

A pilot study to standardize and peer-review shift handoffs in an academic internal medicine residency program

The DOCFISH method

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Abstract

With increased oversight of residency work hours, there has been an increase in shift handoffs, which are prone to medical errors. To date, there are no evidence-based recommendations on essential elements of shift handoffs. We implemented a standardized shift-handoff rubric at an academic medicine residency program. Compliance, resident/faculty perceptions, and surrogate markers of patient safety were measured.

Shift-handoff documents were collected January-February 2016 (control) April-June 2016 (intervention). Signouts were scored based on inclusion of seven elements: Daily events, Overnight events, Code status, Follow up tasks, If/then statements, 'sick or stable' and History present illness. The mnemonic 'DOCFISH' was taught in a grand-rounds forum then embedded into a shift-handoff tool within our electronic health record (EHR). Senior residents were assigned to supervise/provide feedback on shift handoffs from April-June 2016. Faculty and resident perceptions regarding quality of shift handoffs was measured by the annual ACGME (Accreditation Council Graduate Medical Education) program survey.

Patient safety was measured by number of rapid-response teams (RRT) initiated for unstable vital signs. Handoffs were 74% complete in intervention group and 60% in control group ($p < .0001$). Median DOCFISH features present in patients that required RRT was 3 of 7 whereas, total post-intervention group had 5 of 7 ($p < .001$). 'Daily events' and 'follow-up tasks' were less frequent in patients that required RRT (20%, 67% respectively, $p < .001$).

Academic medical centers can implement standardized shift handoffs by embedding high-yield information in an EHR with peer-review. Information during shift changes that may have significant improvement on patient safety includes: 'daily events' and 'follow-up tasks.'

Abbreviations: ACGME = Accreditation Council Graduate Medical Education, CT = computed tomography, DOCFISH = Daily events, Overnight events, Code status, Follow-up items, If/then statements, History of presenting illness, EHR = electronic health record, HANDOFF = Hospital location, Allergies/adverse reactions/medications, Name/Number, DNAR/Diet/Deep venous thrombosis prophylaxis, Ongoing medical/surgical problems, Facts about this hospitalization, Follow-up on?, IRB = Institutional Review Board, 5 Ps = Patient, Plan, Purpose, Problems, Precautions, RRTs = rapid-response teams, SIGNOUT = Sick or Do Not Resuscitate? Identifying data, General hospital course, New events of the day, Overall health status/clinical condition, Upcoming possibilities with plan or rationale, Tasks to complete overnight with plan or rationale, Any questions?.

Keywords: Accreditation Council for Graduate Medical Education, DOCFISH method, medicine, resident, shift handoff, standardized

1. Introduction

The changes to resident work hours enacted in 2003 has lead to a nationwide increase in the number of times a patient's care is handed off in 1 day. With this, breakdowns in communication

during shift handoffs have been implicated as the second most common error found in malpractice claims involving teaching hospitals.^[1] Residents' perceptions of shift handoffs acknowledge that transitions in care are haphazard and education addressing

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handoffs is lacking.^[2,3] The Joint Commission has recommended a standardized approach to shift handoffs^[4] and the Accreditation Council for Graduate Medical Education (ACGME) has integrated this best practice recommendation into programs nationwide by requiring residents to be supervised and taught how to hand off patients during transitions in care.^[5] While some curriculum exists for teaching shift handoffs, few have been able to link a standardized approach to improved shift handoffs with a quantifiable improvement on patient outcomes.^[6] A recent meta-analysis showed that while 94% of studies conducted on shift handoffs focused on patient outcomes, most measured patient outcomes by survey-based tools (70%) with user satisfaction metrics (53%) as the predominant modality.^[7] Currently, there is wide variation in handoff methods, tools, and supervision within different training programs^[8] likely because core elements of an effective shift handoff have yet to be defined.

