HOUSE

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Housestaff Quality and Safety Committee

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UW Medicine
GRADUATE
MEDICAL EDUCATION
HOUSESTAFF QUALITY
& SAFETY COMMITTEE

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A Note from the Editor

Dear UW Medicine Reader,

On behalf of the UW Housestaff Quality & Safety Committee (HQSC), I am proud to present the second issue of HOUSE, journal of the HQSC. This journal was founded in 2015 by Irving Ye, Nick Meo, and Chen Wu to help promote the science and art of improvement of patient care at UW Medicine. This issue of HOUSE includes an impressive group of quality improvement (QI) and patient safety (PS) projects carried out by UW housestaff, faculty, and staff.

In a Hobbesian way, residency and fellowship can feel nasty, brutish, short, and seemingly incompatible with valuable scholarly work. However, extensive hours spent in the hospital and a willingness to ditch tradition affords housestaff the unique opportunity to improve clinical processes in ways that make our patients safer. Furthermore, as opposed to clinical or basic science research, which requires a measured and often time-consuming approach, QI and PS projects involve rapid cycles of small changes and measurements. Most importantly, underlying all QI and PS projects is something that drives all of us – a continuous desire to improve patient care.

The fundamentals of QI and PS have been embodied and instilled by the HQSC (www.uwhqsc.org), a multi-specialty committee of residents and fellows who serve as the housestaff voice for improving patient safety. Aided by the extraordinary leadership of Chen Wu, Vlad Golgotiu, and Milner Staub, members of HQSC have worked tirelessly to design and carry out over twenty QI and PS projects throughout the year. The HQSC's success has hinged on the incredible guidance and backing of faculty advisors and UW Medicine administrators – they deserve enormous thanks for their support.

As you read these quality improvement projects, please remember that all content is confidential and cannot be copied or distributed without the permission of UW Medicine, the Office of GME, and the HQSC.

I thank you for taking the time to read this issue of HOUSE and hope it inspires you to get involved with quality improvement or patient safety.

Andrew Moon, MD, MPH - Internal Medicine

Editor-in-Chief

Getting Involved in Quality Improvement and Patient Safety

University of Washington residents and fellows have numerous opportunities to participate in improving healthcare delivery. From providing resident input in administrative meetings, to earning a certificate in quality improvement (QI) and patient safety (PS), to finding and implementing personal projects – trainees at all levels are encouraged and supported. Below are some of the more popular avenues to get involved:

Housestaff Quality and Safety Committee

Formed in 2011, the UW Housestaff Quality & Safety Committee (HQSC) is a trainee-led organization with members comprising a range of academic divisions. HQSC functions in partnership with the UW Patient Safety and Quality Coordinating Committee and the Graduate Medical Education Committee, with the goal of engaging members in the quality and safety work pursued throughout UW training sites. PGY-2 residents and above are welcome to this group. Applications are sent out in the spring for the following year. Members attend monthly meetings throughout the year to learn the skills needed to become future leaders in QI and patient safety. Because of impressive year-over-year growth, HQSC has debuted a new leadership team to better serve our members in areas of publication, technology, development, and outreach.

Certificate Program: Motivated HQSC members can earn a certificate in quality improvement and patient safety by consistently attending monthly meetings, completing an IHI Open School online training course, and undertaking a longitudinal project with some kind of output (i.e. publication, presentation).

Liaisons Program: The Liaisons program is a less demanding way to get involved in administrative meetings around the UW training sites. This group is open to all trainees, including interns. A monthly calendar is maintained by the Liaisons leadership, with a request that Liaisons attend a minimum of three meetings over the course of the year.

See **uwhqsc.org** for more details.

QI Match

QI Match is a home-grown UW product and was borne out of a desire to connect trainees with QI and PS opportunities under the UW Medicine umbrella. Co-sponsored by the UW Center for Scholarship and Patient Safety, QI Match has been revamped into a robust, interactive platform that allows users to create, search for, and apply to projects. A full re-launch is expected in late 2016/early 2017. Login is available to all users with a UW NetID.

See **qimatch.com** for more details, and thank you for your patience through the construction period.

Transformation of Care

UW Medicine is the recipient of a $30 million, four-year award from the Center for Medicare and Medicaid Innovation to serve as a Practice Transformation Network for the WWAMI region (Washington, Wyoming, Alaska, Montana, and Idaho). Oversight for this grant is through the office of the Chief Medical Officer, who is identifying projects in need of resident input before making these opportunities available on QI Match.

See **http://www.uwmedicine.org/about/transformation** for more details.

De-identified Clinical Data Repository (DCDR)

The DCDR is a tool that can be used to query the medical record at UWMC and HMC, returning de-identified data on user-defined patient populations. For example, a user can request: "Provide me a count of patients, age 30-65 with a diagnosis of myocardial infarction, who were discharged within the past six months." It is free for any resident after completion of a short training module.

See **http://www.iths.org/investigators/services/bmi/dcdr** for more details.

Access to Excellence

Access to Excellence is a frequently updated, electronic quality dashboard of key metrics. All metrics are protected and require AMC login to view. Access to Excellence provides detailed quality data on numerous metrics and allows users to search performance information for specific units, services, or departments. This function can provide you with performance information on a specific unit, service, or department. There are also dashboards for key departments/centers of emphasis, accessible by clicking on the department/center's initials in the upper right hand corner. Access to Excellence is a great reference for current QI and PS efforts underway at UWMC and HMC. Each metric has a champion, and his or her contact information is displayed if you would like to reach out. Click on the Access to Excellence banner on the HMC or UWMC intranet webpage to access.

PSN (Patient Safety Network)

Remembering that patient safety starts with front-line care providers, the PSN system is available to all users in the UW Medicine network by simply clicking the desktop icon found on hospital and clinic computers. This is one of the most direct ways of raising attention to issues that affect or have the potential to affect patient care. Here you can report near-miss or harm events and ask for feedback on your submission form from the patient safety office.

HQSC Members and Certificate Awardees 2015-2016

HOUSE CHAIRS

Chen Wu –Chief Resident for Quality & Patient Safety, Internal Medicine
Vlad Golgotiu –Anesthesiology & Pain Medicine

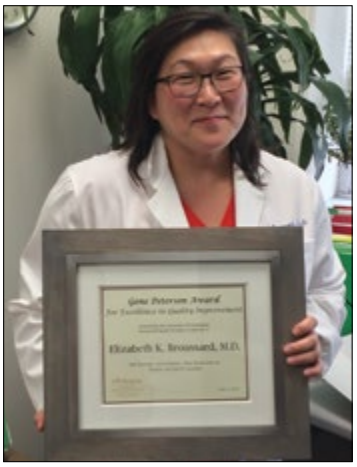
HQSC MEMBERS

Andrew Moon –Internal Medicine
Anthony Esposito –Internal Medicine
Blake Mann –Pulmonary & Critical Care Medicine
Carlo Milani –Physical Medicine & Rehabilitation
Crystal Shen –Pediatrics
Daniel Kuo –Internal Medicine
Daniel Lieberman –Emergency Medicine
Emily Zepeda –Ophthalmology
Gillian Pet –Neonatal-Perinatal Medicine
Gurleen Dhami –Radiation Oncology
Jaclyn Russell –Physical Medicine & Rehabilitation
Jacob Smith –Radiology
James Lee –Cardiology
Jason Espinoza –Pediatrics
Jessamyn Blau –Internal Medicine
Jill Steiner –Cardiology
Katherine Hicks –Internal Medicine
Kathryn Bowman –Internal Medicine
Kathryn Stadeli –General Surgery
Katie Benziger –Cardiology
Kelly Ledbetter –Plastic Surgery
Lauren Poull –Pediatrics
Linda Chen –Radiology
Marissa Black –Internal Medicine
Matthew Lidstrom –Radiology
Matthew Spraker –Radiation Oncology
Milner Staub –Internal Medicine
Nicole Poole –Pediatric Infectious Disease
Patrick Mathias –Clinical Informatics
Reiko Emtman –Psychiatry
Reza Hosseini Ghomi –Psychiatry
Sarah Wittry –Physical Medicine & Rehabilitation
Shoshana Zha –Internal Medicine
Stephanie Carr –Internal Medicine
Stephanie Field –Internal Medicine
Tania Kourtidou –Pediatrics Cardiology
Tejas Dhawale –Hematology-Oncology
Thomas Mullen –Radiation Oncology
Vidang Nguyen –Internal Medicine

UW GME GRADUATE QUALITY & SAFETY CERTIFICATE AWARDEES

Blake Mann –Pulmonary & Critical Care Medicine
James Lee –Cardiology
Jill Steiner –Cardiology
Katie Benziger –Cardiology
Lauren Poull –Pediatrics
Nicole Poole –Pediatric Infectious Disease
Sarah Wittry –Physical Medicine & Rehabilitation
Shoshana Zha –Internal Medicine
Tania Kourtidou –Pediatric Cardiology
Vidang Nguyen –Internal Medicine
Vlad Golgotiu –Anesthesiolgy & Pain Medicine

GENE PETERSON AWARD



Dr. Elizabeth Broussard was selected as the recipient of the Gene Peterson Award for Excellence in Quality Improvement Mentorship. This resident-nominated award is named in honor of the late Dr. Gene Peterson, a quality and safety pioneer. Dr. Broussard is a clinical faculty member in the Department of Gastroenterology, and was specifically recognized for her mentorship of students' quality improvement projects in the HMC colorectal cancer screening program.

This section features exceptional work conducted by the residents and fellows of UW Medicine in the field of quality improvement.

Standardized Patient Handoffs in the ICU: a Resident-Led Clinically-Integrated Quality Improvement Program

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ABSTRACT

Introduction: Handoff communication failures contribute to one third of all sentinel events. The Accreditation Council for Graduate Medical Education has responded by requiring that all residency programs teach "adequate handoff skills." Through a resident-led multidisciplinary team approach, we developed and implemented an evidence-based handoff curriculum, and integrated it into the electronic medical record.

Project Development and Design: This resident-led quality improvement project was funded by an institutional patient-safety innovations grant and implemented via a cluster-randomized step-wedge design at eight intensive care units across a multi-institutional academic center. An evidence-based handoff curriculum, "UW-IPASS," was adapted to the local clinical environment and integrated into the electronic-medical record. Project compliance was assessed via measurement of weekly completion of online training modules, direct observation of handoffs, handoff didactics, and advocate meetings.

Project Impact: 133 of 192 recruited providers (69%) completed the online learning module. The weekly proportion of providers who completed the module increased from 56% in the first 6 weeks to 74% in the last 6 weeks (p=0.001). Mean compliance with verbal and written handoff formats was rated by observers as 8/10 overall. On-site advocate meetings with the attending or fellow of the week were completed 67% of the time.

Conclusions: The development and implementation of UW-IPASS represents a successful resident-devised and -executed initiative, made possible through collaboration with an interdisciplinary quality council and support from an internally-funded patient-safety program. Resident-led initiatives may be particularly relevant in efforts to reduce communication errors, standardize provider handoffs, and thus improve patient-safety across the spectrum of graduate medical education.

