

Initial assessment of patient handoff in accredited general surgery residency programs in the United States and Canada: a cross-sectional survey

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Background: Communication errors are considered one of the major causes of sentinel events. Our aim was to assess the process of patient handoff among junior surgical residents and to determine ways in which to improve the handoff process.

Methods: We conducted nationwide surveys that included all accredited general surgery residency programs in the United States and Canada.

Results: Of the 244 American and 17 Canadian accredited surgical residency programs contacted, 65 (27%) and 12 (71%), respectively, participated in the survey. Of the American and Canadian respondents, 66% and 69%, respectively, were from post-graduate year (PGY) 1, and 32% and 29%, respectively, were from PGY 2; 85 (77%) and 50 (96%), respectively, had not received any training about patient handoff before their surgical residency, and 27% and 64%, respectively, reported that the existing handoff system at their institutions did not adequately protect patient safety. Moreover, 29% of American respondents and 37% of Canadian respondents thought that the existing handoffs did not support continuity of patient care. Of the American residents, 67% and 6% reported receiving an incomplete handoff that resulted in minor and major patient harm, respectively. These results mirrored those from Canadian residents (63% minor and 7% major harm). The most frequent factor reported to improve the patient handoff process was standardization of the verbal handoff.

Conclusion: Our survey results indicate that the current patient handoff system contributes to patient harm. More efforts are needed to establish standardized forms of verbal and written handoff to ensure patient safety and continuity of care.

Contexte : Les erreurs de communication sont considérées comme l'une des causes majeures des événements sentinelles. Notre but était d'évaluer le processus de transfert des patients chez les résidents junior en chirurgie et de trouver des façons de l'améliorer.

Méthodes : Nous avons procédé à des sondages nationaux qui ont inclus tous les programmes agréés de résidence en chirurgie générale aux États Unis et au Canada.

Résultats : Sur les 244 programmes agréés de résidence en chirurgie américains et les 17 canadiens, 65 (27 %) et 12 (71 %), respectivement, ont participé au sondage. Parmi les participants américains et canadiens, 66 % et 69 %, respectivement, étaient en première année de résidence (PGY 1) et 32 % et 29 %, respectivement, étaient en deuxième année de résidence (PGY 2); 85 (77 %) et 50 (96 %), respectivement, n'avaient reçu aucune formation sur le transfert des patients avant leur résidence en chirurgie et 27 % et 64 %, respectivement, ont déclaré que le système actuel de transfert de leur établissement n'assurait pas adéquatement la sécurité des patients. De plus, 29 % des participants américains et 37 % des participants canadiens ont dit estimer que le mode actuel de transfert ne favorisait pas la continuité des soins. Chez les résidents américains, 67 % et 6 % ont déclaré recevoir un rapport de transfert incomplet susceptible d'entraîner un préjudice mineur et majeur, respectivement, pour le patient. Ces réponses correspondaient à celles des résidents canadiens (63 % et 7 %, respectivement, en ce qui concerne les préjudices mineurs et majeurs). Le facteur mentionné comme le plus propice à une amélioration du processus de transfert des patients était la standardisation du rapport verbal.

Conclusion : Les résultats de nos sondages indiquent que le système actuel de transfert des patients serait préjudiciable à ces derniers. Il faudra travailler à standardiser les processus de transfert et de rapports verbaux et écrits pour assurer la sécurité des patients et la continuité des soins.

Patient handoff is an important method to transfer patient care from one health care provider to another to ensure patient safety and continuity of care. Patient handoff takes place multiple times during the day among health care providers, including residents, nurses and staff surgeons. After the Accreditation Council for Graduate Medical Education's (ACGME) new rules to limit resident working hours came into effect in January 2003,¹ more frequent handoffs were required between health care providers to comply with the new rules and to ensure continuity of care for patients.

Despite the importance of patient handoff, incomplete patient handoff and communication failure are still considered to be the most common causes of a sentinel event. The Joint Commission defines sentinel events as an unexpected occurrence involving death or serious physical or psychological injury, which includes loss of limb or function.² In an analysis of root causes of sentinel events by the Joint Commission conducted from 2012 through 2014, communication errors were found to be one of the leading causes.³ Furthermore, the analysis showed that communication errors contributed to all types of sentinel events.³ In response to these results, the Joint Commission instituted a National Patient Safety Goal in 2006 to implement a standardized approach to patient handoffs in all hospitals.

