Transfers of Patient Care Between House Staff on Internal Medicine Wards

A National Survey

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Background: Transfer of responsibility for patient care between physicians is a key process in the care of hospitalized patients. Systems of transfer management and transfer frequency may affect clinical outcomes.

Methods: To characterize the systems by which patient information is transferred ("signed out") between resident physicians in internal medicine residency programs and to determine the impact of recently enacted resident work-hour regulations on the frequency of transfers, we mailed a self-administered survey to chief residents at 324 accredited US internal medicine residency programs outside of New York State. The main outcome measures were sign-out practices, skills training, and transfer frequency.

Results: Surveys were returned from 202 programs (62%). Transfer systems varied among and within institutions: 55% did not consistently require both a written and an oral sign-out at transfers of care, 34% left sign-out to interns alone, and 59% had no means of informing nurses that a transfer had taken place. In addition, 60% of the programs did not provide any lectures or workshops on sign-out skills. After work-hour regulations were instituted, transfers of care for a hypothetical patient increased by a mean of 11% (from 7.0 to 7.8 transfers; *P*<.001) during a Monday-Friday hospitalization. A member of the primary team was in the hospital for 47% of the hospitalization.

Conclusion: Although transfers of care are increasingly frequent, few internal medicine residency programs have comprehensive transfer of care systems in place, and most do not provide formal training in sign-out skills to all residents.

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TRANSFERS OF CARE ARE events that are particularly susceptible to communication failure, as important information may be "lost in transition" between physicians.[1] This is a critical issue for patient safety because communication failure is one of the most common root causes of medical error.[2-7] Indeed, discontinuity of care has been associated with adverse clinical outcomes in the outpatient setting.[8-13] In hospitalized patients, adverse events can result even from relatively short-term transfers of care between physicians. Poor sign-out practices have been explicitly linked to adverse events.[7] Overnight residents are more likely to make preventable medical errors when caring for patients briefly transferred to them than when caring for their own patients.[14] Likewise, in-hospital complications,[15] length of stay,[16,17] and inpatient laboratory orders[17] are increased in patients subject to more handoffs of care. As several recent case reports[18-20] illustrate, repeated transfers can occasionally have disastrous consequences.

Although each transfer of care creates an opportunity for error, practitioners routinely bridge these gaps in continuity through a variety of means, improvised and formalized.[21] Systems of transfer and communication between hospital physicians have been shown to reduce information loss and improve resident satisfaction and patient outcomes.[22-27] Consequently, the Joint Commission on Accreditation of Healthcare Organizations has made "a standardized approach to 'hand off' communications" one of its new National Patient Safety Goals for 2006.[28] However, transfer management in US hospitals has never been characterized on a national level, and it is unknown whether standardized approaches are in place.

Recent policy changes may have made the need for safe and effective transfers even more pressing. The Accreditation Council for Graduate Medical Education instituted regulations in July 2003 limiting resident duty hours.[29] Many physicians have expressed concern that physicians working fewer hours would have to turn over care of their patients to col-

leagues more often, increasing the number of transfers.[30-34] However, data on actual changes in transfer rates are lacking. The purpose of this study, therefore, is to describe the management of transfers of care in internal medicine residency programs across the nation and to investigate changes in transfer rates since work-hour regulations were implemented.

METHODS

PARTICIPANTS

We identified all 386 Accreditation Council for Graduate Medical Education–accredited internal medicine residencies by searching FREIDA (the Fellowship and Residency Electronic Interactive Database). We excluded the 60 New York State residency programs because New York had been subject to more stringent regulations since 1989.[35] Two additional programs were excluded because they were not active before 2003. The final eligible study population thus comprised 324 programs. Information on program size, geographic region, and practice setting for the study sample was obtained from FREIDA and the Accreditation Council for Graduate Medical Education Web site; however, information on practice setting was missing for 69 programs. We used FREIDA criteria to define program size as a categorical variable with 3 levels based on number of residents (<30, 30-50, >50), geographic setting as a categorical variable based on US Census regions, and practice setting as a categorical variable with 5 levels (university based, community based and university affiliated, community based, military, and other). Practice setting was defined based on the primary institution served by the residency program.

We addressed the survey to "chief resident, internal medicine" at the program's main institution only, and we asked for 1 response per program. We surveyed chief residents because they had administrative expertise and first-hand experience of any changes, having been residents before and after the institution of work-hour regulations. The Yale Human Investigation Committee approved the study and granted a waiver of signed informed consent to preserve the anonymity of the respondents.

SURVEY

The survey instrument was created by the study investigators and was pilot tested for clarity and content by 15 physicians, including 6 who had recent experience as chief residents. The final questionnaire included sections on workload, education, and transfers of care. This article describes the results of the transfers of care portion of the survey.