INTRODUCTION

Handoff communication failures contribute to one third of all sentinel events.[1] In an effort to reduce preventable adverse outcomes, the Joint Commission and the Accreditation Council for Graduate Medical Education (ACGME) require providers to "implement a standardized approach to handoff communication."[2-4]

Despite prioritization of handoff education, there is currently no widely-accepted, evidence-based curriculum for resident handoffs. Patient handoff is learned through "trial and error" and modeling by senior residents. As both participants and instructors in handoff procedures, residents are therefore ideally positioned for leading quality improvement (QI) initiatives to optimize handoffs.[4]

"IPASS" is a mnemonic originally developed for acute care pediatric patient handoffs at Boston Children's Hospital. Implementation of the original IPASS curriculum improved provider satisfaction and decreased medical errors, adverse events, and time spent on handoff.[5] A multidisciplinary, resident-led QI team at the University of Washington used IPASS as a template to develop a new handoff tool, "UW-IPASS," for adult intensive care unit (ICU) patients; this report describes that adaptation and implementation.

PROJECT DEVELOPMENT AND DESIGN

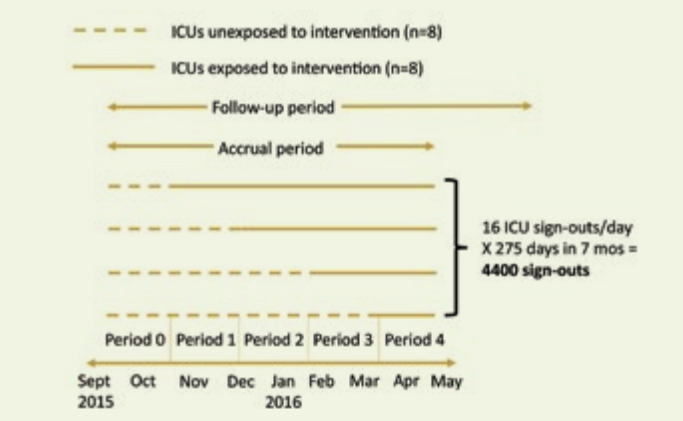
Project Conception: This resident-led QI initiative originated in the University of Washington Housestaff Quality & Safety Committee (HQSC). Members of the committee identified provider handoff as an ideal target for improvement. Consultation with institutional patient safety experts and a literature review demonstrated that "IPASS"[5] was the handoff tool with the most robust evidence and applicability to the critical-care setting.

Project Team Formation and Stakeholder Engagement: Targeted providers for this project spanned two hospitals, eight ICUs, a variety of clinical roles [attending, fellow, resident, medical student, advanced practice providers (APPs), nurses, and six specialties (surgery, medicine, anesthesia, emergency medicine, trauma critical care, pulmonary critical care). Early objectives were to engage stakeholders and form a multi-disciplinary leadership team, thereby enhancing

provider project ownership and participation. Two surgical research residents served as co-leaders of the team, and the medical directors of critical care at both hospitals acted as faculty advisors.

Intervention Design: Curriculum: After obtaining permission for adaption, the original pediatric IPASS curriculum[6] was used as a template to develop a new handoff tool for providers in adult critical-care populations, dubbed "UW-IPASS."

Figure 2. Step-wedge cluster randomized implementation of the UW-IPASS standardized handoff curriculum in eight ICUs over a period of 7 months at two academic medical centers.



Computerized Handoff Tool: UW-IPASS was incorporated into the institution's electronic medical record (Cerner Millennium, Cerner Corporation, Kansas City, MO) using an embedded rounding and handoff application (CORES, TransformativeMed Inc, Seattle, WA). This permitted patient information to be stored in customizable, UW-IPASS formatted, rounding and handoff reports that integrated with provider work-flow (Figure 1).

Orientation and On-Site Support: Individual providers were sent an email prior to rotating on an ICU service, introducing the UW-IPASS project and providing instructions to complete the online module. Upon arrival in the ICU, new providers were oriented by project staff using an audio-visual presentation. Handoffs were observed by either an attending faculty, fellow, or 'on-site advocate,' structured feedback was provided, and posters with basic IPASS instructions were placed in team rooms (Figure 1).

Project Implementation: Project leaders implemented the UW-IPASS curriculum in each of eight ICUs in a step-wedge cluster randomized fashion (Figure 2) over eight months.

Project Evaluation: Four outcomes were measured weekly: 1) completion of online training modules, 2) compliance with UW-IPASS based on a weekly sample of one to two providers in each ICU who were scored from 1 to 10 by trained on-site observers, 3) completion of handoff didactics, and 4) completion of a weekly advocate meeting. Data was collected over a total of 12 weeks, and grouped into two 6-week time-periods for analysis. Online module completion (by time period) was assessed using Pearson's chi-squared test. Mean handoff compliance scores (by time period) were assessed using a student's t-test (p=0.05). Analyses were performed using Stata 13.1 (College Station, TX).

PROJECT IMPACT

Overall, 133 of 192 recruited providers (69%) completed the online learning module. The weekly proportion of providers who completed the module increased from 56% in the first 6 weeks to 74% in the last 6

Figure 1. The "UW-IPASS" handoff mnemonic, designed for standardized inter-provider communication in the adult intensive-care-unit.

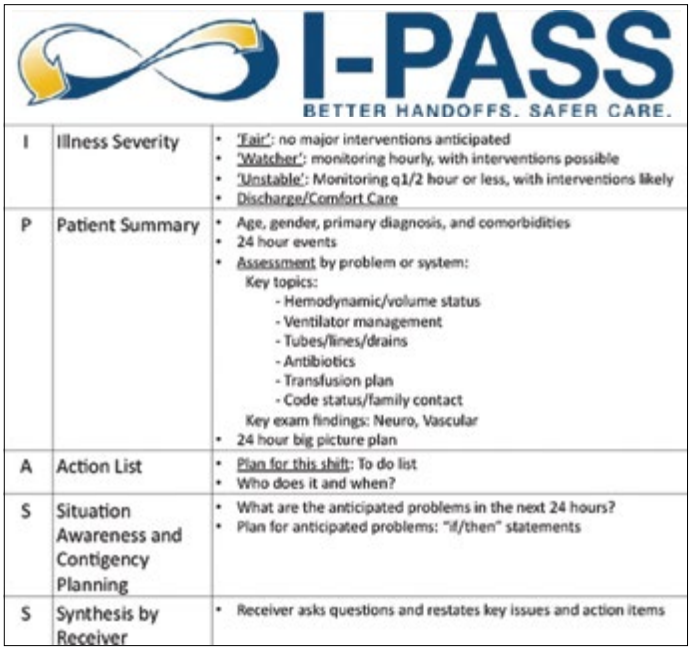
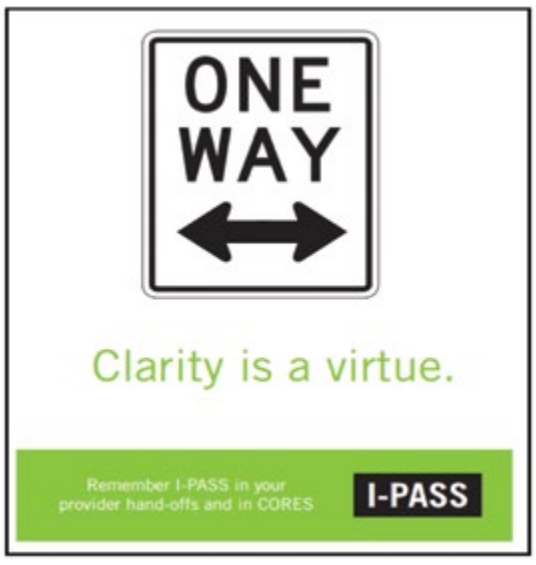
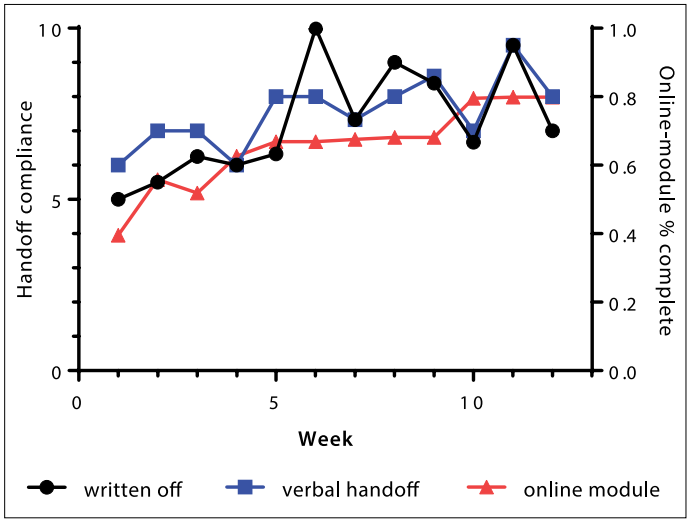


Figure 3. One of the promotional posters for the standardized handoff curriculum UW-IPASS in the intensive care units at two academic medical centers.



weeks (p=0.001). Over twelve weeks, on-site advocates presented the weekly didactic in each ICU 100% of the time. In a sample of 105 providers, compliance with UW-IPASS in both written and verbal formats was scored by on-site observers. Mean compliance with verbal and written handoff formats was rated by observers as 8/10 overall. Mean score for both written and verbal handoff compliance increased when comparing the first six weeks to the last six weeks, but neither reached statistical significance (7.1 to 7.9, p=0.2; 6.9 to 8.1 p=0.08, respectively) (Figure 4). On-site advocate meetings with the attending or fellow of the week were completed 67% of the time.

Figure 4. Serial evaluations of health-care provider compliance over the first 12 weeks with the UW-IPASS standardized handoff curriculum in intensive-care units at two academic medical centers. Ω



Ω Components evaluated included weekly completion rates for an online module (total modules completed / total modules assigned), and weekly compliance assessments on both written and verbal handoff (scored by on-site observers, scale 1=minimal use, to 10=full use).

DISCUSSION

This project effectively fulfilled three ACGME residency training requirements: patient-safety initiative evaluation, training in clinical QI, and education in effective handoff communication.[7] The choice of handoffs as an urgent target for this resident-led QI program was inspired by current literature indicating that handoff errors are common and associated with patient-care errors, sentinel events, and other adverse outcomes.[9,10]

The multi-disciplinary and multi-level consensus-driven approach to curriculum development and implementation enhanced collective sense of ownership and endorsement. Legitimacy and sustainability were achieved, in part, by integration of the UW-IPASS elements into the EMR. Anecdotally, providers frequently requested continued access to the EMR tool after finishing ICU rotations due to its perceived benefits.

Rigorous compliance monitoring was paired with a regular feedback mechanism via on-site advocates. On-site advocates were instrumental in facilitating adoption within each ICU; gaps in compliance with UW-IPASS invariably had a coinciding gap in on-site advocate coverage. The metrics reported in this paper capture compliance with the new UW-IPASS curriculum and globally assess culture change in the ICU.

The UW-IPASS project has several future directions. A rigorous assessment of the impact of this project will occur via a comparison to a control period before the intervention. After a thorough evaluation of these outcomes, the handoff curriculum will be modified and expanded to include the acute care floors throughout both institutions.

CONCLUSION

The development and implementation of UW-IPASS represents a successful resident-devised and -executed initiative, made possible through collaboration with an interdisciplinary quality council and support from an internally-funded patient-safety program.