In a survey of 161 medical and surgical residents at the Massachusetts General Hospital conducted by Kitch and colleagues,⁴ 58% of residents reported that at least 1 patient had experienced minor harm, and 12.3% reported that at least 1 patient had experienced major harm related to handoffs. However, information about patient handoff among junior surgical residents and how they perceive the current process of patient handoff is lacking despite the importance of this skill.

The aim of the present study was three-fold: to gain a better understanding of how verbal and written patient handoff is conducted between junior surgical residents at the time of the handoff in accredited general surgery residency programs in the United States and Canada, to identify the common reasons leading to incomplete handoff and to determine the factors perceived by the residents as necessary to improve the existing handoff process at their institutions.

METHODS

Selection criteria

We identified 246 ACGME-accredited general surgery residency programs in the United States using the ACGME website (www.acgme.org). Two general surgery residency programs were excluded because they were not active at the time of the survey. Further, we identified 17 accredited general surgery residency programs in Canada using the Royal College of Physicians and Surgeons of Canada website (www.royalcollege.ca). All of the accredited general surgery

programs were contacted initially by phone and then by email to the program director to explain the background and aims of the study. All programs that agreed to participate in the study were sent another email containing an electronic link to the survey to be sent to all junior general surgery residents. All junior general surgery residents (postgraduate year [PGY] 1 and PGY 2) who rotated at least 1 month in general surgery were eligible to participate in the study. All participants were assured that the survey was completely anonymous. As remuneration for study participation, all residents who successfully completed the survey received 1 week of free access to the American Board of Surgery In-Training Examination online question bank (www.clinicalreview.com). They did not have any contribution to the study methods or results. The institutional review boards of Tufts University and McGill University approved our study protocol.

Survey content

The survey, which we developed to assess each step of the patient handoff process, was composed of 6 sections with a total of 47 questions. The first section contained questions about demographics and general questions about patient handoff, the second section focused on verbal handoff and how it was conducted and the third section focused on the written handoff. The fourth and fifth sections contained questions about minor and major harm, respectively. The sixth section contained items eliciting participants' perspectives on how to improve the existing handoff at their institutions. The survey instrument was first pilot tested by the junior and senior surgical residents at Tufts Medical Center and the Lahey Hospital and Medical Center to ensure clarity of items and flow.

Survey administration

The survey was administered online using SurveyMonkey as a one-time data collection effort. We sent the link to the online survey to program directors with an accompanying request to forward it to eligible residents. Owing to the confidentiality of residents' emails, we were not able to send reminders to nonresponders.

Definitions of patient handoff and patient harm

Patient handoff is defined as "the transfer of information (along with authority and responsibility) during transitions in care across the continuum; to include an opportunity to ask questions, clarify, and confirm."⁵ Minor harm was defined as an event with a limited clinical consequence (e.g., a missed or delayed follow up on a radiological test or laboratory result, a delay in assessing a new patient owing to communication error or incomplete handoff) without any harm occurring to the patient as a result. Major harm was defined as an event with a clinically important consequence

of communication failure or incomplete handoff, including the examples mentioned for minor harm, resulting in the patient experiencing a complication, being injured or dying.

Statistical analysis

Data are presented as counts and proportions. We downloaded summary statistics from the SurveyMonkey website (www.surveymonkey.com).

RESULTS

Respondent characteristics

Of the 244 American and 17 Canadian accredited surgical residency programs contacted, 65 (27%) and 12 (71%), respectively, participated in the survey. Reasons for non-participation were not collected. The demographics of the American and Canadian participants from these programs are shown in Table 1.

General questions about patient handoff

Of the 127 US and 73 Canadian junior surgical residents who participated, 79% and 71%, respectively, reported that the time they spent receiving the handoff was adequate, whereas 18% and 29%, respectively, found that not enough time was spent receiving the handoff. Fifty percent of American and 13.5% of the Canadian surgical residents reported that the handoff was always conducted in an interactive fashion, with opportunity for questions and answers. Only 3% of American and 2% of Canadian surgical residents reported that senior residents always supervised the handoff process; no residents from either country reported that a staff member always supervised the handoff process. Twenty percent of American and 15% of Canadian surgical residents reported that the handoff process always occurred at a designated time; similarly, 20% of American and 14% of Canadian surgical residents reported that it always occurred at a designated place. Among the American surgical residents, 54% reported that they were always interrupted during the handoff process in contrast to 14% of the Canadian surgical residents. The most common reasons for handoff interruptions for American and Canadian surgical residents, respectively, were nurses paging (79% and 69%), medical personnel paging (12 and 21%), trauma alert or patient coding (5% and 2%), and new consults or admissions (4% and 4%).

