Original Investigation | ASSOCIATION OF VA SURGEONS

Distractions During Resident Handoffs
Incidence, Sources, and Influence on Handoff Quality and Effectiveness

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IMPORTANCE Handoffs have significantly increased in number following Accreditation Council for Graduate Medical Education (ACGME) work-hour restrictions. Studies have shown correlations between the number of handoffs and errors/patient harm. Distractions are common during handoffs and may interfere with handoff quality and effectiveness.

OBJECTIVE To examine the frequency of distractions and their impact on handoff quality.

DESIGN, SETTING, AND PARTICIPANTS In this prospective observational study, a total of 214 surgical resident handoffs (residents = 184; Bay area residents [moonlighters] = 30) were observed over 18 months (July 11, 2012-December 19, 2014) by 2 independent observers in 3 teaching hospitals (university, county, and veterans).

MAIN OUTCOMES AND MEASURES Handoff quality (both giver and receiver) was assessed using a standardized scoring system. The number and types of distractions were recorded.

RESULTS Pages were the most common distraction (37.5%), followed by telephone calls (32.8%), residents/medical students (9.3%), talking (5.2%), and noise (4.1%). Distractions from attending physicians, electronics, nursing, consults, and room changes were less common (collectively 11%, each <3%). Distractions were present in 102 resident handoffs (48%) (16% with 1 distraction; 15% with 2; 6% with 3, and 11% with ≥4). Distractions occurred in 54% of junior resident handoffs (mean, 1.4/handoff), 30% of moonlighter handoffs (mean, 0.5/handoff), and 38% of senior resident handoffs (mean, 0.89/handoff) (*P* = .01, junior vs moonlighter/senior). Distractions were more common during evening than morning handoffs (52% vs 36%; *P* = .045) and during team vs individual handoffs (58% vs 44%; *P* < .10). Handoffs without distractions were shorter in length (13.2 minutes without distractions vs 21.5 minutes with distractions; *P* < .001) and minutes per patient (1.78 without vs 2.15 with distractions; *P* = .04). Handoff quality was not diminished by distractions, as measured by handoff giver score (15.41 without vs 15.47 with distractions; *P* = .90) and receiver score (7.42 without vs 7.25 with distractions; *P* = .45).

CONCLUSIONS AND RELEVANCE To our knowledge, this is the largest study of distractions during surgical resident handoffs. Distractions were very common during handoffs; they were more common in the evening when junior residents more commonly performed the handoff and they increased the handoff length. However, distractions did not negatively affect the quality of resident handoffs. This may demonstrate the resilience of surgical residents to distractions.

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Traditionally, surgical training stressed continuity of care; however, in 2003, the Accreditation Council for Graduate Medical Education (ACGME) limited resident work hours to 80 hours per week and this led to increased cross-coverage and increased resident handoffs.[1] In 2011, work hours were further restricted and the number of handoffs increased even further. This increased frequency of handoffs is a potential threat to patient safety. Arora et al[2] interviewed 26 interns after a night on call who noted 25 incidents due to communication failures leading to uncertainty during clinical decision making. One study of 52 surgery resident handoffs found that intern handoffs were often missing vital elements.[3] Similarly, Horwitz et al[4] taped handoff sessions and found 7.5 sign-out-related problems per 100 patient days. A survey of medicine and surgery residents at Massachusetts General Hospital found that 58.3% of residents could identify a patient harmed by handoffs during a recent rotation, of which 12.3% identified this harm as major and 31% rated the handoff quality as "fair or poor."[5] The ACGME now has an increased focus on handoff communication. They mandated that programs "design clinical assignments to minimize transitions in patient care" and "ensure and monitor effective, structured handover processes to facilitate both continuity of care and patient safety."[1]

One concern is that residents are often interrupted or distracted during the handoff process.[6] Distractions can have significant consequences. In aviation, distractions have been found to be responsible for almost half of human error-related accidents.[4] Distractions are known to be common during residency[7,8] and have been reported to be a potential source of error.[9] Recommendations to improve the quality of the handoff process often include minimizing distractions and interruptions,[5,6,10-14] although when surgical residents made suggestions to improve the quality of the handoff, they did not mention distractions or interruptions as a concern.[15,16]

Our group has previously focused on improving handoff communication. We noticed that distractions were common in handoffs but did not know whether distractions influenced handoff quality. In this study, we examined the prevalence and etiology of distractions during surgical resident handoffs and assessed their impact on the length and quality of the handoff process.