Acknowledgements

The authors wish to thank the University of Washington Patient Safety and Innovations Program for funding the materials and staff necessary for this project. The authors also wish to thank: Dr. Amy Starmer for her consultation via phone; Dr. Doug Zatzick and Dr. James Perkins for their mentorship on study design; Jan Anscher, Caleb Pong, and Simona Lazar for assistance in developing online modules; Gayle Garson for assistance in gathering aggregate data; Aidan Garver-Hume and Tyler Kight for assistance in developing an integrated-EMR tool; Matthew Fisler for assistance with administration of surveys; Dr. David Dorsey and Dr. Rachel Chard for assistance with project design; Laura Hennessy for assistance with research coordination.

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Lacey LaGrone, General Surgery discusses the signout process with Harborview RN Ron Carrick

Karl Kmiecik, Emergency Medicine and James Costakis, Emergency Medicine carry out UW-IPASS signout

Lacey LaGrone, General Surgery answers questions about UW-IPASS with Kevin Labadie, General Surgery

Outreach Education Events Lead to Increase in Lung Cancer Screening CTs

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BACKGROUND

Lung cancer is the leading cause of cancer death for both men and women. The American Cancer Society estimates that 158,080 people will die from lung cancer in the United States in 2016. Patients diagnosed with early stage lung cancer have a much higher likelihood of survival and cure compared to those with advanced stage disease suggesting that early detection may improve mortality. The National Lung Screening Trial (NLST) published in 2011 reported a 20% decrease in lung cancer mortality with annual low-dose computed tomography (LDCT) compared to chest radiography in high-risk subjects with at least a 30 pack-year smoking history. The study had an absolute risk reduction of 0.33%, meaning 320 people needed to be screened to prevent one death from lung cancer.

Concerns about cost effectiveness, a high false-positive rate, complications related to diagnostic procedures, and the potential for over-diagnosis have raised questions on how best to implement lung cancer screening. The American College of Chest Physicians and American Society of Clinical Oncology weakly recommend (Grade 2B) that high-risk patients be offered lung cancer screening (Table 1). In 2013, the United States Preventive Services Task Force (USPSTF) issued a Grade B recommendation for annual screening with LDCT in adults ages 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years. In 2015, the Centers for Medicare and Medicaid Services (CMS) began covering LDCT for lung cancer screening in beneficiaries ages 55-77 provided that certain criteria are met (Table 2). Criteria include documentation of shared decision making with use of a decision aid and discussion of benefits and harms

Table 1. Lung Cancer Screening Guidelines and Recommendations

Organization	Recommendation for Screening	Year
American Academy of Family Physicians	Evidence is insufficient to recommend for or against screening.	2013
American Association for Thoracic Surgery	Age 55 to 79 with ≥ 30 pack year smoking history. Long-term lung cancer survivors who have completed 4 years of surveillance without recurrence and who can tolerate lung cancer treatment following screening to detect second primary lung cancer until the age of 79. Age 50 to 79 years with a ≥ 20 pack year smoking history and additional comorbidity that produces a cumulative risk of developing lung cancer ≥ 5% in 5 years.	2012
American Cancer Society	Age 55 to 74 with ≥ 30 pack year smoking history, who either currently smoke or have quit within the past 15 years, and who are in relatively good health.	2013
American College of Chest Physicians and American Society of Clinical Oncology	Age 55 to 74 with ≥ 30 pack year smoking history, who either currently smoke or have quit within the past 15 years.	2012
American Lung Association	Age 55 to 74 years with ≥ 30 pack year smoking history and no history of lung cancer.	2012
Centers for Medicare and Medicaid Services	Age 55 to 77 years with ≥ 30 pack year smoking history and either currently smoke or have quit within the past 15 years.	2015
National Comprehensive Cancer Network	Age 55 to 74 with ≥ 30 pack year smoking history and smoking cessation < 15 years. Age ≥ 50 years and ≥ 30 pack year smoking history and 1 additional risk factor (other than secondhand smoke exposure).*	2012
U.S. Preventative Services Task Force	Age 55 to 80 years with ≥ 30 pack year history and either currently smoke or have quit within the past 15 years.	2013

A pack year is smoking an average of one pack of cigarettes per day for one year. For example, a person could have a 30 pack year history by smoking one pack a day for 30 years or two packs a day for 15 years.

*Additional risk factors include cancer history, lung disease history, family history of lung cancer, radon exposure, occupational exposure, and history of chronic obstructive pulmonary disease or pulmonary fibrosis. Cancers with increased risk of developing new primary lung cancer include survivors of lung cancer, lymphomas, cancer of the head and neck, and smoking-related cancers. Occupational exposures identified as carcinogens targeting the lungs include silica, cadmium, asbestos, arsenic, beryllium, chromium (VI), diesel fumes, nickel, coal smoke, and soot.

Table adapted from http://www.cdc.gov/cancer/lung/pdf/guidelines.pdf

of screening, follow-up diagnostic testing, over-diagnosis, false-positive rate, and total radiation exposure. These differences in screening criteria and additional requirements by CMS present challenges to primary care physicians and pulmonologists who are in the position to offer LDCT to patients.

University of Washington (UW) Medicine offers lung cancer screening through its partnership with the Seattle Cancer Care Alliance (SCCA). The SCCA lung cancer screening program is accredited by the American College of Radiology and meets the requirements outlined by CMS. Additionally, the program is affiliated with the SCCA Lung Cancer Early Detection and Prevention Clinic and a nodule board consisting of pulmonologists, thoracic surgeons, and a chest radiologist who meet weekly to review patients who are referred for abnormal findings or nodules concerning for lung cancer. This multidisciplinary approach allows for collaboration among experts in lung cancer diagnosis and treatment and facilitates a consensus recommendation for patients and families. Additionally, smoking cessation counseling and nicotine replacement therapies are available at no cost to SCCA patients.

In 2015, providers from the SCCA Early Detection and Prevention Clinic began to offer outreach educational events to the UW Neighborhood Clinics. These events presented evidence for lung cancer screening including results of the NLST, guideline recommendations for screening CT scans, resources for shared decision making, and a practical approach for ordering screening CT scans. Events were intended to provide primary care providers the knowledge and resources to offer lung cancer screening to eligible patients and to improve adherence to Medicare guidelines, including documentation of shared decision making and use of appropriate billing codes.

METHODS

We retrospectively reviewed all Epic orders for screening CT scans at four clinics where outreach events were held within 120 days of the initial outreach event. Only the initial baseline screening order for any given patient was included. We compared the total number of orders placed at each clinic site before and after the outreach event. We grouped orders by 30-day increments to observe any trend in order frequency and to determine if the effect of the educational intervention was sustained over time. Additionally we reviewed all orders for Medicare patients for use of a CMS-approved diagnosis code before and after the intervention.

RESULTS

A total of 99 screening CT orders met inclusion criteria. Thirty orders were placed during the 120 days before the outreach events and 69 orders were placed during the 120 days following the outreach events. This reflects a mean of 7.5 orders per 30-day period prior to the

Table 2. Elements Required for Medicare Reimbursement for Lung Cancer Screening with Low-Dose CT

- Determination of beneficiary eligibility including age, absence of signs or symptoms of lung cancer, a specific calculation of cigarette smoking pack years, and, if a former smoker, the number of years since quitting
- Shared decision-making counseling visit with a physician or qualified non-physician practitioner*, including the use of one or more decision aids. Counseling should include benefits and harms of screening, follow-up diagnostic testing, over-diagnosis, false-positive rate, and total radiation exposure
- Counseling on the importance of adherence to annual lung cancer LDCT screening, impact of co-morbidities, and ability or willingness to undergo diagnosis and treatment
- Counseling on the importance of maintaining cigarette smoking abstinence if former smoker or the importance of smoking cessation if current -smoker and, if appropriate, furnishing of information about tobacco cessation interventions
- If appropriate, the furnishing of a written order for lung cancer screening CT provided by a physician or qualified non-physician practitioner
- Services must be billed with one of the following diagnosis codes

ICD-9

- V15.82 – Personal history of tobacco use
- 305.1 – Tobacco Use Disorder

ICD-10

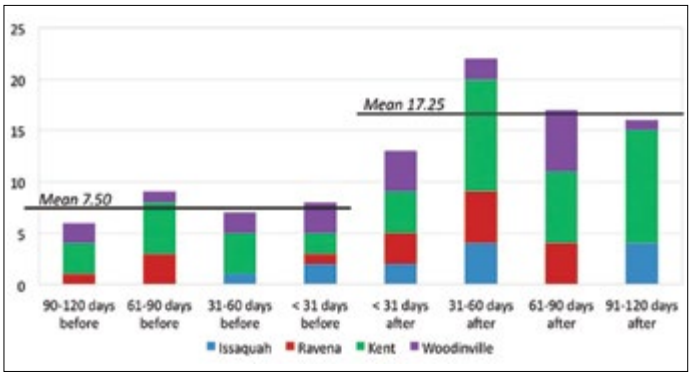
- Z87.891 – Personal history of tobacco use/personal history of nicotine dependence
- F17.210 – Nicotine dependence, uncomplicated
- F17.211 – Nicotine dependence, in remission
- F17.213 – Nicotine dependence, with withdrawal
- F17.218 – Nicotine dependence, with other nicotine-induced disorders
- F17.219 – Nicotine dependence, with unspecified nicotine-induced disorders

*A qualified non-physician practitioner includes a physician assistant, nurse practitioner, or clinical nurse specialist

outreach events compared to 17.25 orders per 30-day period following the outreach event (Figure 1). The greatest increase in orders was seen in the 31- to 60-day period following the event. The number of orders in the subsequent 30-day periods were lower, suggesting a downward trend in screening CT orders.

Of the 99 orders included, 56 were for patients on Medicare. Prior to the outreach events, 85% (17 of 20) were coded with a CMS-approved diagnosis code. Following the outreach events, only 56% (20 of 36) were coded with a CMS-approved diagnosis code (Figure 2).

Figure 1. Initial lung cancer screening CT orders before and after outreach events



DISCUSSION

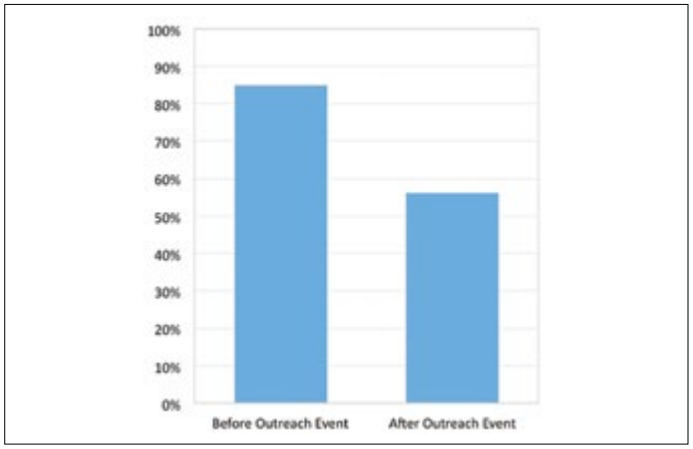
A one-time outreach education event led to an increase in the number of lung cancer screening CT orders at four UW Neighborhood clinics. This increase appears to be sustained over a 120-day period; however, there appears to be a decline in orders placed over the last 60 days, suggesting the effect may decrease over time. We suspect the increase in orders occurred because providers have a better understanding of lung cancer screening recommendations, are more comfortable conducting and documenting shared decision-making counseling, and have a better understanding of how to order screening CT scans.