American and Canadian surgical residents, respectively, reported that interruptions during patient handoff led to the following consequences: loss of some information related to patients (75% and 82%), decreased quality of effective communication (69% and 53%), decreased quality of patient care (23% and 28%) and patient harm (11% and 16%). According to American and Canadian respondents, respect-

ively, handoff was most problematic when the resident was the cross-coverage resident (72% and 51%), followed by the night float resident (11% and 20%), the primary team resident (10% and 14%) and the moonlighting resident (8% and 14%). Forty percent of American residents reported that they typically cover 20–39 patients, including service patients and consults, when they are on call, while 25% reported that they cover 40–60 patients. However, 39% of the Canadian residents covered 40–60 patients during their on-call time, 35% covered more than 60 patients and 25% covered 20–39 patients. About 77% of American and 96% of Canadian residents reported that they did not receive patient handoff training of any kind during their surgical training. The 2 groups also reported that the existing handoff systems at their institutions do not adequately protect patient safety (27% American v. 64% Canadian). Moreover, 29% of American and 37% of Canadian surgical residents

Table 1. Characteristics of the survey participants by country

Characteristic	Country; no. (%)*	
	United States	Canada
Total no. programs	244	17
Participated	65 (27)	12 (71)
Refused	20 (8)	0 (0)
No response	159 (65)	5 (29)
Male sex	65 (55)	33 (46)
Age, mean, yr	28.9	29.0
Level of training		
PGY-1	78 (66)	45 (69)
PGY-2	38 (32)	19 (29)
Hospital type		—
University hospital	78 (66)	—
Community hospital affiliated with a university	28 (24)	—
Community hospital not affiliated with a university	8 (7)	—
VA hospital	0 (0)	—
Military hospital	3 (3)	—
Other	1 (0.8)	—
Region		—
Northeast	15 (13)	—
Middle Atlantic	30 (25)	—
South	38 (32)	—
Midwest	25 (21)	—
Southwest	5 (4)	—
West	5 (4)	—
Type of resident		—
International medical graduate	23 (20)	10 (14)
American or Canadian medical graduate	94 (80)	62 (86)
Specialty		—
General surgery	104 (91)	58 (98)
Other	17 (9)	4 (2)

PGY = postgraduate year; VA = Veterans Affairs.

*Unless otherwise indicated.

thought that the existing handoffs do not allow continuity of care for patients.

Overall, 9% of the American surgical residents were very satisfied with the patient handoff process at their institutions, 63% were moderately satisfied, 25% were moderately dissatisfied and 3% were very dissatisfied; in comparison, 6% of the Canadian surgical residents were very satisfied about the current patient handoff at their institutions, 52% were moderately satisfied, 35% were moderately dissatisfied and 8% were very dissatisfied.

Assessment of the verbal handoff

At their institutions, 87% of American surgical residents and 96% of Canadian surgical residents reported that they did not have a standardized protocol for verbal handoff. Fifty-one (49.5%) of the American surgical residents compared with 10 (20.8%) of the Canadian residents spent on average 15–29 minutes receiving handoffs when they were the incoming (starting) residents. Further assessment of the verbal handoff and how it was conducted is shown in Table 2.

Assessment of the written handoff

Among the American and Canadian participants, 77% and 89%, respectively, reported that they did not have a stan-

dardized protocol for the written handoff at their institutions. Of the American residents, 94% used a written handoff created electronically, 57% reported that the handoff program is linked electronically to the hospital computer system so that elements such as a patient’s room number can be updated automatically, and 67% reported that they could access the patient list from any computer in the hospital. Only 14% were very satisfied with the existing computer program for the written handoff, and 49% were moderately satisfied. Outgoing residents reported spending 15–29 minutes preparing for the written handoff (i.e., adding new patients to the list, updating the list). Table 3 shows further assessment of the written handoff and how it was conducted.

Among the Canadian residents, 70% reported that they used an electronically generated patient handoff, 58% stated that the computer program they used to create the patient handoff is linked to the hospital computer system, and 62% reported that the patient list is accessible from any computer in the hospital. Of the Canadian respondents, 16.7% were very satisfied and 42% were moderately satisfied with the current patient handoff computer system. As outgoing residents, 62.2% reported spending less than 15 minutes updating the patient handoff list before leaving the hospital. Further details about the content of both verbal and written handoffs are shown in Table 4.

