Sustainability and Effectiveness of a Quality Improvement Project to Improve Handoffs to Night Float Residents in an Internal Medicine Residency Program

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Abstract

Background Handoff is the process in which patient care is transitioned from one provider to another. In teaching hospitals, handoffs are frequent, and resident duty hour restrictions have increased the use of night float staff. To date, few studies have focused on long-term sustainability and effectiveness of a handoff quality improvement project.

Objective The objective of our resident-driven quality improvement project was to evaluate the effectiveness and sustainability of a standardized template for handoff quality in a community hospital internal medicine program.

Methods We used a multistep continuous quality improvement approach. Problems in the handoff process were identified through process mapping and anonymous needs assessment of the residents. A group of residents and faculty identified problems during biweekly discussions, created a standardized template, and adopted a new handoff process. We audited handoffs and surveyed residents at 3 and 9 months after implementation to assess effectiveness and sustainability.

Results Before the intervention, only 40% of residents reported regular morning handoff. Using the standardized template, statistically significant, sustained improvements were seen in morning handoff frequency (59% preintervention, 90% at 3 months, 89% at 9 months), along with decreases in unreported overnight events (84% preintervention, 58% at 3 months, 50% at 9 months) and uncertainty about decisions because of poor handoffs (72% preintervention, 49% at 3 months, 37% at 9 months). Statistically significant decreases in missed content (69%–46%) and copy-and-paste behavior (78%–38%) at 3 months were not sustained.

Conclusions We demonstrated sustained improvements in unreported events and uncertainty caused by poor handoffs. Initial improvements in missed content and copy-and-paste behavior that were not sustained suggest a need for ongoing reinforcement and monitoring of handoff quality.

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Editor's Note: The online version of this article contains the handoff signout survey used in this study.

Introduction

With reductions in work hours for resident physicians implemented by the Accreditation Council for Graduate Medical Education (ACGME), there has been a need to improve patient care handoff. The Institute of Medicine committee on resident duty hours recommended that residents receive training on handoffs and that system improvements be undertaken to improve handoffs.[1] ACGME now requires residency programs to ensure residents achieve competency in handoffs.[2]

Night "float" rotations represent an opportunity to improve handoffs, especially given the break in continuity of patient care and high-volume patient coverage by a night float service.[3] Poor communication between residency

trainees during inpatient handoffs can increase uncertainty and threaten patient safety.[4,5] Therefore, improving hand-offs is especially important and timely at present.

Few studies have described long-term sustainability and effectiveness of a handoff quality improvement project in a teaching hospital that uses a night float model of coverage.[6] We hypothesized that a quality improvement approach could be used to identify problems, create solutions, and evaluate long-term effects of an updated handoff strategy. In this study, we evaluated the sustainability and effectiveness of a standardized handoff process in a community-based residency program.

Methods

Mercy Hospital and Medical Center (MHMC) is a 300-bed teaching hospital located in Chicago, IL. The internal medicine (IM) residency program at MHMC has 16 categorical residents in each year. The night float rotation is a 4-week block staffed with 1 intern. The intern provides cross-coverage for a 12-hour period 6 times a week during this rotation. Cross-coverage on the weekend was provided by the day team that is on long-call overnight. MHMC residents use Cerner (Kansas City, MO) electronic health record to perform clinical documentation. The written signout exists outside of the electronic health record (EHR) as a separate Word document (Microsoft, Redmond, WA). To populate the written signout, Mercy residents are able to copy and paste clinical information from the EHR into the Word template.

The quality improvement team that executed this project included 8 residents and 2 faculty members and followed Plan-Do-Study-Act methodology.[7] The group met during interactive biweekly 1-hour discussions. A focus group was conducted to understand the barriers and facilitators to a proper handoff and a process map of the current process of handoffs at MHMC on the night float rotation was created. Attention was paid to various phases of a handoff: (1) pre-handoff (handoff information is organized and updated by sender); (2) arrival (patient tasks are stopped and sender and receiver met to exchange data); (3) dialogue (verbal and visual exchange of data between sender and receiver); and (4) post-handoff period (integration of new data and start of patient care by receiver).[8] Focus was placed on the morning handoff due to concerns that it was not occurring regularly (FIGURE 1).

An anonymous needs assessment survey was created to understand general handoff behaviors, cross-coverage problems, and morning sign-in process, using items from previously published quality improvement handoff projects.[9] These items related to perceived quality of the handoff, such as information later discovered on rounds.

What was known

Use of night float in teaching hospitals has increased the frequency of handoffs, calling for a sustainable solution to improve continuity of care during these transitions.

What is new

Use of a standard template to improve handoff quality in a community hospital-based internal medicine program increased the frequency of reliable handoffs and reduced unreported overnight events and resident uncertainty.