2. Methods

Situation Background Assessment Recommendation (SBAR), PEDIATRIC (Problem list, Expected tasks to be done, Diagnostic one-liner, If/then, Administrative data/Advanced directives, Therapeutics, Results and other important facts, IV access/Invasive Devices, Custody and Consent issues), HANDOFF (Hospital location, Allergies/adverse reactions/medications, Name/Number, DNAR/Diet/Deep venous thrombosis prophylaxis, Ongoing medical/surgical problems, Facts about this hospitalization, Follow-up on?), the 5 Ps (Patient, Plan, Purpose, Problems, Precautions), and SIGNOUT (Sick or Do Not Resuscitate? Identifying data, General hospital course, New events of the day, Overall health status/clinical condition, Upcoming possibilities with plan or rationale, Tasks to complete overnight with plan or rationale, Any questions?) are all published mnemonics used in pediatrics, emergency medicine, internal medicine, and nursing.^[4,9–13] We derived 7 features common to these mnemonics to create “DOCFISH” specific for medicine resident use. Basic patient demographics including the following: patient name, room number, date of birth, code status and attending of record, as well as the mnemonic (Daily events, Overnight events, Code status, Follow-up tasks, If/then statements, Sick/Stable and History of present illness) were embedded into the shift handoff tool within our electronic health record (EHR). Two senior residents led a department-wide, grand rounds forum reviewing the literature on deaths related to medical errors^[14–16] and how miscommunication during shift handoffs plays a critical role in causing errors.^[16] The presentation also reviewed actual cases in which shift handoffs with minimal information communicated to the night float team resulted in patient harm and/or increased length of stay.

Finally, the DOCFISH mnemonic was introduced to the residents with the expectation that completion of the template prepopulated on the shift handoff tool would be standard practice going forward.

After the grand rounds presentation, PGY-3 residents and/or an attending supervised the shift handoff of the day team to the intern covering from 4 PM to 8 PM. Immediate feedback was given to the resident handing off patients as well as the intern taking over patient care duties. The quality of the shift handoffs was defined by what percent of the handoffs had the DOCFISH information available to the night float intern (covering from 8 PM–8 AM). This percentage was determined by a point system, in which 1 point was allocated if the written handoff had included the information, and 0 points if that information was absent. For example, if the shift handoff included history of present illness, if/then statements, follow-up items, code status, and daily events, the handoff would have been granted 5 of 7 possible points.

At our institution, rapid-response teams (RRTs) are initiated per the early warning system nursing protocol in response to new unstable vital signs or change in the clinical status of a patient.^[17] The protocol uses respiratory rate (breaths/minute), oxygen saturation (%), temperature (Celsius), systolic blood pressure (mm Hg), and heart rate (beats/minute) to calculate a score. If the patient has a score >5 then the RRT is contacted to immediately assess the patient. The bedside nurse is also able to initiate an RRT at his/her clinical discretion, regardless of the patient’s early warning system score (Table 1).

The number of RRTs initiated was used as a surrogate marker of patient safety as this follows a standardized criterion to alert physicians to a patient’s clinical decline. This standardization provides another tool to measure patient safety allowing for hospitals and researchers to quantify changes in quality of care. One question our research attempts to answer is that with improved communication from a shift handoff, will the number of RRTs decrease? We hypothesize that the covering physician would be more familiar with the patient’s hospital course and be more attentive to following up on testing done at night thereby preventing a clinical decline in a patient before an RRT is initiated. The number of code blue(s) defined by advanced cardiac life support protocol was not used as measure of patient safety as these events were too infrequent therefore making it difficult to detect differences in quality of care.

The Institutional Review Board (IRB) of the State University of New York Medical Center at Syracuse, NY, approved this retrospective study. Given the IRB-exemption status, ethics committee approval was not necessary. This study was conducted at a 735-inpatient bed, tertiary academic medical center, and began during the 2015 to 2016 academic year. At that time, there were 100 medicine residents involved and 5659 total patient encounters.

Table 1

Early warning system (EWS) scoring system.

	3	2	1	0	1	2	3
Respiratory rate, breaths/min	≥36	31–35	21–30	9–20			
SpO ₂ , %	<85	85–89	90–92	≥93			
Temperature, °C		≥39	38.3–38.9	36–38.2	35–35.9	34–34.9	≤33.9
Systolic blood pressure, mmHg		≥200		100–199	80–99	70–79	≤69
Heart rate, beats/min	≥130	110–129	91–109	59–90	40–49	30–39	≤29

If the patient’s score determined by the early warning system is greater than 5, then the bedside nurse calls the rapid response team for immediate assessment of the patient.