Following the outreach event, only 56% of screening CT orders placed for Medicare patients were coded with a CMS-approved ICD-9 or ICD-10 diagnosis code. Of the remaining 44% percent, the most common code used was V76.0 –"Encounter for screening for malignant neoplasm of respiratory organs." This code is not approved by CMS for reimbursement for lung cancer screening CT scans.

Our data collection is limited in that we only reviewed orders placed for low-dose screening CT scans. Orders placed for a standard non-contrast chest CT, even if ordered for the purpose of lung cancer screening, would not have been captured. It is possible that some providers were ordering standard non-contrast chest CTs prior to the education event, thus the increase in screening CT orders may not accurately reflect the same increase in patients being screened for lung cancer.

Two additional outreach events and a UWNP Webinar on CT screening have also been conducted; however, at the time of this manuscript, the effects have not been measured. Future events will need to emphasize the importance of using one of the CMS-approved diagnosis codes in order to meet reimbursement criteria. Plans are underway to provide a note template within the electronic medical record that supports the shared decision making and documentation requirements as outlined by CMS. Additionally, an Epic Smart Set may be created which can incorporate the note template, order for screening CT scan, and appropriate billing and diagnosis codes. Our goal is to provide primary care providers the education and resources to easily and effectively offer lung cancer screening to eligible patients at risk for lung cancer.

Figure 2. Screening CT orders for Medicare patients with a CMS-approved diagnosis code



Acknowledgments:

We would like to thank Douglas Wood, MD and David Madtes, MD for providing the outreach education events. Additionally, we would like to thank the staff and providers at the Belltown, Factoria, Kent-Des Moines, Issaquah, Ravenna, and Woodinville UW Neighborhood clinics. We appreciate the assistance of E. Sally Lee, PhD, Healthcare and Finance Analyst for providing data for analysis. Thank you to Anneliese Schleyer for your mentorship in quality improvement.

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Urinary Catheter Management for Non-Urologists: A Resident-Driven Educational Initiative

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ABSTRACT

Introduction: Prevention of catheter-associated urinary tract infection (CAUTI) relies on timely catheter removal and care of indwelling catheters. Educational and quality improvement initiatives to prevent CAUTI should address the basics of urinary catheter placement and management. Internal medicine (IM) residents are an appropriate target for these efforts and may lack formal training in these issues. We developed a resident-driven orientation session that covers basic Foley catheter management principles: Foley Troubleshooting, Indications, and Practice Sessions (TIPS) program.

Methods: Urology residents at UW were queried on common consultations for urinary catheter-related issues. The incoming intern IM class at the University of Washington (UW) took a pre-TIPS survey that evaluated their baseline urological experience and knowledge. A one-hour didactic session led by urology residents was followed by hands-on directed practice with mannequins. The web-based survey was repeated one month later.

Results: 54 of 60 (90%) total residents took the initial survey. In medical school, 38/54 (70%) residents had never rotated in Urology. On repeat survey at one month, the response rate was 34/60 (57%). The proportion confident in their ability to troubleshoot catheter problems increased from 50 to 88% ($p<0.05$). Knowledge of indications, clot retention, and proper catheter technique improved as well ($p<0.05$).

Conclusions: A focused educational session about common urologic catheter management scenarios resulted in improved IM resident confidence in catheter troubleshooting and knowledge of basic urinary catheter placement indications. These educational sessions may be one method to improve non-urology resident education and awareness of common urologic issues.

INTRODUCTION

Quality improvement initiatives in healthcare are becoming important driving forces in the promotion of care that is safe, effective, and efficient.[1,2] In the last 10 years, nearly every major medical society has established a division dedicated to quality improvement in patient care. One of the most widely adopted quality improvement initiatives across the country is the prevention of catheter associated urinary tract infection (CAUTI).[3] Prevention of CAUTI has been identified as a prime target for improving patient care and decreasing healthcare costs.[4] CAUTI are tracked as a metric of hospital performance, and recently Medicare has adopted a nonpayment policy for additional care and costs resulting from a CAUTI diagnosis.[5]

Although quality improvement initiatives have been adopted at many hospitals, most physicians other than urologists have no working knowledge of urinary catheters and their management, potentially compromising the efficacy of these quality improvement initiatives. In fact, to date, no formalized programs directly address the basics of urinary catheter placement and important issues that relate to catheter management for internal medicine (IM) residents. Such a curriculum would echo ongoing efforts around central venous line placement, in which modules involving simulation models orient resident trainees to a complex procedure and potential source of in-hospital morbidity.[6]

We sought to address this training deficiency in a teaching hospital environment through the use of an educational session. In this project we created a focused session covering commonly encountered topics in urology and tested its effectiveness among incoming internal medicine interns at the University of Washington. The session was designed to cover urinary catheter Troubleshooting and Indications for Placement, and included hands-on Practice Sessions (TIPS).

METHODS

This pilot project was designed to educate IM interns and improve their knowledge and confidence with urinary catheter-related issues, in accordance with our overarching goal of improving patient care. The curriculum derived from consultation with urology residents and faculty regarding the most commonly encountered reasons for urologic consultation. Two weeks prior to orientation week, the IM resident class was invited to complete a brief web-based survey. This survey was implemented online through the UW Catalyst system, and two email reminders were circulated to increase participation.

The TIPS intervention was a 60-minute session with a 15-minute didactic lecture, followed by 35-minute hands on practicum (Image 1) guided by senior urology residents and faculty, and lastly, a 10-minute summary session to review key points and the case-based scenarios.

Image 1. Urology resident working with residents during hands-on practice sessions

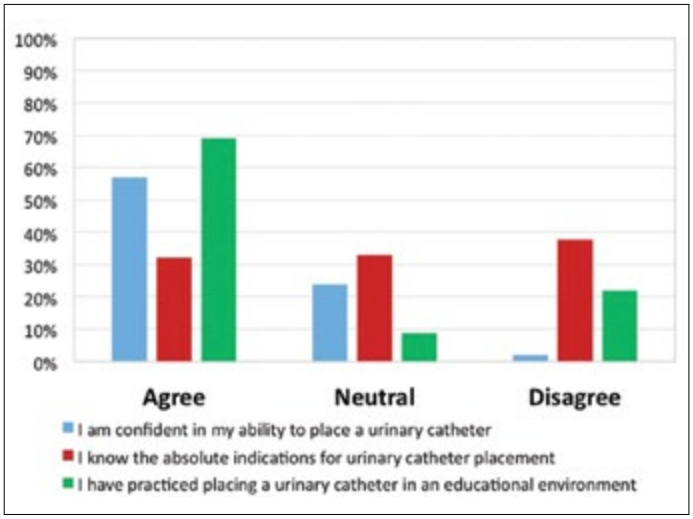
One month post-TIPS, we repeated the same survey with IM resident participants. Descriptive statistics were performed for survey results before and after the session.

RESULTS

In June 2014, the incoming University of Washington IM resident class (n=60) took the initial survey for a response rate of 90% (54/60). Approximately half of respondents were confident in their ability to troubleshoot catheter problems (Figure 1). Of 54 queried residents, only two had never placed a urinary catheter as medical students.

One month post-TIPS, 57% (34/60) of residents completed a follow-up survey. Confidence in troubleshooting urinary catheter-related issues, knowledge of indications, management of clot retention, and knowledge of correct catheter placement increased significantly (Figure 2, χ^2 $p < 0.05$). Of the residents that completed the post-test survey, 91% said they would recommend TIPS to a fellow resident, citing reasons including "practical and concise presentation [and] useful handouts."

Figure 1. Baseline internal medicine resident experience (n=54)



*P < 0.05

DISCUSSION

We describe an educational intervention that was associated with significant improvement in IM residents' knowledge and confidence in urinary catheter management. We believe that integrating this session into resident orientation will help avert medical errors related to knowledge deficiencies in urinary catheter management.

In one study of U.S. hospitals, 75% of attending physicians did not monitor the duration of urinary catheter placement or note its discontinuation.[7] This underscores residents as an important source of urinary catheter awareness and management. Resident-driven quality improvement initiatives are a cost-effective method for potentially addressing sources of CAUTI. Practicing catheter placement in a supervised session may help minimize patient morbidity and avert repeated catheter attempts that induce urothelial trauma and increase CAUTI risk.

A perceived uptick in medical errors and surgical complications at teaching institutions as compared to neighboring community hospitals in July is commonly described as the July Effect and may underscore the need for supervised orientation sessions to new residents.[8] A review of over 800 urinary catheter consults found that, of the cases associated with urethral injury, over 76% of occurred within the first 6 months of the academic year.[9] Orientation prior to beginning the intern year provides needed practical experience.

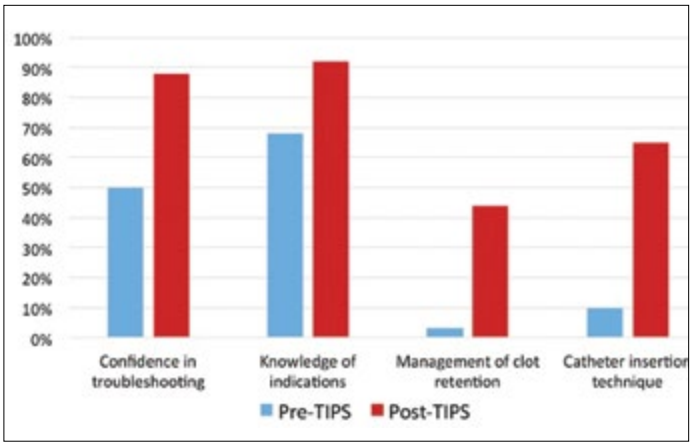
We believe that promoting increased knowledge and practical experience among IM residents will have meaningful clinical impact in several ways. First, residents may have improved communication of pertinent urologic details when requesting consultations. Second, residents may have increased insight of indications for urinary catheter placement and avoid reflexive orders. Third, residents may have increased awareness of less-invasive methods for urinary monitoring, such as condom catheters. And fourth, increased awareness of troubleshooting techniques may obviate repeated urothelial trauma that may contribute to CAUTI.

Another important aspect of our study was the use of residents as instructors. Residents as instructors increases resident satisfaction and retention of information.[10] This learning module (TIPS) will be continued as part of the IM orientation curriculum led by Urology research-year residents as part of their expected responsibilities. Such sessions may be of benefit to medical professionals in any discipline that manage hospitalized patients with urinary catheters. We have expanded the audience for TIPS to additionally include Emergency Medicine residents, Family Medicine residents, and the medical and surgical intensive care unit nursing staff.

This study has several inherent limitations, including that our results are limited to a single cohort at a single institution, TIPS is not yet a validated curriculum, and our follow-up response rate is suboptimal.

Despite these limitations, we demonstrated that a brief didactic session on urinary catheter management was associated with improved IM resident knowledge and confidence. Resident-led educational initia-

Figure 2. Impact of dedicated training sessions



tives are a valuable opportunity to potentially improve patient care and non-urology resident awareness of common urologic issues.