Limitations

Single site study and small sample. Initial improvements in missed content and "copy and paste" behavior were not sustained.

Bottom line

The intervention produced sustained improvements in unreported events and resident uncertainty due to poor handoffs.

Responses were recorded using a 5-point Likert frequency scale from Never to Always (provided as online supplemental material). Survey results were dichotomized to reflect behavior significant to ensuring handoffs were optimized all the time. Answers of "often" and "always" were grouped into "agree," and the other 3 answer options were coded to denote no agreement.

To address problems identified in the process of morning handoff, a new protocol was created that incorporated best practices from the existing literature (FIGURE 2).[10–13] For example, the new process required morning handoff to occur in a dedicated room (resident lounge which has tools to facilitate communication and transfer of care) at a dedicated time (6:30 AM to 7:00 AM).

The survey also revealed "copy-and-paste" problems and the fact that the written signout was often missing pertinent information. A simplified template to address the most fundamental parts of handoffs was created and named "Mercy 10-D." Mercy 10-D included the following elements (TABLE): iDentity (room number, patient's last and first names, age, and sex and medical record number); DNR (do not resuscitate) or other code status; Diet, with particular attention to NPO (nothing by mouth) for procedures; Danger Drugs (allergies); Diagnosis (reason for admission); Diseases (comorbid conditions); Drugs (including deep vein thrombosis [DVT] prophylaxis); Daily Progress and Plan; To Do (for the night float resident to check); Directions (for the night float resident to act upon in the event of patient deterioration or based on results of the To Do things). DVT prophylaxis was emphasized in the Drug section to pair with an existing quality improvement initiative at Mercy Hospital. Later, trainees were educated about problematic behaviors such as copy and paste. The new education strategy taught that, while it was at times
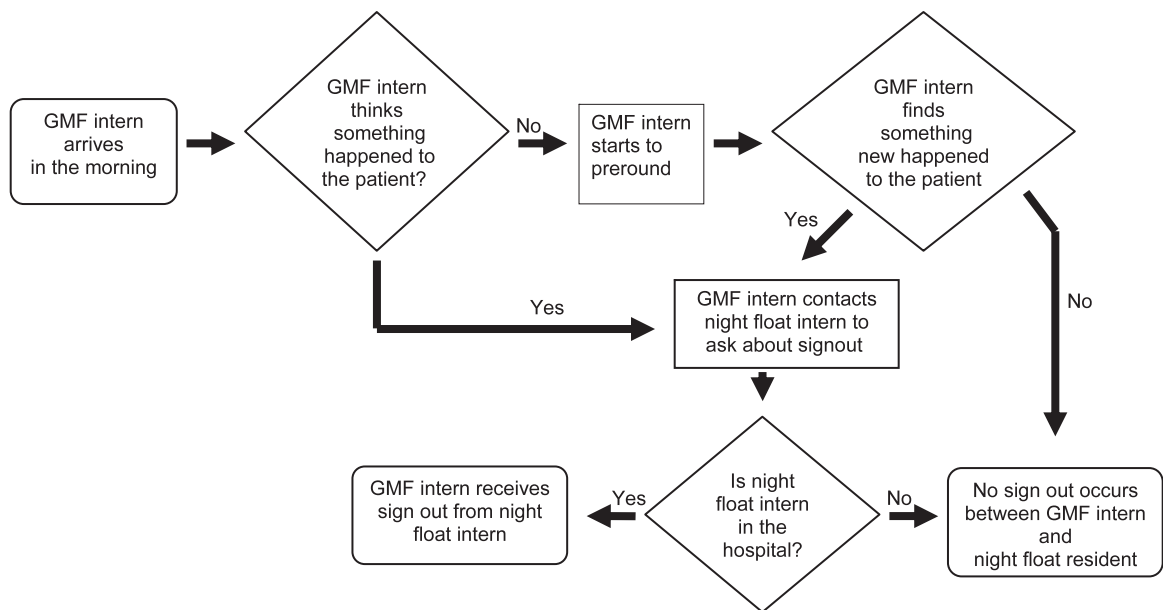
FIGURE 1 | **PREVIOUS MORNING HANDOFF PROCESS**

Illustration of previous Mercy Hospital morning handoff process showing that morning handoff would not happen regularly because of the lack of an organized sign-in process. GMF, general medical floor.

appropriate to copy and paste, the job of the resident would be to copy, paste, and update.

The new handoff process was first unveiled at a designated teaching session in May 2010. All residents were asked to switch to the new process and adopt the new template, and in July 2010, the educational module on handoffs was repeated for the new interns.