Methods

Study Population

Surgical residents at 3 University of California, San Francisco (UCSF) teaching hospitals (Moffitt-Long, San Francisco VA Medical Center, and San Francisco General Hospital) were observed giving and receiving patient handoffs at shift change (evening and morning handoffs). Handoffs were observed on the general surgical service including hepatobiliary (UCSF, San Francisco VA Medical Center, and San Francisco General Hospital), vascular service (San Francisco VA Medical Center), plastic surgery service (San Francisco VA Medical Center), trauma service (San Francisco General Hospital), and trauma intensive care unit (San Francisco General Hospital). Three surgical resident groups were observed: junior residents and year 1 and 2 residents (R1-R2) who were based at UCSF, senior residents and year 3 to 5 residents (R3-R5) based at UCSF, and Bay area residents (moonlighters) and paid physicians who cover night and weekend call. Most moonlighters were year 2 to 4 residents (R2-R4) in the research portion of their residency (Bay area and UCSF). Both team and individual handoffs were observed. Patients were on surgical wards, transitional care units, and intensive care units.

This quality-improvement study was approved by the institutional review boards of the University of California, San Francisco, and the San Francisco VA Medical Center (12-09953). Patient consent was not required based on institutional review board standards for this study.

Measures

Two independent observers (G.A.N. and C.E.A.) observed 214 handoffs over 18 months (July 11, 2012-December 19, 2014). Neither observer participated in the handoff process but did give feedback when it was directly solicited. Handoffs between junior residents and covering residents were accomplished in person. Senior resident handoffs occurred either in person or via telephone. Our institution used the IPASS model[17] to train residents on how to give and receive handoffs. The IPASS Study acknowledges the risks of interruptions, including loss of information and tangents, but also recognizes the benefits, including the opportunity to obtain new information or reframe the shared mental model.[12] The physicians discussed the patients' acuity level, medical/surgical history, active problems, hospital course, and action plan. The observers assessed handoffs for the presence and type of distractions and noted the overall length of handoffs and the number of patients discussed.

Handoff quality was assessed by the observers using a standardized form to assess both handoff giver and receiver quality. We used a Likert scale (1-5, 5 = best) to score handoffs. For physicians giving the handoff, handoff quality was based on inclusion of the first 4 elements in the IPASS mnemonic (I = illness, P = patient summary, A = action list, S = situational awareness) (maximum score = 20). Because the fifth element in the mnemonic (S = synthesis) was not directly controlled by the handoff giver, we did not use this to measure giver quality. Physicians receiving handoffs were scored on engagement and verbalization, which comprised the receiver score (maximum score = 10). This was a modified version of the IPASS faculty observation tool, which is currently undergoing validity and reliability testing.[18] We have previously shown that this modified version could reliably distinguish between a low-quality and high-quality handoff (untrained residents scored lower than trained residents and junior residents scored lower than senior residents regardless of training).[19]

Statistical and Data Analyses

Statistical analysis was performed using analysis of variance or the t test for interval data, and the χ^2 test for variables on a nominal scale (proportions). SPSS version 21.0 was used for statistical analyses; $P < .05$ was considered significant.

Results

A mean of 9 patients (range, 1-28) were discussed per handoff, and handoffs lasted an average of 17 minutes (range, 1-86 minutes). Distractions were present in 102 handoffs (48%) (16% with 1 distraction; 15% with 2; 6% with 3; and 11% with ≥4). The most common distraction sources were pages (37.5%), telephone calls (32.8%), residents/medical students (9.3%), talking (5.2%), and noise (4.1%). Distractions from attending physicians, electronics, nursing, consults, and room changes were less common (collectively 11%, each <3%) (**Table 1**).

