI, Hodshon B, Emerson B, Jenq G. Yale Center for Healthcare Innovation, Redesign and Learning (CHIRAL) - Project 2: Transitions within the hospital. Joseph A Zaccagnino Patient Safety and Clinical Quality Conference; 2015 May; Bridgeport, CT.
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3. Rosenberg A, Campbell Britton M, Feder SL, Minges K, Emerson B, Hodshon B, Chaudhry SL, Jenq G. Understanding Intra-Hospital Transfers: A Framework for Quality Improvement. Academy Health Research Meeting; 2016 June; Boston, MA.
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5. Rosenberg A, Campbell Britton M, Feder SL, Minges KE, Hodshon B, Chaudhry SI, Jenq G, Emerson BL. A Taxonomy and Cultural Analysis of Intra-Hospital Patient Transfers. Res Nurs Health. 2018. doi: 10.1002/nur.21875. [Epub ahead of print].
6. Germack H, et al. Cooperation and Conflict in Intra-Hospital Transfers: A Qualitative Analysis. Nursing Open [in press]
7. Fekieta R, Rosenberg A, Hodshon B, Feder S, Chaudhry SI, Emerson BL. Organizational Factors Underpinning Intra-hospital Transfers: A Guide for Evaluating Context in Quality Improvement. [under review]
8. Fekieta R, Rosenberg A, Jenq GY, Emerson BL. A New Tool to Assess Clinican Experience with Patient Care Transitions. [under review]

Project 3

Structured Abstract

Purpose: The purpose of this project was to examine safety threats during care transitions between the hospital and Skilled Nursing Facilities (SNFs), including failures in shared sense-making, and to implement and evaluate interventions aimed at reducing unplanned hospital readmissions and improving the quality and safety of patient care.

Scope: One in four Medicare patients is discharged from a hospital to an SNF; within 30 days, 23% of these patients are readmitted back to the hospital. These readmissions are costly and leave patients vulnerable to numerous safety threats, including increased risk of mortality. To examine barriers to safe care transitions in this patient population, we completed a thorough problem analysis that explored the experiences of sending providers, receiving providers, and patients and caregivers, along with the institutional and system-level factors affecting transitions. These barriers were addressed with a series of interventions that were iteratively redesigned with critical input from frontline staff.

Methods: Study units were drawn from the general medicine services at an urban, northeastern teaching hospital. SNF study units included local facilities that received patients discharged from the hospital. Problem analysis data were collected through observations (n=21), safety reports (n=25), semi-structured interviews (n=41), root cause analyses (n=25), process mapping (n=7), focus groups (n=2), chart reviews, surveys (n=2), and feedback workshops. Quantitative data were obtained from the Electronic Health Record (EHR). Interventions aimed at improving the quality and safety of these care transitions were developed and redesigned with input from stakeholders, including end users. Intervention efforts included a multidisciplinary walk through of the EHR, a survey of SNF clinicians, and implementation of a warm handoff before hospital discharge. Our evaluation plan assessed patient outcomes, intervention fidelity, and participant experience.

Results: During problem analysis, participants focused on two major areas of concern: change and communication. Our analysis did not provide evidence that the direct communication between the clinicians responsible for managing patient care reduced hospital utilization. Based on these initial findings, hospital care teams should carefully weigh the potential benefits and drawbacks of using warm handoffs to reduce subsequent hospital utilization.

Keywords: care transition, hospital, skilled nursing facility, quality improvement (QI)

Purpose

The objectives of CHIRAL Project 3 are as follows:

- Examine and mitigate failures in shared sense-making during care transitions from hospitals to SNFs
- Examine and mitigate latent safety threats during care transitions from hospitals to SNFs
- Evaluate the success of a comprehensive set of interventions in improving patient safety during discharge transitions.

Scope

Our study was based at Yale New Haven Hospital, an urban, northeastern academic medical center. The study units were composed of the YNHH general medicine services, including hospitalist units and teaching services, and local SNFs that received patients discharged from the hospital.

Methods

Problem Analysis Methods	Intervention Methods	Intervention Methods: Evaluation
Observations of hospital and SNF study units[1] (N=21)	Surveys of SNF clinicians	Discharge summary review
Reviews of safety calls and adverse event reports[1] (N=25)	Chart reviews within the EHR[7]	In-person meetings with end-users
Qualitative interviews with hospital and SNF providers[3,4] (N=41)	Outreach through telephone calls, emails, and meetings with hospital and SNF participants[7]	Pre- and post-intervention surveys
Process mapping sessions with frontline staff[5] (N=7)	Quantitative analyses of EHR data	
Case studies of recent readmissions[2]		
Focus groups with SNF patients and caregivers[6]		

Interventions focused on enhancing shared sense-making through clinician communication:

- **EHR walk through:** Hospital and SNF personnel came together to compare workflows, views, and access in the EHR and identify areas for improvement. This effort led to the inclusion of pending lab tests to referral documentation and updates to the EHR training guides distributed to post-acute care providers.
- **Warm handoff:** Before patient discharge, a sending clinician from the patient's hospital care team called the receiving SNF clinician to give report, with a focus on what information the receiver needs to continue safe patient care. Clinicians were defined as physicians or advanced practice providers (publication 7, below).
- **YNHH Patient Discharges to SNFs survey:** This survey assessed SNF clinicians' experiences with hospital discharges, including disposition, communication, notification, preparation, and coordination. The results were used to assess intervening variables.