Table 2. Assessment of the verbal handoff and how it was conducted

Question; How often...	American surgical residents; no. (%)					Canadian surgical residents; no. (%)				
	Always	Most of the time	Some of the time	Rarely	Never	Always	Most of the time	Some of the time	Rarely	Never
Do you receive a verbal handoff about all patients whom you need to take care of during the on call?	36 (35)	48 (47)	9 (9)	7 (7)	3 (2)	4 (8)	5 (10)	9 (19)	13 (27)	17 (35)
Do you receive complete verbal handoff, which makes you well prepared for the shift change?	12 (12)	55 (54)	30 (30)	4 (4)	1 (1)	1 (2)	15 (31)	20 (42)	10 (21)	2 (4)
Is the verbal handoff conducted face to face?	23 (23)	73 (71)	5 (5)	2 (2)	0 (0)	7 (15)	25 (52)	13 (27)	3 (6)	0 (0)
Is the verbal handoff conducted over the phone?	0 (0)	2 (2)	29 (29)	53 (52)	19 (18)	0 (0)	8 (17)	22 (46)	15 (31)	3 (6)
Do you use the read-back technique (repeating back critical information to ensure that it is accurately received)?	7 (7)	23 (23)	35 (35)	23 (23)	11 (11)	2 (4)	11 (23)	12 (25)	11 (23)	12 (25)

Table 3. Assessment of the written handoff and how it was conducted

Question; How often...	American surgical residents; no. (%)					Canadian surgical residents; no. (%)				
	Always	Most of the time	Some of the time	Rarely	Never	Always	Most of the time	Some of the time	Rarely	Never
Do you receive a complete written handoff about all the patients whom you need to take care of during the on call?	44 (43)	29 (28)	14 (14)	10 (10)	5 (5)	5 (11)	7 (15)	3 (7)	10 (22)	21 (46)
Do you receive complete written handoff, which makes you well prepared for the shift change?	30 (29)	37 (36)	19 (18.6)	9 (8.8)	7 (6.9)	2 (4)	8 (17)	5 (11)	12 (26)	19 (41)
Is the written handoff handed to you physically?	31 (31)	40 (40)	10 (10)	7 (7)	13 (13)	2 (4)	9 (20)	1 (2)	13 (28)	21 (46)
Is the written handoff left for you so that you can pick it up?	6 (6)	11 (11)	23 (22)	34 (33)	28 (28)	2 (4)	1 (2)	6 (13)	14 (30)	23 (50)

Minor patient harm

Sixty-seven percent of the American surgical residents and 63% of the Canadian surgical residents reported receiving an incomplete patient handoff that resulted in minor harm.

Both the American (70%) and the Canadian (59%) surgical residents reported that the most common reason for incomplete patient handoff that resulted in minor patient harm was lack of the most current information about the patient during the verbal handoff. Other reasons are listed in Table 5.

Table 4. Components of verbal and written handoff, by country

Component	Verbal handoff; no. (%)		Written handoff; no. (%)	
	United States	Canada	United States	Canada
Name of each patient	87 (85)	32 (67)	93 (98)	26 (87)
Age of each patient	67 (65)	19 (40)	91 (96)	24 (80)
Room number of each patient	42 (41)	5 (10)	82 (86)	24 (80)
Medical record number of each patient	27 (26)	3 (6)	77 (81)	24 (80)
Date of admission for each patient	33 (32)	3 (6)	80 (84)	16 (53)
Primary diagnosis for each patient	85 (83)	29 (60)	85 (90)	24 (80)
Primary physician for each patient	36 (35)	8 (17)	70 (74)	16 (53)
Type of surgical procedure(s) in the current admission for each patient	94 (91)	33 (69)	88 (93)	20 (67)
Date of procedure(s) for each patient	69 (67)	15 (31)	78 (82)	18 (60)
Relevant prior surgical procedure(s) for each patient	55 (53)	13 (27)	64 (67)	9 (30)
Clinical course in the current admission for each patient	73 (71)	24 (50)	51 (54)	9 (30)
Complications experienced by each patient	83 (81)	27 (56)	57 (60)	14 (47)
Comorbidities	61 (60)	15 (31)	—	—
Medications for each patients	24 (23)	2 (4)	55 (58)	5 (17)
Diet information for each patient	54 (52)	2 (4)	65 (68)	6 (20)
Code status for each patient (if any recent change)	29 (28)	14 (29)	40 (42)	8 (27)
Identification of the sickest patient on the list	79 (77)	35 (73)	34 (36)	7 (23)
Pending laboratory results to follow	98 (95)	39 (81)	70 (74)	13 (43)
Pending consults to evaluate	75 (73)	37 (77)	60 (63)	11 (37)
Pending radiological tests to follow	99 (96)	40 (83)	63 (66)	15 (50)
Anticipated issues or problems	88 (85)	39 (81)	51 (54)	13 (43)
New consults/admissions	68 (66)	30 (63)	47 (50)	10 (33)