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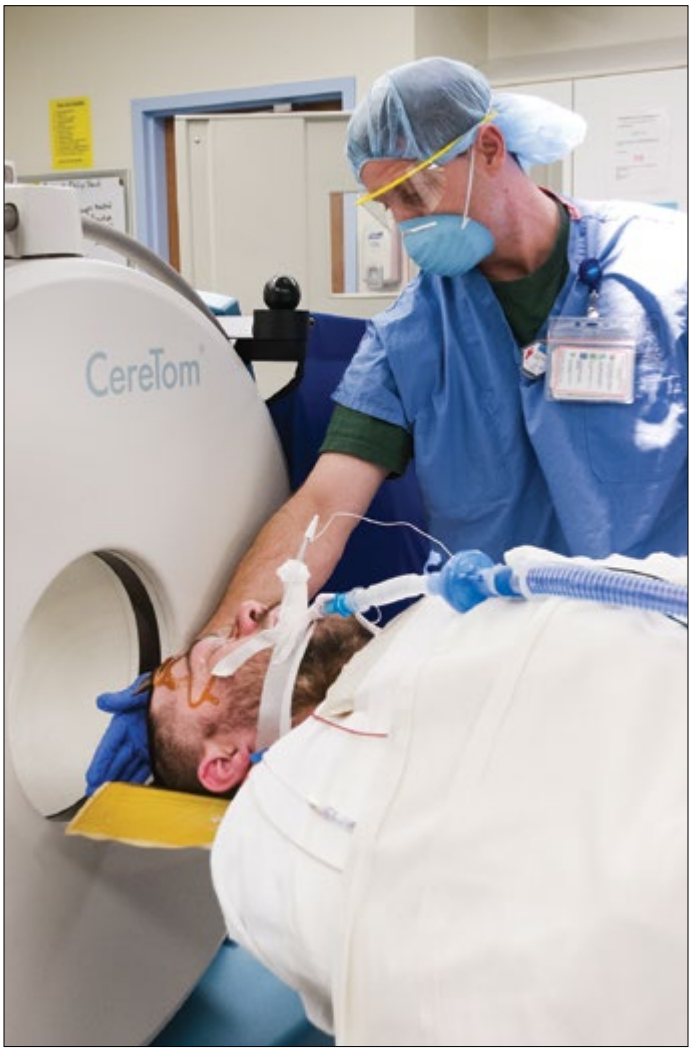

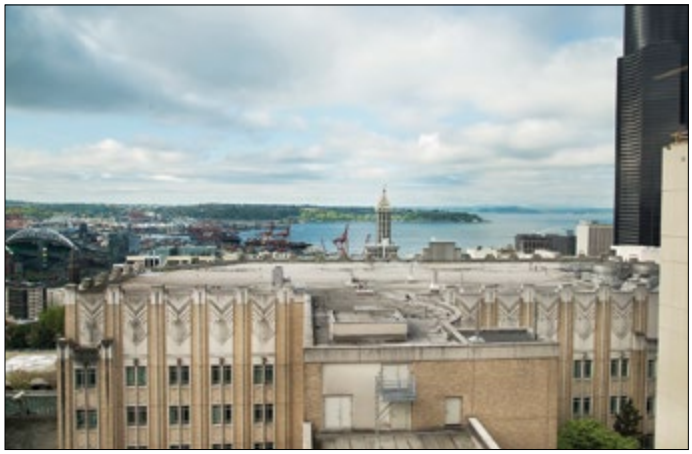

Acute Care Telemetry Indications and Usage at Harborview Medical Center: Provider Knowledge of Appropriate Use

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ABSTRACT

Cardiac telemetry, while designed to decrease in-hospital mortality from potentially lethal cardiac arrhythmias, is associated with high costs as well as patient distress and inconvenience. Recommendations for starting and continuing telemetry monitoring were delineated in 2004 by the American Heart Association (AHA). However, the extent to which these recommendations are applied in clinical practice remains unclear.

To better understand practice patterns of telemetry use in acute care settings, we conducted a survey among care providers at Harborview Medical Center (HMC) before piloting a new telemetry ordering set that adheres to AHA recommendations. In comparing telemetry utilization data with providers' knowledge of telemetry indications before and after implementation of a new ordering system within the electronic health record, we intend to characterize the close relationships between quality improvement initiatives and medical knowledge within an urban, academic, safety-net hospital. This pilot project is currently ongoing.

BACKGROUND

Cardiac telemetry was designed to detect and allow for early intervention for cardiac arrhythmias. Appropriate use has been shown to reduce mortality by as much as 30%.[1] However, use of telemetry is associated with high costs, false-positive rates leading to over-testing and alarm fatigue, and increased ED boarding times due to limited telemetry beds.[2] To guide telemetry usage, the American Heart Association (AHA) released recommendations in 2004 that use inpatient clinical indications to classify telemetry usage into class I (indicated), class II (beneficial in some patients but not all), and class III (not indicated).[4] The Choosing Wisely Campaign further encourages use of acute care telemetry continuation protocols.[3] Recent studies have implemented telemetry order sets that match AHA recommendations, resulting in reduced telemetry usage by up to 70%, reduced mean daily costs from $19000 to $5800,[5] and no impact on clinical outcomes for class III patients.[6]

In line with these initiatives, a telemetry order set was created based on national guidelines, and implemented at HMC and University of Washington Medical Center in June 2016. The new telemetry program has the potential to simultaneously educate and guide appropriate use among providers. We therefore sought to characterize the baseline knowledge of housestaff, faculty, and nurses regarding indications for acute care telemetry at HMC prior to the intervention with the ultimate goal of comparing telemetry knowledge and utilization rates before and after implementation of the new, guideline-driven telemetry program.

METHODS

In April and May 2016, we surveyed HMC nurses (n=69), housestaff (n=42), and hospitalists (n=18). Survey participants 1) indicated whether they were aware the AHA guidelines existed, 2) selected the telemetry classifications for ten medical indications, and 3) chose whether or not to continue telemetry in five short clinical scenarios.

The telemetry innovation was released in June 2016. As part of the order sets, the acute care telemetry system guides ordering providers to select a specific telemetry indication, and categorizes indications by duration (Figure 1). If telemetry usage exceeds this duration of time, the ordering provider receives a page suggesting that telemetry be discontinued, unless there is another clinical indication to warrant continued usage.

Following the pilot stage, telemetry utilization rates and provider knowledge of the guidelines will be reassessed using order data and a repeat survey, respectively.

RESULTS

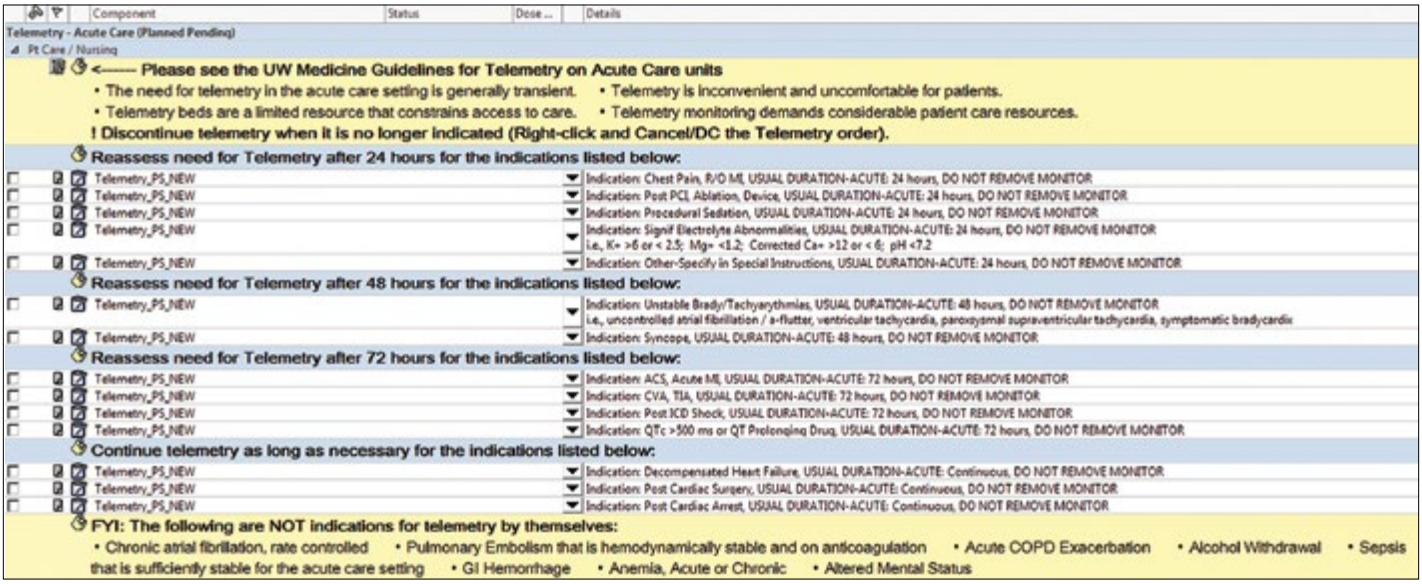
Acute care telemetry indications were correctly classified per AHA guidelines by care providers including housestaff, nurses, and hospitalists in 59%, 62%, and 72% of cases, respectively, whereas clinical scenarios were correctly answered in 75%, 74%, and 67% of cases, respectively. When telemetry continuation was indicated, 87% of all care providers responded correctly, whereas when telemetry discontinuation was indicated, 47% responded correctly (Figure 2). The most correctly classified indications were acute coronary syndrome and arrhythmia, whereas frequently incorrect indications included gastrointestinal bleeding, alcohol withdrawal, and hemodynamically stable pulmonary embolism.

Of survey responders, 33% of physicians and 16% of nurses were previously aware of AHA telemetry recommendations for usage. Although there was a trend toward higher overall scores for providers who were previously aware of the AHA guidelines compared to those who were not, this was not a statistically significant difference (p=0.16). Among housestaff responders, senior residents and interns did not have significantly different scores in any category (p=0.23).

DISCUSSION

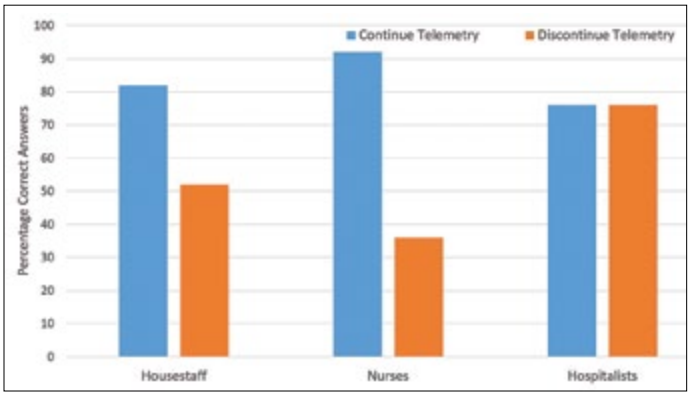
These data represent baseline results of our ongoing pilot project. We look forward to comparing utilization and guideline knowl-

Figure 1. Telemetry Ordering Set



edge data with upcoming results. We expect to learn whether the pilot order set increases knowledge of appropriate telemetry indications amongst housestaff, and whether this will translate into different telemetry-ordering behaviors. Ultimately, we intend to characterize long-term outcomes with this new, parsimonious telemetry order set. Other insights that may be delineated in the pilot include: differences in knowledge of telemetry between nurses, residents, and attending physicians, changes in perceptions for specific clinical indications after implementing the telemetry ordering set, and HMC telemetry utilization rates in comparison to other institutions.