There are several limitations to our study. This was a single-center study, and the policies, practices, and results may not be generalized to all hospitals or post-acute care facilities. Our intervention methods had small sample sizes, and the fidelity metrics of our warm handoff focused on whether the call was made, not the quality or content of the conversation.

Results

During problem analysis, participants' responses focused on two major areas: change and communication:

- **Changing patients:** Hospitalized patients discharged to SNFs are increasingly medically and socially complicated, with multiple comorbidities and challenging psychosocial needs. Participants discussed their struggles to establish safe, effective discharge plans and cited the need for goals of care discussions and long-term care planning to support those efforts (publications 1-5, below).
- **Changing Facilities:** Participants discussed the pressures they face to optimize their patient census, either through promptly discharging hospitalized patients who no longer need inpatient-level services or by carefully selecting new patients for continued care at the SNF. They described conflict stemming from disagreements about disposition and a lack of knowledge about post-acute care services (publications 2-5, below).
- **Changing systems:** Participants described QI efforts aimed at improving hospital-SNF transfers and reducing readmission penalties, along with the cultural shifts needed to make these changes successful, including ending the "when in doubt, send them out" mentality at SNFs and building meaningful partnerships across the continuum of care (publications 2-5, below).
- **Communication among patients and providers:** Participants overwhelmingly identified communication as the most important issue impacting care transitions. They described significant barriers, including a lack of direct communication between hospital and SNF clinicians, discrepancies and delays in documentation, and late notifications about the patient's status (publications 1-6, below).

Our evaluation plan included examining the impact of CHIRAL efforts on 7-day and 30-day unplanned hospital readmissions from SNFs.

30-Day Readmissions			
	Pre-CHIRAL	Post-CHIRAL	p-value
ED Visit			
Within 7 days of discharge	38 (1.9%)	30 (2.4%)	0.27
Within 30 days of discharge	154 (7.6%)	94 (7.7%)	0.95
Inpatient Readmission			
Within 7 days of discharge	180 (8.9%)	95 (7.7%)	0.26
Within 30 days of discharge	500 (24.7%)	298 (24.3%)	0.80

Discussion

Project 3 demonstrated that efforts to improve hospital-SNF care transitions require meaningful partnership among patients, providers, and healthcare institutions. Specific attention should be paid to meeting the needs of complex patients, enhancing communication, and fostering opportunities for collaboration to provide safe, effective, patient-centered care across the continuum.

Conclusions, Significance, and Implications

Hospitalized patients discharged to SNFs for continued care are at increased risk of clinical and functional deterioration. The care transition is burdened by poor communication among providers, fiscal policies that can influence care planning, and the increased complexity of an aging – and growing – patient population. Our primary intervention, which focused on enhancing communication between the clinicians responsible for managing care, did not have a significant impact on subsequent hospital utilization. The implications of our work include consideration of how communication can and should be used in care transitions, the importance of fostering relationships across facilities, and the need to incorporate a diverse group of stakeholders in order to better understand the experiences and needs of the people directly involved in the targeted process. In response to this project, the Yale-New Haven Health system has formed a Care Transitions Committee to further the work of understanding and improving care transitions across providers and facilities, including the introduction of structured interdisciplinary bedside rounds on selected teaching units of the hospital.

List of Publications and Products

1. Campbell Britton M, Hodshon B, Chaudhry SI, editors. Yale Center for Healthcare Innovation, Redesign and Learning (CHIRAL) - Project 3: Transitions out of the hospital. Joseph A Zaccagnino Patient Safety and Clinical Quality Conference; 2015 May; Bridgeport, CT.
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5. Campbell Britton M, Hodshon B, Chaudhry SI. Implementing a Warm Handoff Between Hospital and Skilled Nursing Facility Clinicians. Journal of Patient Safety. 2019 Sep;15(3):198-204.6.
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10. Katz B. Chapter 3: Care Transitions- Fractured or Flowing? *Connecting Care for Patients: Interdisciplinary Care Transitions and Collaboration*. Burlington, Mass: Jones & Bartlett Learning, 2020: 73-109.
11. NIH R15 Application under review (PI: Minges; co-I: Chaudhry), an extension of CHIRAL Project 3 which evaluates qualitative differences between high- and low- readmitting skilled nursing facilities to identify potentially modifiable characteristics that may be addressed to reduce unnecessary readmission.