Among handoffs observed, handoffs were performed by junior residents in 147 cases (69%), by moonlighters in 30 cases (14%), and by senior residents in 37 cases (17%). Distractions were more common during junior resident handoffs (54%) and less common during moonlighter (30%) and senior resident (38%) handoffs ($P < .001$; χ^2 test). The number of distractions per handoff session was also higher during junior resident handoffs (junior resident handoffs, 1.4 distractions/handoff; moonlighters, 0.5 distractions/handoff; and senior residents, 0.89 distractions/handoff) ($P = .01$, junior vs moonlighter/senior residents; analysis of variance) (**Table 2**).

Table 1. Sources of Distractions During Resident Handoffs

Types of Distractions	No. of Occurrences[a]	Prevalence, %
Pages	129	38
Telephone calls	113	33
Other physician	32	9
Talking	18	5
Noise	14	4
Electronic (eg, text and computer)	10	3
Nurse	9	3
Consult	9	3
Attending physician	7	2
Room change	3	1

[a] Handoffs may contain the same distraction multiple times and, if so, each occurrence was counted.

Distractions were significantly more common during evening (52%) than morning (36%) handoffs ($P = .045$; χ^2 test); and the number of distractions per handoff session was higher in evening handoffs (evening vs morning, 1.4 vs 0.6; $P = .004$; *t* test). Distractions were more common during team handoffs (58%) compared with individual handoffs (44%); however, this difference was not statistically significant ($P < .10$). Distractions were more common among handoffs that occurred in nonclinical areas (52%) rather than those in clinical areas (42%); and the number of distractions per handoff session was also higher in nonclinical areas (nonclinical vs clinical, 1.42 vs 0.89; $P = .03$; *t* test) (Table 2).

Distractions increased handoff length; however, larger services were also more prone to distractions. The number of distractions increased with the number of patients discussed (distractions vs none, 10.6 vs 8 patients discussed; $P < .001$; *t* test). Handoffs with distractions were also longer (distractions vs none, 21.5 minutes vs 13.2 minutes; $P < .001$; *t* test). And the time required per patient (minutes/patient) was also longer for handoffs with distractions (distractions vs none, 2.15 vs 1.78 minutes/patient; $P = .02$; *t* test).

While there was an increase in handoff length with distractions, there was no significant difference in the quality of handoffs when distractions were present. This was the case for both the handoff giver score (distractions vs none, 15.47 vs 15.41; $P = .90$) and handoff receiver score (distractions vs none, 7.25 vs 7.42; $P = .45$). In addition, there was no differences in handoff quality when the data were analyzed by each resident group (junior, moonlighter, and senior) (**Figure**). Similarly, there was no significant impact of IPASS training on resilience to distractions, and the time of academic year did not significantly affect resident resilience.

Discussion

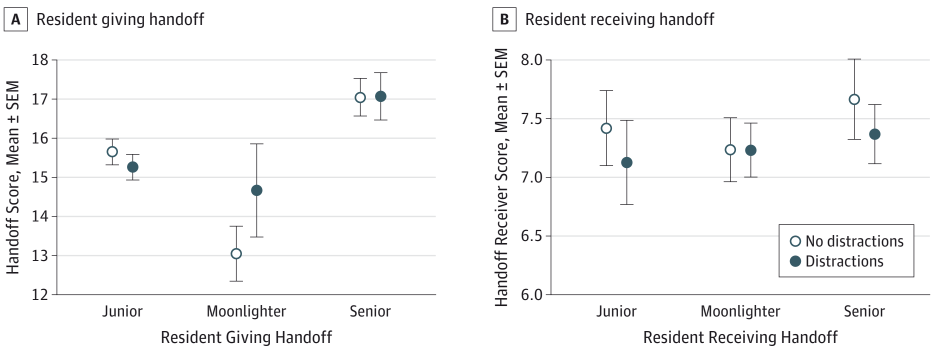
This study demonstrated that distractions were very common during surgical resident handoffs (48%), particularly during evening handoffs (performed by junior residents). Pagers