Figure 2. Correct answers for telemetry continuation and discontinuation questions amongst HMC housestaff, nurses, and hospitalists



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Workflow Improvement for Inpatient Cardioversions at the University of Washington

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ABSTRACT

Electrical cardioversion, while a technically straightforward procedure, can be difficult to schedule and perform in a timely manner. Delays in the delivery of this procedure have been noted to negatively affect patient care. To improve the efficiency of this process for inpatient procedures, a new ORCA electronic order set was developed and a common electronic communication tool was implemented. In the period immediately following implementation, these interventions anecdotally have effectively improved this process. Further efforts are underway to refine these interventions and improve other components of the scheduling process.

BACKGROUND

Direct current electrical cardioversion is the process by which an abnormal heart rhythm is converted back to normal sinus rhythm using an electric shock, most commonly used to treat arrhythmias such as atrial fibrillation or atrial flutter. This can be done on an elective basis for outpatients, or more urgently for inpatients. If the arrhythmia has persisted greater than 48 hours without anticoagulation, a pre-procedure transesophageal echocardiogram (TEE) is typically performed to evaluate for intracardiac thrombus to reduce the risk of stroke.

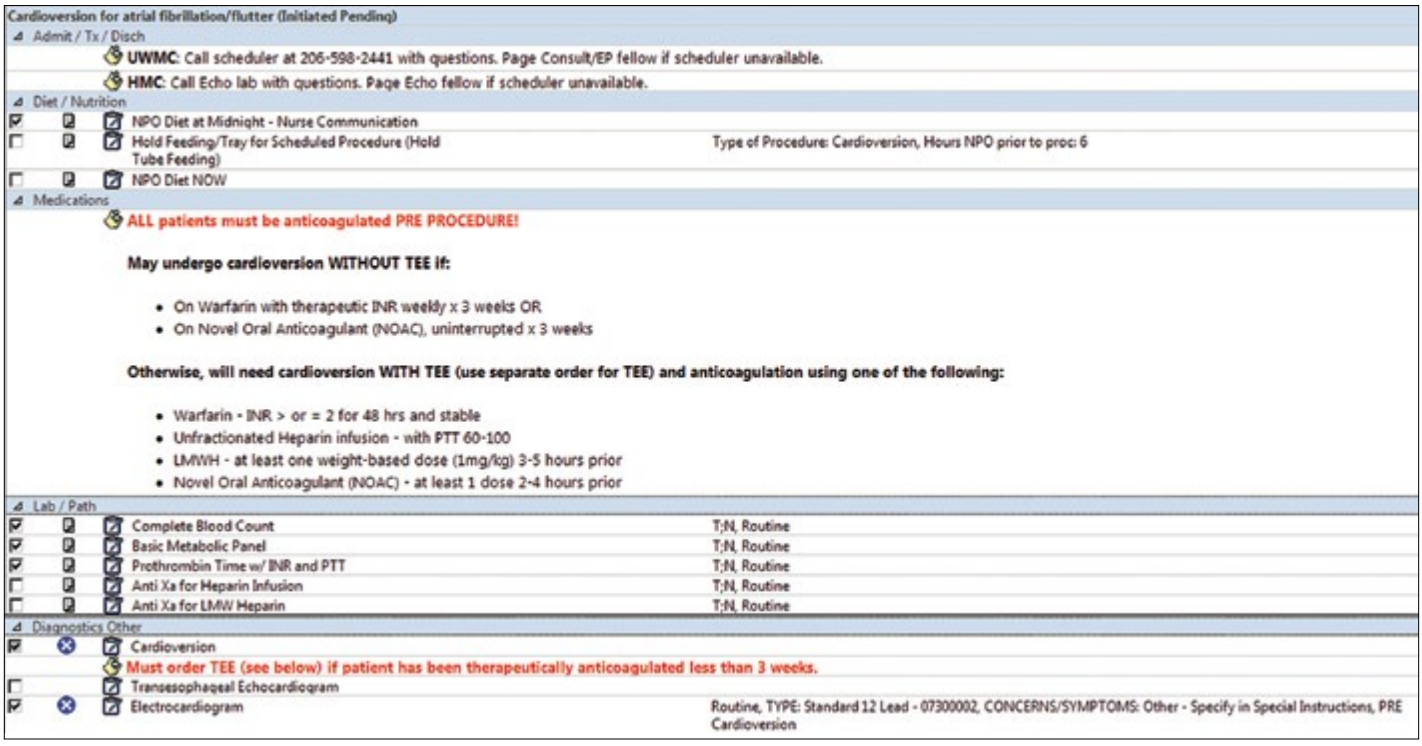
Although a technically straightforward procedure, due to the number of providers involved and the timely scheduling, the process of performing a cardioversion can be challenging. It was anecdotally observed that difficulty in the scheduling and performance of cardioversions negatively impacted patient care by delaying discharge or, if outside of the 48-hour window, triggering the additional cost and invasiveness of a TEE.

As such, we proposed to evaluate the system and implement a series of continuous quality improvement cycles with the goal of improving efficiency of the ordering process. Our initial efforts focused on inpatient cardioversions due to the relative urgency of these procedures.

INTERVENTION

Beginning in October 2015, we collected baseline data on the number of calls required to schedule a cardioversion, number of times the procedure was cancelled or moved, and time from order placement to anesthesia start time. This showed that, on average, an inpatient required a minimum of 6-7 calls for the patient coordinator to schedule a cardioversion. We then created a process map to identify high-yield targets for intervention. We met with key stakeholders within Cardiology and Anesthesia, as well as representatives from ORCA and the

Figure 1. New ORCA Powerplan for Cardioversion



procedural areas. Two projects were planned based on these initial meetings:

1) Creation of an optimized ORCA electronic order setting for ordering inpatient cardioversions.

2) Implementation of the Anesthesia/OR whiteboard as a tool for schedule coordination.

Project 1:

The pre-existing cardioversion order was missing key information including pre-procedure NPO status, anticoagulation status, pertinent lab orders, if a TEE was required, and whether the patient had a pacemaker or defibrillator. In addition, the order requisition was found to be assigned to an abandoned printer and, thus, a cardioversion would only be scheduled if the ordering provider personally called in to confirm. In partnership with ORCA, we developed a new, optimized order set for the University of Washington Medical Center (UWMC) and Harborview Medical Center (HMC) (Figure 1). It now includes all necessary information required to order a cardioversion, as well as guidelines on anticoagulation and patient preparation. The order's printing destination was also reassigned so that it correctly prints directly to the scheduler.

Project 2:

A significant challenge to the efficiency of cardioversions is the identification of providers who will be involved in the procedure. There are also discrepancies in knowledge of procedure start time due to the use of multiple scheduling systems. A proposal was made to streamline communication on the day of the procedure by using the Anesthesia/OR whiteboard as a common communication system. This is a real-time, frequently-updated web application that displays information such as time and location of the procedure, persons involved, etc. We identified all providers involved in cardioversions without prior whiteboard credentials, and they were granted access. Providers can now log in to the application through the University of Washington Clinical Toolkit to update contact information and add comments relevant to the procedure. Prior to this system, a complex phone chain-based on a monthly schedule was the only method of communication used to coordinate day-of events.

OUTCOMES

Our metrics were "number of calls needed to schedule a cardioversion" and "time from order request to anesthesia start time." Due to delays with implementation and systemic structural changes, there has not yet been a trend towards decreased calls or time from order to procedure. However, initial feedback from ordering providers is that the new powerplan is easy to use and helpful to remind providers which issues need to be addressed prior to cardioversion. The cardioversion scheduler is now receiving the order requisitions, and we have received feedback that the process of identifying a cardioversion request and scheduling it is significantly simplified.

CONCLUSION

Inpatient cardioversion, while simple from a technical standpoint, is a complex procedure to schedule and accomplish. Multiple opportunities for improvements in this process were identified, and two projects addressing challenges have been anecdotally effective. However, further work is needed to refine these interventions and to develop new areas of improvement. The lessons learned are helping to further streamline the outpatient cardioversion ordering process

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Just Take Your Meds! A Seattle VA Medication Adherence QI Project

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ABSTRACT

Background: One-quarter of the 7,500 Veterans with a diagnosis of hypertension at the Seattle Veterans Affairs (VA) primary care clinic have systolic blood pressures above recommend guidelines. Using medication possession ratio (MPR) data as an indirect measurement, one-fifth of these same Veterans are non-adherent to antihypertensive agents. Patient non-adherence or non-compliance is a common cause of poorly controlled hypertension. To improve hypertension management, we aim to increase the percentage of male Veterans adherent to antihypertensive medications, as measured by the MPR, by 5% in 6 months.

Methods: With consultation of a multidisciplinary stakeholder group, a detailed flow map of medication processing at the Seattle VA was generated. A failure mode effects and analysis (FMEA) was conducted followed by issuance of a survey to providers assessing knowledge of the current medication system.

Result: The FMEA illustrated multiple failure modes in the medication refill and renewal system resulting in patients not receiving medications. It highlights providers as a keystone in the limited existing control measures. The provider survey had a response rate of 73% (33/45). The majority of providers endorsed statements that were factually incorrect regarding the VA medication refill and renewal process.

Discussion: Providers have a pivotal role in intercepting refill and renewal process, yet many have misconceptions about this process. To address some of these shortcomings, we created a training video about refills/renewals and disseminated it to providers. We also designed a refill/renewal educational handout and distributed it to patients at each clinical encounter. Analysis will involve reassessing provider knowledge and collecting updated MPR data. Future interventions will target structural changes to pharmacy refill/renewal processing.

BACKGROUND

Medication nonadherence is a common cause of poorly-controlled hypertension, which leads to adverse health outcomes.[1,2] Difficulty maintaining a medication supply is one cause of patient nonadherence.[3] The medication possession ratio (MPR) is an indirect measurement of medication adherence and is defined as the number of days a medication is filled over the number of days it is prescribed. A value below 80% strongly correlates with medication nonadherence.[4] Of the 7,500 patients at the Seattle Veterans Affairs (VA) medical center with a diagnosis of hypertension, one-fifth have an MPR of antihypertensive medications below 80%. Among this population, one-quarter have systolic blood pressures above recommended guidelines. In an effort to improve hypertension management at the Seattle VA, we focused on improving adherence to antihypertensive medications. Our first quality improvement cycle focused on helping patients maintain an adequate supply of medication with an aim to increase the percentage of male Veterans adherent to antihypertensive medications, as measured by the MPR, by 5% in 6 months.

METHODS

A multidisciplinary stakeholder group consisting of residents, attending physicians, nurses, and pharmacists was consulted on the medication prescription, dispensing, refill, and renewal systems at the Seattle VA. Process maps were generated detailing the refill and renewal systems (Figures 1 and 2) followed by completion of a failure mode and effect analysis (FMEA).[5] Next, a survey consisting of 17 Likert-like scale questions assessing knowledge of the current refill and renewal system was disseminated to Seattle VA primary care staff physicians, staff nurse practitioners, residents, and nurse practitioner trainees.

