

INNOVATION AND IMPROVEMENT

Warm Handoffs: a Novel Strategy to Improve End-of-Rotation Care Transitions

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BACKGROUND: Hospitalized medical patients undergoing transition of care by house staff teams at the end of a ward rotation are associated with an increased risk of mortality, yet best practices surrounding this transition are lacking.

AIM: To assess the impact of a warm handoff protocol for end-of-rotation care transitions.

SETTING: A large, university-based internal medicine residency using three different training sites.

PARTICIPANTS: PGY-2 and PGY-3 internal medicine residents.

PROGRAM DESCRIPTION: Implementation of a warm handoff protocol whereby the incoming and outgoing residents meet at the hospital to sign out in-person and jointly round at the bedside on sicker patients using a checklist.

PROGRAM EVALUATION: An eight-question survey completed by 60 of 99 eligible residents demonstrated that 85% of residents perceived warm handoffs to be safer for patients ($p < 0.001$), while 98% felt warm handoffs improved their knowledge and comfort level of patients on day 1 of an inpatient rotation ($p < 0.001$) as compared to prior handoff techniques. Finally, 88% felt warm handoffs were worthwhile despite requiring additional time ($p < 0.001$).

DISCUSSION: A warm handoff protocol represents a novel strategy to potentially mitigate the known risks associated with end-of-rotation care transitions. Additional studies analyzing patient outcomes will be needed to assess the impact of this strategy.

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safety during this transition.^{3–5} However, adverse consequences of end-of-rotation care transition, a more permanent transfer of information occurring when a physician transfers an entire list of patients, often 10–20, to a new oncoming provider, have been less well defined.^{6,7} Increasing evidence suggests this type of transition is associated with higher mortality,^{8,9} yet little standardization exists on best practices to safely perform this difficult and complicated process.

Strategies that improve end-of-rotation handoffs are urgently needed to address this potentially serious gap in clinical care. Given that failures in communication are a leading cause of adverse healthcare events,¹⁰ Solet et al. have suggested “unambiguous, face-to-face communication” between providers at the bedside as a means to ensure effective handoffs. We have defined such bedside rounding and transfer of care as “warm handoffs.” While warm handoffs have been studied and recommended as a quality improvement strategy in nursing literature,^{11–13} its impact on resident physician end-of-rotation transitions is unknown.

Beginning July 2015, the New York University (NYU) Internal Medicine Residency Program implemented a standardized end-of-rotation transition in care protocol utilizing warm handoffs for resident physicians transferring care at the end of their rotations. We hypothesized this new model would decrease communication breakdowns and increase the incoming residents’ knowledge and confidence to assume the care of their patients from day 1 compared to written or verbal sign out alone.

INTRODUCTION

Transitions in care, also termed handoffs, occur when the care of a hospitalized patient is transferred between providers. Shift-to-shift handoffs, which can occur daily such as with overnight coverage or the end of a shift, are linked to delays in diagnosis, increased diagnostic testing, and adverse outcomes.^{1,2} Evidence suggests implementation of structured handoff reform measures may considerably improve patient

SETTING AND PARTICIPANTS

The NYU School of Medicine Internal Medicine Residency is a large university-affiliated residency program in New York City with 168 trainees during the 2015–2016 academic year. House staff rotate at three diverse inpatient training sites: (1) NYU Langone Medical Center-Tisch Hospital, a university-based academic medical center; (2) Bellevue Hospital, a large public hospital and member of New York City Health and Hospitals Corporation; (3) Veterans Affairs New York Harbor Healthcare System, Manhattan Campus. Eligible participants included all post-graduate year (PGY) 2 and 3 residents.

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PROGRAM DESCRIPTION

Prior to July 2015, outgoing residents handed off their inpatient service prior to service change in a non-standardized fashion, typically providing an e-mailed written or telephonic verbal sign out. While residents received training on appropriate shift-to-shift handoffs using I-PASS,⁴ no formal training was done for end-of-service transitions.

In July 2015, a 1-h formal training session was given to all PGY-2/3 residents on how to perform warm handoffs. This training included reviewing evidence showing that patients are at an increased risk for mortality at the time of team transition⁸ as well as program expectations of how and when warm handoffs should be performed. Beginning July 2015, it was expected that the incoming and outgoing PGY-2/3 resident would jointly perform a warm handoff on the day prior to resident switch day for all inpatient medical ward services across all three hospital sites. Interns were not expected to perform warm handoffs nor residents when rotating on and off ICU teams. Otherwise, warm handoffs were the expectation of the program for all other service changes. The warm handoff was expected to include the incoming and outgoing residents meeting face to face at the hospital to transition care including discussing patient's past medical history, history of presenting illness, hospital course, assessment, and plan. Further, residents were expected to jointly round on the sickest patients as determined by the opinion of the outgoing resident. A bedside rounding checklist (Text Box 1) was developed internally to guide the structure of joint bedside rounding to maximize impact and efficiency focusing on elements that are best conveyed while at the patient's bedside such as physical examination findings. An email was sent by a Chief Resident before switch days reminding residents to perform warm handoffs on the day prior to switch day along with a bedside rounding checklist that was introduced at the formal training session (Text Box 1). All PGY-2/3 residents rotate services every 2–4 weeks on the same day of the week.