We defined a transfer of care as a time at which immediate responsibility for a patient was passed from one physician to another, excluding short-term transfers between team members, such as for clinic coverage. Four multiple-choice questions examined systems of transfer for ward patients: the mechanism of sign-out (oral, written, or bedside rounds), the format of written sign-out, the personnel participating in the sign-out, and the means of informing staff that a transfer had taken place. One multiple-choice question assessed whether programs provided sign-out training by inquiring about the presence of a lecture or workshop on sign-out skills, supervision of oral sign-out by a chief resident or attending, or review of written sign-out by a chief resident or attending.

Four questions each assessed the number of transfers of care and hours a member of the primary care team was in-house to care for the patient, before and after work-hour rules were instituted. For these questions, the chief residents were asked to determine the number of transfers and hours of primary care team coverage for a hypothetical patient admitted Monday morning at 7 AM and discharged Friday morning and again for a hypothetical patient admitted Thursday morning at 7 AM and discharged Monday morning. We chose a 4-day period because it most closely approximated the typical call cycle for residents and the typical length of stay for teaching hospital inpatients.[36] The questionnaire also assessed the number of float rotations assigned to each residency class before and after work-hour regulations were introduced. A float rotation is one in which an intern or resident is assigned to care for patients of a team when that team is not in the hospital, either during the day or at night.

Questionnaires were mailed in March 2005 and re-sent twice at 2-week intervals to nonresponders. After the third mailing, the principal investigator (L.I.H.) contacted any remaining nonresponders by telephone. When we received more than 1 response from a residency program, we included only the more complete questionnaire or, if equally complete, the first received. The survey could be completed on paper or online. A lottery for a $100 Amazon.com gift certificate was a financial incentive for participation.

STATISTICAL ANALYSIS

Differences between respondents and nonrespondents were analyzed using χ^2 tests. Changes in number of transfers and hours of primary care team coverage were calculated using paired t tests. We used descriptive statistics to describe methods of transfer. Because we hypothesized that larger programs might have more resources to devote to sign-out, and because our experience was that float rotations increased transfers, we also prespecified analyses by program size and by the addition of float rotations. We defined programs that added float rotations as those that increased the number of float rotations after work-hour regulations were instituted. For these analyses, we used Fisher exact tests to compare sign-out systems and t tests to compare the number of transitions and hours of primary care team coverage. An $\alpha = .05$ was used for assessing statistical significance; all statistical tests were 2-tailed. We performed all statistical analyses using SAS version 9.1.2 (SAS Institute Inc, Cary, NC).

RESULTS

Surveys were completed by 202 (62%) of the 324 eligible residency programs (online by 38% and on paper by 62%). There were no statistically significant differences in demographic characteristics between respondents and nonrespondents (**Table 1**).

SYSTEMS OF TRANSFER

Most respondents reported always providing either an oral or a written sign-out during transfers of care (**Table 2**). However, fewer respondents (45%, 85/188) required both methods at all times. Interns alone participated in the sign-out process in 34% (66/194) of the programs, whereas residents were present in 30% (59/194) of the programs. In 14% (28/194) of the programs, interns and residents signed out to each other separately.

Most programs with written sign-outs used low-technology formats: 29% (54/184) were handwritten and 45% (83/184) were typed into a text program. Fourteen percent (25/184) of the programs used a Web-based or clinical information system–based sign-out, and just 7% (13/184) imported clinical information directly into the

sign-out. Five percent (9/184) reported other or multiple formats.

Most respondents reported no explicit means of notifying staff that a transfer had taken place. That is, in 59% (114/194) of the programs, staff members determined whether the primary care team or the covering team was responsible for a patient based on the time of day alone. Only 14% (28/194) of the respondents reported that pages to the primary care team were automatically forwarded to covering staff. An additional 1% (2/194) of the respondents reported that a message was left on the primary care team pager, and 5% (10/194) left an order on the medical record indicating that the primary care team had signed out. Sign-out training was variable among institutions: 40% of the programs taught sign-out skills through a lecture or workshop, 45% supervised oral sign-outs, and 38% reviewed written sign-outs. Residents in 27% of the programs received neither training nor supervision.

Programs that added a float rotation in response to the enactment of work-hour rules (77 of 146) had systems of transfer similar to those that did not. Similarly, program size had no effect on the frequency of oral, written, or bedside sign-outs or the method of informing staff of a transfer. Large programs (>50 residents) were, however, significantly more likely than small programs (<30 residents) to leave sign-out to interns (43% vs 29%; $P=.02$) and were more likely to have technologically advanced forms of written sign-out, such as Web-based sign-outs (18% vs 3%; $P=.04$).