RESULTS

The FMEA illustrated multiple failure modes in the medication refill and renewal system at the Seattle VA with risk priority numbers (numeric assessment of risk assigned to a process) of 750 and 800, respectively. Fifteen staff and eighteen trainees responded to the survey with a response rate of 73%. Fifty-seven percent of providers agreed or strongly agreed with statements of confidence in their personal ability to educate patients about the refill or renewal process (Table 1), while only 45% agreed or strongly agreed it was their role on the medical team to do so (Table 2). Ninety-three percent of respondents believed pharmacists educate patients about the refill and renewal process often or somewhat often (Table 3). Sixty-three percent of providers indicated there was an automated refill system (Table 4), while 69% endorsed similar statements about a renewal system (Table 5). Failure to refill medications, forgetting to take medications, and expiration of medications without renewal were the three most commonly perceived barriers to adherence.

DISCUSSION

A thorough understanding of the current state of the medication renewal process led to important insights including recognition of a complex system prone to error. The current refill and renewal system has limited existing control measures and relies heavily on providers to catch medication refill and renewal errors. A survey of frontline physicians demonstrated common but factually incorrect knowledge of the actual process. Per survey results, most providers believe pharmacists counsel patients on how to refill and renew medications, yet this happens rarely since most medications are sent by mail. A majority of providers also indicated automated medication refill and renewal

Table 1. Providers' responses to statement: "I am confident in my ability to educate patients about the refill process"

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
0%	21%	21%	45%	12%
			57%	

Table 2. Providers' responses to statement: "It is primarily my responsibility on the health care team to educate patients about how to refill and renew their medications"

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6%	24%	24%	36%	9%
			45%	

Table 3. Providers' responses to statement: "Pharmacists educate patients about the refill/renewal process"

Never	Rarely	Sometimes	Often	Very Often
0%	6%	36%	48%	9%
		93%		

Table 4. Providers' responses to statement: "Patients are prompted to request a refill when the medication supply end date approaches by an automated calling system"

Never	Rarely	Sometimes	Often	Very Often
36%	21%	24%	18%	0%
	63%			

Table 5. Providers' responses to statement: "Patients are prompted to request a renewal when the medication expiration date approaches by an automated calling system"

Never	Rarely	Sometimes	Often	Very Often
30%	18%	24%	21%	6%
	69%			

systems were in place to assist Veterans, which is inconsistent with the current process.

To address some of these systemic shortcomings, a quality improvement cycle was directed at improving patient and provider knowledge about medication renewals. A patient-centered educational handout regarding how to refill and renew medications was created with input from the multidisciplinary stakeholder team and is now distributed to patients during each primary care visit. In addition, a provider educational video detailing the current refill and renewal system and illustrating panel management techniques was created and disseminated to all providers at the Seattle VA primary care clinic.

Our next step is to re-survey providers following deployment of our educational intervention. We continue to collect clinic-wide MPR data and are monitoring the percentage of Veterans in the Seattle VA primary care clinic with well-controlled blood pressure. Future improvement cycles may involve systemic changes to other components of the refill process.

Figure 1. Diagnosis, prescription, medication fill, and refill process

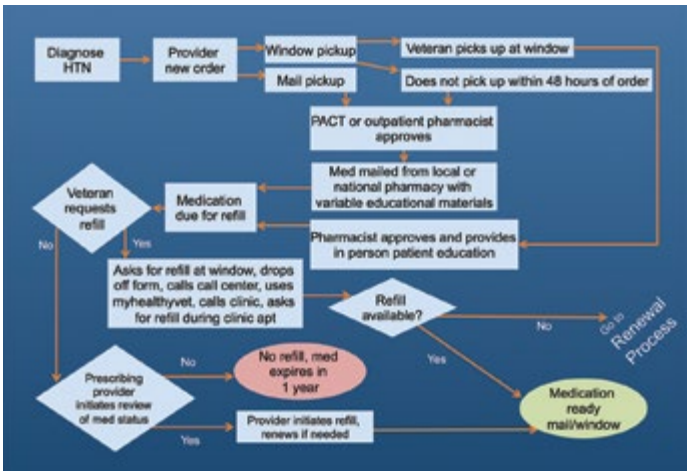
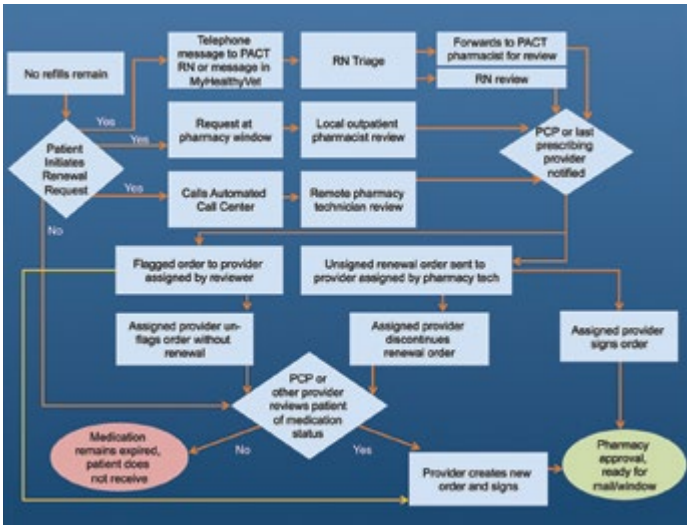


Figure 2. Renewal process



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Appropriate Use of Venous Thromboembolism Prophylaxis in Orthopaedic Trauma Patients with Vascular and Radiographic Studies

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ABSTRACT

Objective: To evaluate venous thromboembolism (VTE) prophylaxis adherence and effectiveness in patients treated by orthopaedic and spine traumatologists who had vascular or radiographic studies showing deep vein thromboses (DVTs) or pulmonary emboli (PEs).

Design: Retrospective review.

Setting: The medical records of patients treated surgically were interrogated using a technical tool that electronically captures thrombotic event data from vascular and radiologic imaging studies via natural language processing between July 2010 and March 2013.

Patients: A total of 476 patients were identified who had undergone vascular or radiographic studies and also underwent operative treatments for orthopaedic injuries.

Main Outcome Measurements: Patients were evaluated for hospital guideline-directed VTE prophylaxis adherence with mechanical or chemical prophylaxis. Patient demographics, associated injuries, mechanism of injury, and symptoms that led to imaging for a VTE were also evaluated.

RESULTS

Of the 476 orthopaedic patients who met inclusion criteria, 100 (age 52.3, SD 18.3, 70% men) had positive VTE studies. 376 (age 47.3, SD 17.3, 69% men) were found to have negative VTE studies. Of the 100 patients with DVTs and/or PEs, 63 DVTs and 49 PEs were found. Eighty-five percent of all patients met hospital guideline VTE prophylaxis standards.

CONCLUSION

The study population had better than previously reported VTE prophylaxis adherence; however, we had a high proportion of patients that developed VTEs. This may be due to inadequate VTE prophylaxis for this select population or low efficacy of VTE prophylaxis among high-risk trauma patients.

INTRODUCTION

Deep vein thromboses (DVTs) and pulmonary emboli (PEs) are widely recognized as potential complications of orthopedic trauma and surgical procedures as well as a major cause of hospital-related morbidity and mortality.[1-3] Contributing factors were classically described over 160 years ago by Virchow and include immobility, venous stasis, induction of a hypercoagulable state, and direct vessel insult.[4] However, prophylaxis and treatment remain difficult. The American College of Chest Physicians' (Evidence-Based Clinical Practice Guidelines regarding prevention of thromboembolic events estimate the occurrence of nonfatal, symptomatic venous thromboembolism (VTE) rates after major orthopaedic surgery as 4.3% (1.5% PE, 2.8% DVT) and 1.8% (0.55% PE, 1.25% DVT) for patients with no prophylaxis and those who received low molecular weight heparin in the cumulative postoperative period of 0-35 days, respectively.[5]

Goal-directed therapies consisting of mechanical and chemical means are the tenets of VTE prophylaxis. Consistently providing prophylactic treatments to patients in the hospital remains difficult. The aim of this study was to evaluate the use of guideline-directed VTE prophylaxis for orthopaedic and spine trauma inpatients.

METHODS

A descriptive retrospective review was undertaken and was comprised of patients between the ages of 18 and 99 who were treated surgically by trauma and spine trauma orthopaedists and who had imaging studies to evaluate for VTE between July 2010 and March 2013. Four hundred and seventy-six patients were identified and their electronic medical records were interrogated using a technical tool for radiographic (Amalga: Caradigm Bellevue, WA) and vascular (Xcelera: Phillips Healthcare Andover, MA) studies that captures thrombotic event data via natural language processing.[6] VTE imaging studies were either venous ultrasound (US) or CT pulmonary angiogram with intravenous contrast.

Demographic information and clinical information were obtained. Significant associated injuries and orthopaedic injury location were broken down into groups. Injury Severity Score (ISS) recorded at the time of admission was collected.[7] Chemical and mechanical VTE prophylaxis dosing and adherence, as well as reasons for withholding therapy were collected from the medication administration record and nursing progress notes.

Institutional chemical VTE prophylaxis medications used included subcutaneous heparin, dalteparin, and enoxaparin, as well as argatroban in the setting of heparin-induced thrombocytopenia. Mechanical VTE prophylaxis was provided via sequential compression devices. Chemical VTE prophylaxis dosing was adjusted per institutional guidelines. VTE prophylaxis administration was compared to institutionally-set guidelines for appropriate use in the inpatient setting.

RESULTS

Four hundred seventy-six patients were identified to have undergone vascular or radiographic studies and met inclusion criteria. Of those, 100 patients (age 52.3, SD 18.3, 70% men) had positive VTE studies. Three hundred seventy-six (age 47.3, SD 17.3, 69% male) had negative studies. Of the 100 patients with DVTs and/or PEs, there were 63 DVTs and 49 PEs. There was no significant difference in the Body Mass Index (BMI), total length of hospital stay, or hospital day VTE was diagnosed between groups. Older patients had a trend toward an increased risk of VTE with an Odds Ratio (OR) of 1.02 (p=0.039, CI 1.0-1.04).

ISS was available for 283 (75%) patients that had negative VTE studies and 89 (89%) of patients with positive VTE studies. Patients with VTE had higher ISS than those without VTE (24 v. 19.9, p<0.02) (Table 1).

Mechanism of injury, injury location, associated injury(ies), and signs and symptoms that led to the VTE study can be seen in Table 2. The signs and symptoms that led to the most positive VTE studies were desaturations plus tachycardia (22%) and swelling plus pain (18%).

Overall, 85% (406/476) of all patients reviewed met guideline-directed criteria for VTE prophylaxis during their hospital admission. Seventeen percent (70/406) of patients who had positive VTE studies received guideline-directed prophylaxis and still developed a VTE. Ideal uninterrupted chemical VTE prophylaxis was performed in 54% of patients who had a positive VTE imaging study.

Table 1.

Demographics	Negative VTE Study (Group 1) (n=376, 79%)	Positive VTE Study (Group 2) (n=100, 21%)
Average Age	52.3	47.3
Male %	70	69
BMI	29.3	29.2
Length of Hospital Stay (days)	19.1	18.2
Hospital Day VTE Diagnosed	7.3	6.7
Injury Severity Score (ISS)	24	19.9***

*** p<0.05

DISCUSSION

In our study, we focused on a small portion of the trauma population who were treated surgically by orthopaedic surgeons and had signs or symptoms that were concerning for VTE, which led to further evaluation with imaging studies. To our knowledge, no other studies have examined adherence to institutional guidelines for VTE prophylaxis, specifically for orthopaedic trauma patients. We found that, among all patients who followed guideline-directed VTE prophylaxis, a significant portion (17%, 70/406) still had a VTE event. Further, despite ideal uninterrupted chemical VTE prophylaxis 11% (54/476) of patients who underwent evaluation had a VTE event.