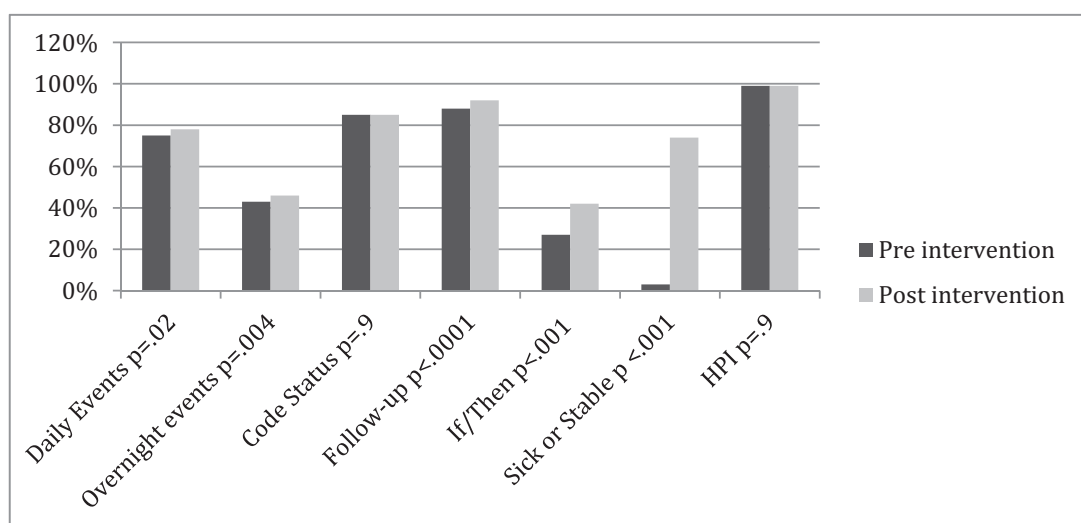


Figure 1. Resident Compliance in Completing DOCFISH Mnemonic During Shift HANDOFF. There were significant changes seen in overnight events, follow-up items, if/then statements, and “sick or stable” elements of DOCFISH (Daily events, Overnight events, Code status, Follow-up items, If/then statements, History of presenting illness) rubric when comparing pre- and postintervention.

3. Results

Our results show more complete shift handoffs were observed after the teaching session, integrating the DOCFISH mnemonic with EHR’s handoff tool and with implementing supervised sign outs. The preintervention data showed that the shift handoff had a mean of $4.5 \pm .9$ components of the DOCFISH mnemonic completed, while the postintervention data averaged 5.5 ± 1.05 ; $P < .001$ components completed. There was also a decrease in the amount of rapid responses initiated per day ($1.05/d$ vs $0.98/d$); however, this was not found to be statistically significant ($P = .345$) due to events being rare ($n = 45$ of 5659 patient encounters) (Fig. 1 and Table 2).

Elements of the handoff that did not show significant differences after intervention included history of present illness and code status ($P = .9$). This correlates with the basic demographic information that comes prepopulated within EHR’s shift handoff tool. It is important to note that the demographic information populated on the template remained the same in pre- and postintervention groups.

In all patients that had an RRT called ($n = 45$) it was found that the median number of DOCFISH features completed was 3 of 7 possible points, vs 5 of 7 possible points in the total number of patient encounters ($n = 5659$; $P < .001$). The 2 features noted to be less frequent in the patients that had an RRT called were “daily events” (79.1% total patients vs 20% RRT group; $P < .001$) and “follow-up” tasks (93% in total patients vs 67% in RRT group; $P < .001$).

Newly admitted patients are particularly vulnerable to errors attributed to shift handoffs due to ongoing diagnostic workup that may overlap shifts. The mean number of DOCFISH features for newly admitted patients was $2.5 \pm .8$ and post 2.7 ± 1.0 ; $P = .001$. While a marginal improvement was observed in the postintervention group, handoffs for newly admitted patients were more often incomplete in comparison to patients that had been admitted for >1 day ($4.5 \pm .9$, 5.5 ± 1.05 ; $P < .001$).

The perceived quality of handoff within the department of medicine by faculty and residents is assessed annually by the ACGME annual program review survey. In March 2016, prior to our intervention, faculty responded on a Likert-based scale how compliant the program was in “residents communicating effectively when transferring clinical care.” Results showed 90% compliance (mean 4.6) in March 2016 and 100% program compliance (mean 4.7) in March 2017, after implementation of our handoff initiative. Prior to the quality initiative, faculty felt that “information [was] not lost during shift changes or patient transfers” 60% of the time (mean 3.6), compared to 73% of the time (mean 4.0; $P < .05$) postintervention. Residents responded to the same question with 85% compliance in 2016 (mean 3.4) and 90% (mean 4.2; $P < .05$) in 2017. It should be noted the actual residents surveyed differed between the years due to matriculation whereas the faculty surveyed did not.

Table 2
Patient encounters and resident compliance with DOCFISH parameters.

DOCFISH features	Pre [N = 2909(%)]	Post [N = 2750(%)]	P
HPI	2898 (99%)	2739 (99%)	.9
Sick or stable	86 (3%)	2029 (74%)	<.001
If/Then	792 (27%)	1154 (42%)	<.001
Follow-up	2553 (88%)	2544 (92%)	<.0001
Code status	2482 (85%)	2349 (85%)	.9
Overnight events	1244 (43%)	1280 (46%)	.004
Daily events	2193 (75%)	2147 (78%)	.02

Exact percentages of patient encounters and resident compliance pre and post intervention.