TRANSFERS OF CARE

The number of holdover patients (patients admitted by one physician and then transferred to a different team for ongoing care) increased after work-hour limitations were instituted in 36% (68/189) of the programs. Programs that instituted float systems were more likely to report an increase in holdover patients (55% vs 29%; $P=.007$). However, size of program did not affect the likelihood of a change in the number of holdover patients.

For the hypothetical patient admitted to the hospital Monday morning and discharged Friday morning, the number of transfers increased 11% after the initiation of work-hour limitations, and hours of primary care team coverage declined 8%. Specifically, transfers increased by a mean of 0.8 transfer (95% confidence interval [CI], 0.6-1.1 transfers; $P<.001$), from 7.0 to 7.8 transfers, and primary care team coverage declined by 3.8 hours (95% CI, −5.0 to −2.6 hours; $P<.001$), from 48.6 to 44.8 hours. Primary care team coverage after work-hour regulations were instituted thus comprised 47% of the 4-day hospitalization. The distribution of changes in transitions was asymmetrical: 32% of respondents noted increases in transitions during a typical 4-day hospitalization, whereas only 4% reported a decrease.

Programs that added a float rotation, however, saw a mean increase of 1.7 transitions of care from Monday to Friday (95% CI, 1.2-2.3 transitions; $P<.001$), and those that did not (61 of 132 programs) saw a mean increase of 0.2 transition (95% CI, 0.0-0.5 transition; $P=.06$). The difference between the 2 groups was statistically significant ($P<.001$). Similarly, hours of primary care team coverage decreased by 6.7 hours during the 4-day period (95% CI, −9.3 to −4.2 hours; $P<.001$) in programs that added a float rotation, whereas hours of primary care team coverage decreased by 2.2 hours (95% CI, −3.2 to −1.2 hours; $P<.001$) in programs that did not. The difference between the 2 groups was statistically significant ($P=.002$). There were no statistically significant differences in the number of transfers or hours of primary care team coverage between programs of different sizes.

Table 1. Demographic Characteristics of Respondents and Nonrespondents

Characteristic	Respondents, No. (%) (n = 200)*	Nonrespondents, No. (%) (n = 124)†	P Value
Size of program			
<30 Residents	44 (22)	32 (26)	
30-50 Residents	68 (34)	44 (36)	.59
>50 Residents	88 (44)	48 (39)	
Setting of program*‡			
University hospital	55 (35)	33 (34)	
Community hospital, university affiliated	64 (40)	37 (39)	
Community hospital	25 (16)	19 (20)	.82
Military hospital	7 (4)	2 (2)	
Other	8 (5)	5 (5)	
Region			
New England	21 (10)	14 (11)	
Mid-Atlantic	28 (14)	20 (16)	
East North Central	40 (20)	26 (21)	
West North Central	15 (7)	5 (4)	
South Atlantic	31 (15)	21 (17)	.19
East South Central	13 (6)	3 (2)	
West South Central	17 (8)	10 (8)	
Mountain	9 (4)	2 (2)	
Pacific	25 (12)	16 (13)	
Territory	2 (1)	6 (5)	

*Excludes 2 programs with missing data.
†Excludes 2 unidentifiable respondents.
‡Data were not available for 69 programs.

Table 2. Frequency With Which Each Method of Sign-out Was Used in 194 Internal Medicine Residency Programs

| Method | Frequency, % | | | |
	Always	Usually	Sometimes	Never
Oral sign-out	66	20	11	3
Written sign-out	63	25	10	2
Bedside rounds	2	2	37	59

For the hypothetical patient admitted to the hospital Thursday morning and discharged Monday morning, the number of transitions increased by 10% and hours of primary care team coverage decreased by 8%. Specifically, transfers increased by 0.6 transition (95% CI, 0.4-0.8 transition; $P<.001$), from 6.2-6.8 transitions, and hours of primary care team coverage declined by 3.4 hours (95% CI, −4.7 to −2.0 hours; $P<.001$), from 43.3 to 39.9 hours. Primary care team coverage thus composed 42% of the 4-day hospitalization after work-hour regulations were introduced.

COMMENT

In this first national assessment of transfer management in residency programs, we found widely disparate methods of transferring care. For example, programs were divided between leaving sign-out solely to interns, requiring interns and residents to sign out together, and allowing residents and interns to sign out separately. Practices often were not systematized even within programs. More than a third of the programs only used written sign-outs "usually" or "sometimes," and nearly as many programs were inconsistent in their use of oral sign-outs. Fewer than half of the programs provided formal sign-out skills training. We also found that the use of technology to aid in the accuracy and transparency of sign-out was rare. Perhaps of most concern, nurses in the majority of programs, nurses were not told that a transfer had taken place, and there was no formal mechanism to forward pages.