To evaluate the intervention, we asked residents to report their perceptions of the handoff process and

written signout quality by using an anonymous survey. On the follow-up survey, residents were asked to report their perceptions of handoff quality based on their last inpatient rotation. Written signout documents were audited to examine whether the 10-D template was in use after the educational sessions and at 3 and 9 months by the resident leader (C.Y.) and chief residents. All interns and residents have experience with handoffs as the night float intern worked only 5 days a week and night
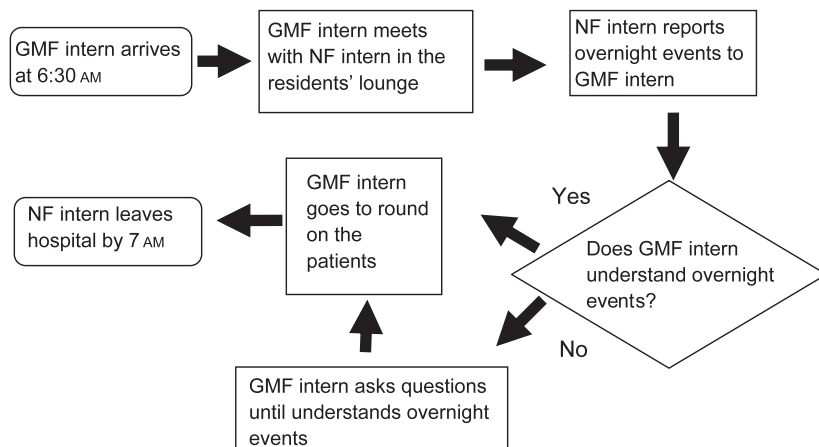

FIGURE 2 | **NEW MORNING HANDOFF PROCESS**

Illustration of new morning handoff process demonstrates a systematic approach to morning handoff process that eliminated the lack of information exchange between general medical floor (GMF) and night float (NF) staff.

TABLE	Mnemonic for 10-D Template
Mnemonic[a]	**Refers to**
i**D**entity	Room number, patient's last and first names, age, and sex and medical record number
co**D**e status	Full code or DNR/DNI
Diet	NPO, full liquids, and other restrictions
Danger **D**rugs	Allergies
Diagnosis	Reason for admission
Diseases	Comorbid conditions
Drugs	Including DVT prophylaxis; highlights important medications
Daily progress/plan	Updates and plans regarding patient's clinical condition
To **D**o	For night float resident to check
Directions	For the night float resident to act on in the event of patient deterioration or based on the results of the "To Do" things; if/then anticipatory guidance

Abbreviations: DNI, do not intubate; DNR, do not resuscitate; DVT, deep vein thrombosis; NPO, nil per os (nothing by mouth).

[a] Mnemonics for the "10-D" template were created as part of a new handoff process. Each "**D**" stands for one of the most fundamental parts of the written signout.

FIGURE 3 | **Final States of Signouts 9 Months Postimplementation of New Signout Process**

Improvements in morning sign in, discovered events, and uncertainty were sustained at 9 months postimplementation of the new signout process. However, missed content and copy-paste behavior were significantly increased at 9 months compared to 3 months, showing only transient improvements ($P < .05$).

coverage on the weekend was provided by the floor teams. Two-sample tests of proportion were used to compare the follow-up data at 3 and 9 months to baseline. All data were analyzed using Stata software (StataCorp, College Station, TX), and a P value of $< .05$ was considered statistically significant.

Results

Sixty-seven percent (32 of 48) of respondents completed the baseline survey, which aimed to identify problems in the handoff process. Postimplementation data were collected from 83% (40 of 48) of residents at 3 months and 98% (47 of 48) of residents at 9 months.

While afternoon handoff was happening as scheduled, only 40% (12 of 32) of residents reported regular morning sign-in during the preintervention period. Furthermore, 84% (27 of 32) of residents reported discovering overnight events that should have been discussed at morning handoff, 72% (23 of 32) reported being uncertain about patient-related decisions due to poor handoff, and 69% (22 of 32) had noted missed content on handoff sheets while performing cross-coverage. In addition, 78% (25 of 32) of residents saw copy-and-paste behavior in handoffs, and 41% (13 of 32) reported inadequate documentation of overnight events in patients' charts.
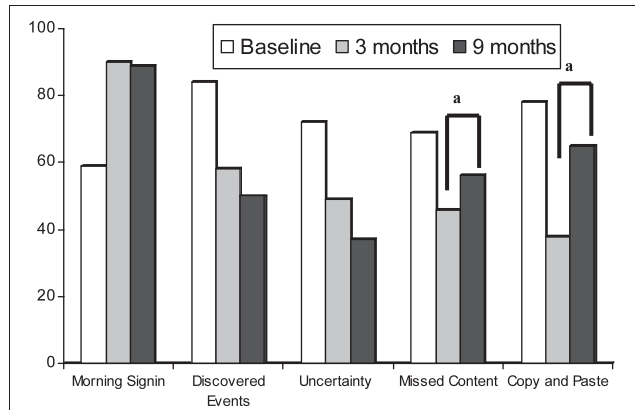
Three months after implementation, a repeated survey revealed improvement in perceived quality of the handoff process. The percentage for residents who reported engaging in morning handoff increased from 59% to 90%. Furthermore, unreported overnight events decreased from 84% to 58%, uncertainty about medical decisions due to poor handoff decreased from 72% to 49%, missed content on written signout sheets decreased from 69% to 46%, and copy-and-paste behavior decreased from 78% to 38% (all $P < .05$). Audit of the written signout sheets by chief residents and resident leaders also showed that all resident teams were still using the Mercy 10-D template correctly.