Table 5. Reasons for incomplete patient handoff resulting in minor or major harm

Reason	American; no. (%)		Canadian; no. (%)	
	Minor	Major	Minor	Major
The verbal handoff did not contain the most current information	45 (70)	6 (100)	17 (59)	3 (100)
The written/electronic handoff did not contain the most current information	30 (47)	3 (50)	3 (10)	1 (33)
Interruption during the handoff process	25 (39)	2 (33)	6 (21)	0 (0)
Language barrier between the residents	1 (2)	0 (0)	2 (7)	0 (0)
Knowledge base problem from either one of the residents	24 (38)	5 (83)	8 (28)	0 (0)
Time constraint affecting the outgoing resident	15 (23)	2 (33)	8 (28)	2 (67)
Time constraint affecting the incoming resident (you)	12 (19)	1 (17)	11 (38)	2 (67)
Interpersonal conflict between you and the outgoing resident	2 (3)	1 (17)	1 (3)	0 (0)
Lack of interactive handoff process (handoff given without opportunity for questions and answers)	15 (23)	2 (33)	8 (28)	1 (33)
The handoff was conducted in a distracting environment (eg, hospital hallway or emergency department)	17 (27)	2 (33)	9 (31)	0 (0)

Of note, 26% of the American and 39% of the Canadian surgical residents who received an incomplete patient handoff that led to minor harm did not report back to the residents providing them with the handoff to discuss what was missing from the handoff in order to prevent such an incident from happening again. In the case of American surgical residents, the reasons cited were no major harm having happened to the patient (35%), having forgotten it (18%), or not wanting to confront the colleague who gave the incomplete handoff (12%). Other less common reasons were that the resident who received the incomplete handoff did not have time to discuss it with the other resident (6%), or that the resident received the handoff from a senior resident (6%). Reasons for not reporting back about the incomplete handoff among Canadian participants was somewhat different, with lack of time (33%) being the most common, followed by having received the handoff from a senior resident (25%), having forgotten about it (25%) and no major harm having happened to the patient (8%).

Major patient harm

Only 6% of American and 7% of Canadian surgical residents reported that major harm occurred as a consequence of problematic patient handoff. The most common reason reported by both groups was that receiving a verbal patient handoff did not contain the most current information. Other reasons are reported in Table 5. All of the American and 67% of the Canadian surgical residents discussed the incident with their senior resident; however, while 50% of the American surgical residents reported that the incident had been discussed in the morbidity and mortality conference, none of the Canadians discussed the incident there. Among the American surgical residents, 83% discussed the incident with the resident who had given them the incomplete handoff, whereas 17% instead discussed it with the senior resident, who consequently addressed it with the resident who was responsible. Of the Canadian surgical residents who had an incomplete handoff that led to major harm, 33% did not discuss the incident with the resident who had given them the handoff owing to lack of time. Fifty percent of the American surgical residents reported that there was a change in the patient handoff process as a result of the patient's major harm; changes included performing the handoff under supervision, asking more questions and making the handoff a more interactive process. None of the Canadian surgical residents reported any change as a result of major events.

Improving patient handoff

Among American respondents, the most frequently endorsed suggestion to improve the patient handoff process was standardizing the verbal handoff so that all residents

follow the same technique every time they sign out. In contrast, taking extra measures to decrease the interruptions during patient handoff and devoting a specific and protected time of day for the handoff process were the most frequent factors reported by the Canadian surgical residents to improve the handoff process (Table 6 and Table 7).