The need for effective systems to ensure accurate communication of information between resident physicians is further highlighted by the finding of a significant increase in transfers after the initiation of work-hour regulations. The average patient is now subject to approximately 2 transfers a day and is cared for by a member of the primary care team for less than half of the hospitalization. Although this corresponds to an 80-hour workweek (48% of weekly hours), it is a noticeable drop from the 70% primary care team coverage time described a decade ago.[25] Because patients being cared for by a physician other than their primary care physician are at higher risk for adverse events,[14] this amount of cross-coverage for acutely ill inpatients is concerning. Many programs (36%) also reported an increase in holdover patients (admitted by a night resident and "held over" for the primary care team). These patients may be particularly vulnerable to information loss during transfer to the primary care team.[17,20]

Formal sign-out systems have been shown to improve outcomes. For example, the researchers who demonstrated the dangers of cross-coverage found that much of its adverse effect was mitigated by a computerized sign-out.[25] Formal communication between physicians and between physicians and staff has reduced length of stay.[22] In addition, sign-out templates and computerized sign-outs improve information content,[23,24,26,27] reduce poor sign-out,[24,27] and are preferred by residents to handwritten sign-outs.[26,27] These studies, combined with those from other areas, such as aviation,[37-39] space shuttle mission control,[40,41] nuclear power,[40] and the military,[37] all demonstrate the potential for improvement in sign-out with

system changes. Our work, however, illustrates how far we have yet to go in disseminating standardized and formalized sign-out systems on internal medicine wards. We have no reason, furthermore, to suspect that transfer systems are markedly better in other specialties.

These findings also highlight the unintended consequences that schedule design may have on patient care. Most programs managed work-hour regulations without increasing transfer rates. However, those that added float rotations were more likely to see an increase in transfers. In addition, these were the programs that were most likely to report more holdover patients. We hypothesize that this is because in most night float systems, the night float does not arrive until late in the evening. Therefore, the teams going home for the day usually must sign out to the on-call team, which in turns hands over care to the night float: an extra transfer of care each day. In addition, night float residents often admit patients, who then must be transferred to a different physician in the morning as holdover admissions. Although night float systems have some advantages,[31,42-44] this study is a reminder that they come at the potentially substantial cost of increased transitions.

As with any survey, this study may have been affected by selection bias. However, the reasonable response rate and the similarity between respondents and nonrespondents reduce this concern. Self-report bias, if present, would likely lead to overreporting of formal transfer systems, so our findings may overestimate the prevalence of standardized systems. Conversely, if New York programs have initiated more sophisticated transfer systems, these findings may be overly pessimistic. Yet even with the optimistic assumption of universal adoption of sophisticated systems in that state, the national rate for pager forwarding or information import into the sign-out would be less than a third. Our results also may not completely reflect the practice of transfers in all teaching hospitals because we surveyed only the main hospital served by each residency program. Next, this study was designed to assess the management of sign-outs, not their content or accuracy. Therefore, we did not assess the frequently voiced concern that sign-outs themselves may contain errors.[30,32,45]

We cannot be certain of the accuracy of responses to the potentially confusing determination of the number of transfers in a 4-day call cycle. However, given their administrative position and their experience as residents, chief residents are well-positioned to represent their programs. In addition, the facts that programs that added a float rotation also separately reported an increase in transfers, as expected, and that reported hours corresponded to an 80-hour workweek and to Accreditation Council for Graduate Medical Education survey data[46] add validity to the findings. The calculation of transfer rates does, however, understate the actual number of physician transfers because we excluded short-term transfers (such as between team members for clinic) and those occurring off the medicine service (such as in the emergency department).

Although this study highlights the variety of systems currently in practice, several gaps in knowledge remain. Further research is needed to evaluate the content and quality of sign-out information currently provided, the data that ought to be included in the sign-out, the personnel who should participate in sign-out, and the clini-

cal effects of formal sign-out education, night float, and transfer frequency.

Residency programs have recently made great strides in developing schedules that minimize fatigue and improve resident well-being, but the same attention does not seem to have been paid to transfer management. Possible solutions range from low-technology approaches, such as structuring schedules to minimize transfers and training residents to sign out well, to high-technology methods, such as pager forwarding and computerized sign-outs that automatically incorporate accurate and up-to-date clinical information. However, few of these approaches have been studied systematically. The finding that transfers are frequent and haphazardly managed lends new urgency to the recent recommendation of the Joint Commission on Accreditation of Healthcare Organizations that safe and effective systems of transfer be developed, evaluated, and broadly adopted.

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