Text Box 1: Bedside Rounding Checklist.

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- A. New symptoms overnight
 B. Same day discharge plans, complicated discharge plans, social barriers to discharge or care
 C. Physical examination with attention to:
 i. Invasive equipment (Foley, CVC, rectal tube, vent, PICC, PEG)
 ii. Pain
 iii. Altered mental status
 iv. Neuro deficits
 v. Volume status
 vi. Skin/cellulitis findings
 vii. Wounds
 viii. Acute abdomen
 ix. Post-procedure
 x. Increased work of breathing or wheezing

Abbreviations legend:

CVC: central venous catheter
 Vent: ventilator
 PICC: peripherally inserted central catheter
 PEG: percutaneous endoscopic gastrostomy tube

PROGRAM EVALUATION

The warm-handoff approach was studied quantitatively using surveys and qualitatively using face-to-face semi-structured open-ended interviews. The mixed-method approach evaluated the implementation rates, impact on perceived patient safety, and resident satisfaction. Qualitative interviews allowed exploration of perceived strengths and weaknesses of the warm-handoff approach and identified possible areas for future improvement.

An eight-question voluntary, anonymous, internet-based survey developed internally was sent to all 99 PGY 2/3 residents in April 2016, roughly 10 months following the start of the intervention. Six residents were randomly selected to participate in face-to-face standardized open-ended interviews that helped to identify underlying factors driving perceptions of patient safety and resident satisfaction. No compensation or incentives were provided for participation. All quantitative data were analyzed using SAS Enterprise Guide 6.1 and SAS 9.4 (SAS Institute Inc., Cary NC). Chi-squared test and Fisher's exact test were used to analyze associations of categorical variables. Ninety-five percent confidence intervals were calculated using binomial confidence intervals.

SURVEY FINDINGS

Sixty of the eligible 99 PGY 2/3 residents completed the survey (60.6%). Survey data for each individual survey question can be seen in Table 1. Survey data showed that at baseline, only 5% of residents signed out in person with 95% using a combination of written and/or verbal sign out to transition care. Following our intervention, 92% of surveyed residents answered that they were performing warm handoffs "half the time" or "almost always" as compared to written or verbal sign out.

The strengths of the warm handoff initiative were demonstrated by an overwhelmingly positive response on a number of survey items. Following the intervention, 98% (95% CI, 95%–100%) acknowledged end-of-rotation transitions were a vulnerable time for patients, and 85% (95% CI, 75%–93%) of residents perceived warm handoffs to be safer for patients than written/verbal handoffs. In addition, 87% (95% CI, 78%–95%) of residents also reported an improved knowledge and comfort level of their patients on day 1 of a new rotation. Although 75% (95% CI, 58%–85%) of residents reported spending an extra hour or more to perform a warm handoff, 88% (95% CI, 80%–95%) felt that warm handoffs were a worthwhile use of their time. Perception of improved patient safety was associated with residents' improved sense of preparedness ($p < 0.001$) as compared to prior handoff techniques and residents' perception of warm handoffs as a worthwhile intervention ($p < 0.001$).

QUALITATIVE FINDINGS

During semi-structured interviews, all participants ($n = 6$) cited the ability to see patients in person as a major advantage of