Table 2. Factors Potentially Influencing Distractions During Resident Handoffs

Variable	No. (%) Distractions	No. (%) No Distractions	*P* Value for χ^2	No. of Distractions/Handoff	*P* Value for ANOVA
Resident giving handoff					
Junior	79 (54)	67 (46)	.02	1.4	.02
Moonlighter	9 (30)	21 (70)		0.5	
Senior	14 (38)	23 (62)		0.89	
Handoff time					
AM	20 (36)	36 (64)	.045	0.63	.004
PM	81 (52)	74 (48)		1.4	
Handoff type					
Individual	69 (44)	88 (56)	<.10	1.1	.21
Team	33 (58)	24 (42)		1.4	
Handoff location					
Clinical area	37 (42)	52 (58)	.17	0.89	.03
Nonclinical area	65 (52)	60 (48)		1.4	

Abbreviation: ANOVA, analysis of variance.

Figure. Distractions and Handoff Quality by Resident Group Giving (A) or Receiving (B) Handoffs



Handoffs with distractions (solid circles) and handoffs without distractions (open circles) had statistically similar quality scores in each resident group. The error bars indicate the SEMs.

and telephone calls were the most common distractions and distractions increased the handoff length but did not reduce handoff quality. We also found that performing the handoff in a nonclinical (presumably quiet) area actually increased the number of distractions (which was an unexpected finding). Other studies have reported similar findings. One study found that residents were paged every 13 minutes.[7] Another study found that residents were paged an average of 57 times during on-call shifts.[8] When surveyed, 55% of neurosurgery residents reported 3 or more interruptions per handoff, although 90% reported that handoffs occurred in a "quiet, private area."[14] In the Massachusetts General Hospital survey, 36.6% indicated that they were interrupted 1 or more times "most of the time or always."[5] A study of hospitalist handoffs found that interruptions occurred in 98% of handoffs and that the number of interruptions was directly related to the number of patients being handed off (as was the case in the current study).[20] Similar to our study, a study of surgical resident handoffs found that residents were interrupted an average of twice per handoff (range, 0-10) and that handoffs with more frequent interruptions were longer in length.[3] A prospective observational study of 86 surgical resident handoffs at Baylor University found each handoff had on average 1.5 interruptions.[21]

While distractions are common, their effect on handoff quality is not certain. Interruptions and distractions have been identified as a source of error and even patient harm in other studies.[9] One study of emergency department physicians found that interruptions caused them to spend more time on tasks (task plus interruption) but paradoxically less time on the task itself.[22] In the current study, we found that distractions increased the length of the handoff process but distractions did not impact the handoff quality. This is an important finding and one that has not been highlighted in most other studies. Similar to our findings, the Baylor University study noted frequent distractions but residents reported that the distractions did not prohibit them from focusing on the handoff.[21] Our findings, and those of the Baylor study, suggest that surgical residents are resilient to distractions during handoffs.

Distractions can have both negative and positive consequences as reported by Jett and George,[23] who studied interruptions in organizations. Negative consequences include loss of time, stress, decreased task immersion, procrastination, and momentum disruption. Positive consequences of interruptions include the ability to "gather real-time information," improvements in relationships and communication, and a mental break. Distractions seem most problematic during complex, cognitively demanding work; however, they may also increase the ability to make simple, routine decisions and disrupt automatic processing, allowing inconsistencies to be noticed.[23] Distraction/conflict theory postulates that distractions improve performance on simple tasks owing to increased focus (although they worsen complex-task performance).[24] Because handoffs are typically a transfer of patient information (unlike diagnostic decision making), it is reasonable to consider them a simple task. Speier et al[25] found that interruptions (particularly similar interruptions) were perceived negatively, whether they interrupted a simple or complex task.