In our study, we also found a significantly higher rate of VTE adherence in the inpatient setting than was previously reported by Schleyer et al.[8] Their group reported a 41% adherence in surgical patients and we found an 85% adherence in our study population.

The risk factors found to be associated with VTE occurrence were previous history of VTE (OR=15) and higher ISS. Older age trended toward significance with VTE occurrence eliciting an OR of 1.02; however the confidence interval included 1. We did not see a significant difference in the rate of VTE in patients with a higher BMI as has previously been published.[9-11]

We had a high number (36%) of patients with isolated upper extremity injuries who developed VTE. Other high risk injury locations included the pelvis, spine, and lower extremity. Current literature supports that spine and pelvis injury patients are at high risk for developing VTE and should receive some form of VTE prophylaxis.[12-19] However, guidelines on VTE prophylaxis in upper extremity trauma and surgery are poorly defined. Our study would suggest that these patients may need some form of prophylaxis during their hospital stay.

CONCLUSIONS

Despite guideline-directed and ideal therapy, VTEs still occur in this patient population. Efforts should be made to define why VTE prophylaxis is being withheld to assist with appropriate clinical decision-making, charting, and patient safety. Patients and families should be made aware about the possibility of developing a VTE after their traumatic event.

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Table 2.

Signs and Symptoms	Total # of Patients (n=476) (% of all patients)	% of Group 1 Patients from all patients	% of Group 2 Patients from all patients
Desaturations	108 (23%)	93 (25%)	15 (15%)
Tachycardia	42 (9%)	28 (7%)	14 (14%)
Desaturations, Tachycardia	84 (18%)	62 (16%)	22 (22%)
Swelling	76 (16%)	61 (16%)	15 (15%)
Pain	37 (8%)	29 (8%)	8 (8%)
Swelling, Pain	111 (23%)	93 (25%)	18 (18%)
Other	17 (4%)	10 (3%)	7 (7%)
Pain, Tachycardia	1 (0%)	0 (0%)	1 (1%)

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Improving Cardiac Stress Testing

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BACKGROUND

Stress testing is an important part of the evaluation of a patient with concern for cardiovascular disease. An exercise stress test may be performed for the following reasons: to aid in the diagnosis of significant coronary artery disease, for prognosis and treatment assessment in patients with known coronary artery disease, and for determination of exercise capacity. However, the ordering provider may often be confused which is the best test to order for each patient, resulting in delays and inappropriate testing. In addition, exercise stress testing requires trained personnel including a qualified monitoring provider or a registered nurse, an electrocardiogram technician, and an Advanced Cardiovascular Life Support-trained physician, for emergencies. It is also complicated to schedule these procedures. If imaging is required, specific equipment and personnel trained to obtain echocardiographic or nuclear images are also required. The American College of Cardiology has guidelines for performing stress tests and specifies the indications and absolute and relative contraindications; however, interpretation of these guidelines varies among providers. There is variability regarding how to report findings and no formal procedure for following up on positive results. The three aims of this project were: 1) update and standardize the stress testing protocol across UW hospitals, 2) educate key providers and nurses on ordering the appropriate test, as well as administering the test correctly, and 3) improve workflow of online and paper orders (ORCA, Epic, and ER paper forms).

METHODS AND RESULTS

The first step in a quality improvement project is stakeholder buy-in. We interviewed key personnel in the echocardiography and nuclear medicine lab, including the front desk personnel and schedulers, EKG technicians, nurses, fellows, and attending cardiologists. From this, we created a process map that described the work flow from ordering the test to performing the test and reporting the results. We identified a few problems with the process. First, the ordering process is confusing. Based on where the initial referral is placed, there are two different electronic medical records that may be used (Epic vs. ORCA) or, in the Emergency Department, a paper copy order is faxed. Second, many providers who administer the test lack knowledge about the standard operating procedure.

To address the first, we created a stress test algorithm to help providers order the correct test. To address the second problem, we created a user-friendly checklist that explains the protocol and indications/contraindications to stress tests and includes criteria for discharge from the stress testing lab. These materials will be distributed to providers ordering the tests and staff members working in the lab and displayed on posters in rooms used for stress testing. Finally, we created an in-service training for cardiology fellows, advanced practice practitioners, and registered nurses to explain the standard operating procedure for cardiac stress testing. There will be a pre- and post-test before and after the training session.

This project is still in progress. We are currently updating and standardizing the stress testing protocol and plan to implement it in the Winter 2017. A small test quantity of posters has been printed. We will survey the personnel administering the test to obtain feedback on the new posters in order to make changes before widespread distribution of the posters in Winter 2017. We will also schedule the in-service training session during a one-hour tutorial session with a 20-question pre- and post-test that assesses knowledge and comfort with supervision of stress tests in Winter of 2017.

The interventions described above were focused on the Cardiology Department, which allowed us to investigate ordering problems throughout the UW health system. We found that most inpatient orders are generally accurate because there is a PowerPlan in ORCA that is easy to use and guides the provider on how to order the correct test. However, we found that it is difficult to order the correct test in Epic, which is the ordering system used in the outpatient setting. Because Epic test referrals are processed in a complex way, it was challenging to obtain data on which type of studies were requested and whether the ordered tests were completed. Despite these limitations, using our clinical data repository (Amalga), we were able to query simple data on the outpatient referral source for most cardiac stress tests (excluding cardiology clinic) at UWMC, as well as types of outpatient cardiac stress tests at Harborview Medical Center (Table 1). This data will be integrated into a larger effort to improve imaging orders for the organization.

CONCLUSION

Cardiac stress testing is an important diagnostic test used in the evaluation of patients with cardiovascular disease. There is a high volume of patient referrals for stress testing within the UW system.

Table 1. Completed and no shows for outpatient cardiology stress testing at Harborview Medical Center in April and May 2016

Visit Type Name	April 2016			May 2016		
	Completed	No Show	% No Show	Completed	No Show	% No Show
Bicycle Ergometry Echocardiogram	4	1	20%	5	0	0%
Bruce Protocol Treadmill	10	1	9%	13	0	0%
Dobutamine Stress Echo	13	1	7%	10	3	23%
Treadmill Myoview	1	1	50%	1	1	50%
Treadmill Stress Echo	21	8	28%	24	4	14%
Total	49	12	25%	53	8	15%

Although this QI project is still in progress, preliminary data shows a high rate of "no show" visits for patients referred to an outpatient stress test. We hypothesize that this might be partly due to confusion in the referral/ordering process. As a result of this confusion, providers carrying out these procedures often do not have the equipment and staff required. We plan to continue to address these issues by updating and standardizing the ordering process and educating ordering and administering providers.

Acknowledgements

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Reflections: Rowing Through Internship

Pranoti Hiremath, MD, Internal Medicine Resident

Halloween in the Harborview Medical Intensive Care Unit (MICU). I was on call overnight, wearing a headband with droopy bumblebee ears, black and yellow clashing with the somber gray haze of the team room. Thus far, my call nights had torn ten thousand holes through my soul. Each was a devastating routine during which people of great medical mystery would rush in and then die by the next day without a clear cause. On rounds, we would struggle to make sense of it logically; emotionally, there was no making sense of anything. I wondered how many more ghosts I would create this night.

As if in response, a beeping pager sent me down to the ED, where I ran into them – ghosts, and also vampires and witches, their half-costume, half-human bodies splayed over stretchers in terrifying, chaotic angles. Tattered angel wings glistened fluorescently on one side of my patient, while on the other side lay her boyfriend with devil horns. '"The streets of heaven are too crowded with angels tonight,"' I said , and he laughed with me because we both knew that these weren't angels, and this wasn't heaven.

Two more people died the next day, and I pictured myself as Charon, the ferryman rowing a boat across the river Styx toward Hades. Surrounded by ghosts, working and working, unable to look up toward the passengers, unable to change course or row against the tide. I felt completely powerless; I could not find meaning or make a difference. And even if I could change something, would it be enough? Could it ever be enough?

It was a sandstorm of despair but, before the dust of apathy settled in, I fell in love with D and his wife. He was a very old gentleman with a rare but clearly diagnosed oncologic condition with a poor prognosis. He had initially wanted to go home without further therapies, but ultimately chose to pursue advanced diagnostic and therapeutic strategies with seemingly limitless hope for cure. His specialists performed a high-risk lung biopsy before administering novel chemotherapeutic treatment. Although his recovery was long and complex, he improved considerably, providing a spark of hope for his providers and sustained faith in the positive impact of scientific advancement. He winked at me when he left the ICU.

The next morning, he was back on our service, having coded for unclear reasons. All he had wanted, initially, was to go home. What if I had pushed him to see his clinical chances of recovery more realistically, or even to reject such a high-risk procedure given his wish to go home as soon as possible? On the other hand, what if he had survived and gone home without complications? There was clearly no right answer, and I wondered wearily how much I could have changed what had happened. The only thing we could still do was honor his wishes in the moment. With his family, we transitioned him to comfort care. His wife's tears are still on my white coat.

D's death was different. It left a restlessness that lifted me away from sadness alone. I had gone too far by falling in love with his family, with his other providers, with the chance for hope provided by his initial medical course. "There are lovers content with longing. I am not one of them," says Rumi. And so I began to consciously eschew complacency and defeat. I sought to capture my wistfulness and use it as fuel to drive forward days of small victories. It was an advanced emotional recycling in this green city; an electric generator to light up faces with smiles; a sublimation of heaviest iron setbacks into bubbles of progress; a transformer to right the ship toward something better.

In medical training, I think there's an emotional processing that precedes the necessary ability to dream. Indeed, the tide is frequently against us, a relentless siege of challenges beyond our power as individuals: patients making choices that worsen their health; homelessness, poverty, violence, abuse; patients falling through the holes within existing healthcare policies; medical errors, frequently caused by ourselves, whether or not we attribute them to system error; limits of medical diagnostics and therapeutics. And yet, there are the little things that can keep us going: seeing a previously depressed patient smile for the first time; connecting with other providers over a mutual clinical experience; successfully seeing someone recover from treatable illness; finding temporary solutions for patients who cannot access care; fixing systematic and individual mistakes with integrity; helping to bring a conflicted family together in united affection for their loved one. At some point, whether in internship or otherwise, we touch the balance between what we can and cannot change; and only then can we push that boundary, dare to dream further without accepting the status quo, forge on without stopping until we find solutions.

Indeed, the solutions are inspiring. You see medical research advancing practice, care providers making unique efforts to ensure their patients will receive care in spite of the system's failures, leaders motivating their teams to take pride in the practice of medicine. You see it yourself in this journal, with quality improvement initiatives that make an impact beyond individual cases, yielding practical and lasting systems-scale changes.

So we keep fighting through the frenetic days and peaceful sunsets, the bleary nights and hopeful sunrises. To relieve suffering not only in the moment, but also in the future. To not lose confidence from our mistakes, but to find smart ways to prevent them in the future. To not only forgive ourselves and our patients, but to also make each person see the strength in themselves. To not reject the system, but instead join it and change it. To not just follow the rules, but help make them. And to remember that, when we do feel powerless, there is great power all around us and within us.