4. Discussion

The combination of using an electronic shift handoff tool embedded with the DOCFISH mnemonic, handoff-communication training, and resident (and or faculty) supervision provided more complete and standardized handoffs. This is consistent with data from a multicenter trial that also used memory aids for oral/written handoffs, communication workshops, and faculty supervision.^[18]

The information that may have the most benefit to the covering resident is events that occurred during the day and follow-up tasks. This is of particular importance because while current literature may recommend a mnemonic to assist in standardizing shift handoffs, none has gone as far as to recommend what information about the patient should be standardized. The DOCFISH method for improving resident shift handoffs also provided insight into what information may have the most impact in preventing a patient from having a clinical decline requiring initiation of an RRT. This finding became apparent when comparing the shift handoff of all the patients who had an RRT initiated and finding a statistically significant absence of information when it came to follow-up tasks and events occurring during the day. This is clinically applicable in scenarios in which early detection of a disease and intervention may impact patient outcomes. For instance, following up computed tomography (CT) angiogram of thorax to rule out pulmonary embolus, or CT head to rule out stroke. Documenting follow-up items in the shift handoff may also be important when serial testing is required. An example includes patients who present with a gastrointestinal bleed and require complete blood counts to be trended. Another is of patients who present with acute coronary syndrome and require troponin levels to be trended throughout the night. If testing such as this is not followed up in a timely manner then the night float provider may miss an opportunity to intervene on a patient with an impending clinical decline.

An essential component of standardizing our shift handoff was embedding the mnemonic into our EHR's shift handoff tool. The beneficial effects being 2-fold: eliminating the need to memorize all components of the mnemonic and assisting with compliance. Supervision was also imperative to compliance in the early initiation of our intervention. At the time of this submitted manuscript, our residents continue to practice our standardized shift handoff techniques despite less supervision (now residents are supervised once weekly).

This study was limited because it was not powered to detect differences in RRTs; however, Mann–Whitney *U* test did identify significant differences in how complete the handoff was in patients who required an RRT. Future research should focus on a greater sample size of RRTs captured by a longer observational time.

One limitation of our study is the short interval follow-up of our postintervention data that do not measure long-term enduring outcomes. To maintain the quality of our handoff process over time, each incoming intern class is educated on the DOCFISH method. In addition, we have continued to provide supervision and feedback on the quality of signouts by having the supervising resident or attending complete a graded rubric.

An independent survey tool by the ACGME suggests that residents and faculty perceive improvement in the quality of shift handoffs after implementation of our initiative. This was an important finding because the change in standardized handoffs was acknowledged by residents and faculty throughout 2 academic years (2015–2016 and 2016–2017). Future studies

may also benefit from using the ACGME program review survey to detect changes in resident/faculty perceptions after implementing changes to improve shift handoffs. This survey is required for all ACGME-certified residency programs and provides valuable information about the program's culture surrounding patient safety. Moreover, these results are easily comparable across academic years and residency programs.

There have been challenges in implementing our standardized shift handoff techniques at a program of our size (2015–2016 resident class = 100, 2016–2017 resident class = 124). Most challenges were seen in attempting to change the habits of residents in their 3rd year while simultaneously teaching new skills to residents in their 1st and 2nd years. With continued handoff communication workshops presented to each incoming class, this challenge is now minimal.

5. Conclusion

The DOCFISH handoff tool provides internal medicine residency programs a guide to implementing a standardized shift handoff. This was done with minimal cost (faculty's time in supervision) and disruption to the workflow already in place. The findings support that standardized shift handoffs can be taught and can create a cultural change among residents and attendings with the continued use of templates and supervised handoffs. A standardized shift handoff with a constant focus on improving patient safety can ensure that errors attributed to exhaustion from longer shifts are not replaced by errors due to haphazard and incomplete signouts.

Further research on shift handoffs should focus on quantifiable markers of patient safety with special attention to the number of times a rapid response is initiated. While surrogate markers of patient safety have been notorious for not matching the effect of the outcome in question,^[19] the number of rapid response initiated has promising insight as these protocols are based on objective evidence of a patient's acute clinical decline. The findings from the DOCFISH method suggest a link between the number of rapid response initiated and the information that is transferred during a shift handoff. Research focusing on exactly what information has the most impact on making transitions of care safer would be beneficial.

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