Handoffs may involve multitasking.[26] The ability to multitask is known to be cognitively complex, requiring retrospective and prospective memory and the ability to plan.[27] With the exception of a minority (2.5%) of supertaskers, most people exhibit diminished performance while multitasking compared with doing tasks sequentially.[28] However, an extreme ability to multitask may result in a decreased ability to maintain sustained vigilance.[28] The ability to multitask can improve with practice[29] or even tyrosine supplementation (which improves working memory during multitasking, probably by restoring some of the degradations in memory due to stress).[30] Importantly, multitasking must be differentiated from interruptions, and it has been shown that even people who do not have the ability to multitask may be able to maintain performance in the face of interruptions.[31]

The nature of the distraction is important. Studies in the psychology literature reported that "simple, dissimilar interruption(s)" are not disruptive (regardless of length), although interruptions more similar to "the main task" are disruptive.[32] Also, similar interruptions were disruptive only to primary tasks, which "lacked associative support among its task components."[33] These authors suggested that to make a task "relatively immune to the effects of interruptions," it could be designed to have "associative connections between task components" or have a simple primary task that does not require much cognitive work to complete or to have a primary task that is essentially habitual.[33] Ironically, the increased number of handoffs has made the process much more habitual.

Our study suggests that surgical residents have developed a tolerance to distractions. This tolerance could be owing to either increased automatization of the process (from experience, with fewer cognitive resources required to complete the primary task) or a global ability to maintain focus in the midst of distractions. Alternatively, features of the surgical handoff itself could make it impervious to distraction. The handoff typically consists of short contained bits of information about individual patients, and residents typically supplement their verbal discussion with a written handoff document. Therefore, if a distraction occurs, the resident may just repeat the summary of that patient and, therefore, would be less impacted by the distraction.

However, while distractions may not impact the quality of handoffs, there are other reasons to limit their frequency. Distractions contribute to the length of the handoff. Because the handoff involves 2 physicians, any time 1 physician is attending to a distraction impacts the efficiency of both physicians. Therefore, in the era of work-hour limitations, minimizing distractions may be relevant to maximizing efficiency. Similarly, we did not specifically look at the contribution of distraction to stress, although other studies have suggested that a distracting environment leads to increased stress and dissatisfaction, even if it does not degrade the task quality.[34] We did not solicit feedback from the residents regarding whether they felt distractions impacted handoff quality or resident stress. We were intentionally trying to minimize the Hawthorne effect and conduct an observational study in the tradition of naturalistic decision making. However, this would certainly be an interesting area for future research.

We acknowledge potential limitations to our study. Although we had a large sample size across many hospitals, all handoffs observed were between UCSF surgical residents and/or Bay area residents (moonlighters). This was an observational study; the 2 observers did not overlap in their observations. Also, the residents knew they were being observed, which could lead to a Hawthorne effect. Additionally, the evaluation was a global, subjective evaluation of handoff quality. Observers did not routinely have direct clinical knowledge of the patients owing to the design of the study, which used objective researchers. We also did not include patient identifiers owing to institutional review board restrictions; therefore, clinical outcomes could not be correlated and we were not able to correlate the quality of patient care or errors with the presence of distractions. Therefore, it is possible that issues related to distractions were not documented.

Conclusions

To our knowledge, this is the largest study of distractions during surgical resident handoffs. Distractions were very common during handoffs; they were more common in the evening when junior residents more commonly performed the handoff and they increased the handoff length. However, distractions did not negatively impact the quality of resident handoffs. This may demonstrate the resilience of surgical residents to distractions. We would recommend further study into the effect that distractions have on the stress of surgical residents and continued research into the impact of handoff quality on patient outcomes. However, at present, we do not recommend making the elimination of distractions during surgical resident handoffs a high priority for residency programs.

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