Nine months after intervention (March 2011), some of the initial handoff improvements were sustained such as the increased frequency of morning handoff (59% preintervention [pre], 90% at 3 months, 89% at 9 months; $P < .05$); decreased reporting of discovering overnight events that should have been communicated during handoff (84% pre, 58% at 3 months, 50% at 9 months; $P < .05$); and decreased uncertainty about decisions due to poor handoff (72% pre, 49% at 3 months, 37% at 9 months; $P < .05$) (FIGURE 3). While statistically significant decreases were reported at 3 months in missed content on written signout sheets (69%–46%, $P < .05$) and copy-and-paste behavior (78%–38%, $P < .05$), these improvements were not sustained at 9 months. Specifically, 56% (27 of 48) of residents reported content was missing from the written signout and 65% (31 of 48) reported copy-and-paste behavior. Audits of written signout at 9 months did demonstrate the Mercy 10-D template was still being used correctly by all teams.

Discussion

Using a quality improvement approach, we were able to identify problems in our handoff process and standardize the transmission of care using handoffs. Despite continued improvement in unreported events, uncertainty during cross-coverage due to a poor handoff, and the implementation of a morning sign-in, some areas continued to remain problematic despite short-term improvements. Specifically, handoffs still had missed content and evidence of copy-and-paste behavior.

Our experience highlights successful implementation of a handoffs quality improvement project with sustained results at 9 months. Quality improvement methods were effective for several reasons. First, the handoff process is easily accepted by the frontline users, the residents. Having resident buy-in to any handoff improvement process is critical to achieve a sustained change. This is important since residency programs may be tempted to use a one-size-fits-all-approach or adopt a program that worked in a different setting, such as the use of the situation-background-assessment-recommendation (SBAR) mnemonic.[14] However, implementing an improvement without customization and ownership may not yield sustainable changes. Second, process maps are especially helpful to understand where current problems lie. Through the creation of the process map, the problem of morning sign-in was identified and corroborated by the needs assessment data. Third, periodic assessment of handoff quality is important since changes may not sustain past a quality improvement intervention.

Through periodic evaluation of handoff practices, we identified problematic areas that required intense intervention. For example, we were not able to sustain improvements in copy-and-paste behavior at 9 months. This is likely due to the ease of using the copy-and-paste feature in the EHR coupled with the lack of oversight and limited time for design and update of handoffs.[15] Given the increase in adoption of EHR and the focus on clinical documentation, programs should continue to monitor resident documentation for copy-and-paste behavior. Solutions to integrate handoffs into the EHR, such as auto-importation of medication lists, may address part of the problem. However, the assessment plans and free text entry needed to provide clinical impressions remains vulnerable to copy-and-paste problems. The problem lies in the failure to update the text, which was likely accurate on the day it was copied and pasted. Another solution could be to employ time stamps for when information was copied, which could serve as an indication of the newness of the data.

Limitations

Our study has certain limitations. Our intervention involved a small sample of IM residents at a single

institution, which limits generalizability. We did not pursue traditional expert validation and cognitive interviewing procedures as it was a quality improvement project rather than a research project. Responders may have interpreted the survey in a different way than authors and there may be variability among responders' answers due to differences in interpreting the questions. While the exact model used in this study may not replicate results exactly, the process of using quality improvement methods to improve handoffs can be repeated elsewhere. Reproducing our results in other venues will be imperative to understanding generalizability. Furthermore, our data was also mostly collected from self-reported questionnaires except for auditing for the use of the written signout template. Last, we were not able to examine patient outcomes.

While outside the scope of an internal quality improvement resident-driven project, future larger studies linking improvements in handoff quality to improvements in patient outcomes are warranted.

Conclusion

As residency programs adopt night float systems to achieve compliance with ACGME duty hour restrictions, examining and improving handoffs is critical. To understand problems in the handoff process and make necessary improvements, a quality improvement approach can be helpful in engaging residents and achieving sustainable improvements in the handoff process. While certain aspects of handoff quality were sustained, improvements in copy-and-paste behaviors were harder to sustain, highlighting the critical need for reinforcement to address such behaviors.

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