Table 1 Survey Results Assessing Warm Handoffs

	Number of responses	% response	Nominal 95% confidence interval (CI)
End-of-rotation transitions a vulnerable time for patients			
No	1	2%	(0%–5%)
Yes	59	98%	(95%–100%)
Sign out methods before warm handoff			
In person at the bedside	2	3%	(0%–8%)
In person at the hospital	1	2%	(0%–5%)
Verbal	11	18%	(5%–28%)
Verbal and written	40	67%	(48%–78%)
Written	6	10%	(2%–18%)
Number of patients rounded on during warm handoff			
0–2	3	5%	(0%–12%)
3–6	23	38%	(22%–50%)
7–10	21	35%	(18%–47%)
>10	13	22%	(8%–32%)
Current frequency of participation in warm handoffs			
Almost never	5	8%	(2%–17%)
Half the time	23	38%	(27%–50%)
Almost always	32	53%	(40%–67%)
Warm handoffs safer for patients compared to written/verbal sign out			
No	9	15%	(7%–25%)
Yes	51	85%	(75%–93%)
Improved knowledge and comfort level with patients using warm handoffs			
No	7	12%	(5%–20%)
Yes	52	87%	(78%–95%)
(Missing)	1	2%	(0%–5%)
Amount of extra time required for warm handoffs vs. prior sign out time			
No additional	3	5%	(0%–12%)
30 min extra	12	20%	(7%–30%)
1 h extra	30	50%	(32%–63%)
More than 1 h extra	15	25%	(10%–37%)
Assuming warm handoffs take extra time, warm handoffs still worthwhile			
No	7	12%	(5%–20%)
Yes	53	88%	(80%–95%)

warm handoffs. Several residents spoke of the importance of seeing a baseline examination for stroke patients, encephalopathy patients, or medically complex patients. Bedside rounding also helped remind outgoing residents of important findings that would not have otherwise been communicated. Half of the respondents reported face-to-face interaction between providers decreased misinformation and improved communication. Examples included use of non-verbal language cues and gestures, active participation (versus passively receiving email), and real-time question and response.

Disadvantages discussed included interruptions during warm handoffs, as warm handoffs occur during and not after the work day ends. Time limitations also prevented residents from conducting a bedside round on every patient.

DISCUSSION

End-of-rotation care transitions are increasingly recognized as a vulnerable time for hospitalized medical patients. While these patients may have 12–34% higher adjusted odds of

hospital death when exposed to this transition,^{8,9} few hospital and medical education systems have standardized a strategy to define best practices for transitioning care during these inopportune times despite recommendations from The Joint Commission and The Accreditation Council for Graduate Medical Education to train residents on communications surrounding shift-to-shift handoff.¹⁴ In this single institution survey study, 98% of surveyed resident physicians felt end-of-rotation transitions placed patients at risk. Warm handoffs at the time of service change between incoming and outgoing upper-level residents represent an innovative approach that may lessen this risk. This intervention clearly changed the way in which residents handed off their service as evidenced by only 5% of surveyed residents indicating they sign out in person at the hospital or bedside at baseline compared with greater than 90% now performing in-person warm handoffs at least half the time following our intervention.

Further, residents perceive warm handoffs to be safer for patients as compared to prior sign out techniques with greater than 85% of respondents citing improved knowledge and comfort level with patients when coming on to a new service using warm handoff. This perceived increase in safety and knowledge of patients following service change is consistent with prior research on shift-to-shift handoff, which has shown decreased adverse events when using a standardized, structured handoff technique.⁴

Qualitative data confirm that the ability to see patients in person is one of the most important aspects contributing to an increased sense of safety and knowledge of the patients, particularly when a patient has a notable physical examination finding or other pertinent finding as noted on the warm handoff rounding checklist (Text Box 1).

Most importantly, residents acknowledge that performing a warm handoff takes additional time compared to verbal or written sign out, yet they believe there is value in spending the extra time it takes to perform a warm handoff. This is particularly striking given that residents work significant hours at baseline and therefore would be less likely to voluntarily devote more of their time toward work than is absolutely required.

There were several limitations to our study that must be acknowledged. First, we were unable to collect survey data on all eligible PGY-2/3's; however, we were able to collect data on over half of all eligible house staff. Second, no monitoring or supervision of warm handoffs took place to confirm the accuracy of house staff-reported answers on how often they performed warm handoffs or how many patients they truly rounded on at the bedside. Further, it is unknown how standardized or similar the warm handoffs were between residents in terms of bedside rounding techniques or information transfer. Despite this, there is little reason to suspect house staff would overestimate their participation or how much time they spent performing warm handoffs. Third, our study was retrospective in nature and looks at only a single residency program. Additionally, both our bedside rounding checklist and survey were developed internally without validation, although

development was guided by resident feedback, previously reported qualitative studies,¹⁵ and from other types of handoff literature.^{2,11–13} Lastly, our study does not look at patient outcomes; thus, there is no way to measure what impact, if any, warm handoffs may have on patient outcomes, which will be important to estimate in future studies.

In conclusion, our study represents a novel strategy that may reduce the risk associated with end-of-rotation service changes. While it is uncertain whether warm handoffs affect patient outcomes, it is clear that residents perceive warm handoffs as a safer way to transition care at the time of service change and rate the exercise as a valuable use of their time. Further studies will need to assess whether this perceived increase in safety translates to safer outcomes for patients.

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare no conflicts of interest.

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