DISCUSSION

Patient handoff is the method used to transfer patient-related information among health care providers at the time of shift change to ensure patient safety and continuity of care. Handoff is not restricted to the medical field. Many other high-impact organizations, including the National Aeronautics and Space Administration (NASA), nuclear power plants, and railroad dispatch centres, depend on handoff between workers on a daily basis to ensure the safety of the community and the employee at the same time, with an excellent safety profile.⁶ However, the health care system is still plagued with medical errors. The landmark report from the US Institute of Medicine in 1999 showed that between 44 000 and 98 000 patients die each year in hospitals secondary to medical errors.⁷ A recent study conducted over 5 years that included 10 hospitals from North Carolina found that 25.1 harms occurred per 100 admissions;⁸ furthermore, no improvement was found during the 5 years of the study. Medical errors have a huge impact on the economy as well. In 2008, it was estimated that the total costs of measurable medical errors was \$17.1 billion.⁹ One of the main causes of patient harm is communication failure among health care providers. Through root cause analysis, the Joint Commission found that communication failure was the third most common cause of sentinel events in 2009 through 2011.¹⁰ Inadequate and incomplete patient handoff had major consequences that led to patient harm.¹¹

In our study, we surveyed junior surgical residents in the United States and Canada to assess their perceptions of patient handoff and to determine how to improve it. The participating residents reported that the most common cause leading to both major and minor harm was incomplete verbal handoff. This could be the result of many factors, including lack of training of the junior surgical residents, lack of standardization of verbal and written handoff, failure to include all patients in the verbal handoff, lack of face-to-face interaction, passive transfer of information without opportunity for questions and answers, interruptions, time constraints and failure to identify the sickest patients on the list. Mnemonics have been used to standardize the handoff process and to ensure the completeness and consistency of the handoff. However, a systematic review conducted between 1987 and 2008 identified 24 mnemonics reported in the literature and found that more than half of the studies used "SBAR" (situation, background, assessment, recommendations).¹² This clearly indicates that there is no single mnemonic that can fit each situation and specialty. Moreover, these mnemonics

were not validated on a larger scale. An example of a comprehensive list of items to follow during the verbal handoff is shown in Table 8, which can be modified according to each rotation. A recent study by Starmer and colleagues¹³ showed that an implementation of I-PASS handoff bundle was associated with a significant decrease in medical errors.

Patient handoff is often conducted by the most junior part of the team at the time of shift change to allow continuity of care and, at the same time, to respect the rules of working hours. Although patient handoff is a critical component of patient safety, we found that most junior surgical residents did not receive any patient handoff training in

Table 6. Ways to improve existing handoff from the residents' perspectives

Suggested improvement	American surgical residents; no. (%)	Canadian surgical residents; no. (%)
Implement an education course about patient handoff to all the residents	33 (36)	11 (24)
Perform the handoff under supervision of the senior resident	27 (29)	8 (17)
Perform the handoff under supervision of the attending surgeon	4 (4)	5 (11)
Take extra measures to decrease the nonurgent interruptions during the handoff process	53 (57)	25 (54)
Standardize the written/electronic handoff so that all the residents will follow the same technique to sign out every time	53 (57)	23 (50)
Standardize the verbal handoff so that all the residents will follow the same technique to sign out every time	54 (58)	24 (52)
Devote a specific and protected time of the day for the handoff process	34 (37)	25 (54)
Devote a specific place for the handoff process to take place	30 (32)	17 (37)
Improve the electronic/written handoff computer program	50 (54)	20 (44)
Use an electronic tablet (such as iPad) for the handoff	30 (32)	14 (30)
Use a smartphone application for the handoff	19 (20)	14 (30)

Table 7. Program- and resident-related recommendations to improve patient handoff from the residents' perspectives

Program-related	Resident-related
Training: implement a training course for the new residents about how to perform patient handoff	The handoff process should be interactive and performed face to face with adequate time for questions and answers
Improve consistency: designate a specific place and time for patient handoff to take place every day at the same place and time	Standardize the verbal handoff by following the same items every time patient handoff is performed Verbal patient handoff should include all patients on the list, not only those who are the sickest
"Sterile medical rule": develop a new protocol to minimize interruptions and pages during the time of patient handoff except for emergencies	Conduct the handoff in a quiet, nondistracting environment
Feedback: adopt a policy to report and discuss any problem in communication or patient handoff that resulted or could have led to patient harm	Always identify the sickest patients on the list, or the patients who might deteriorate, with a proposed plan
Improve electronic format of the written handoff	Use the read-back technique when receiving critical information about patient care Provide feedback at the time of receiving the handoff and after the shift change during the next handoff, and discuss what was missing and how to avoid such a problem in the future Consider performing patient handoff under the supervision of senior residents, especially in the intensive care unit setting or during early residency

Table 8. Proposed list of items to be covered during verbal patient handoff

Patient name, age and sex
Diagnosis
Type of surgery(ies)
Number of postoperative days
Surgical/medical history
Brief hospital course during this current admission
Issues during the day and what has been done to address them
Potential problems during the on call and what's the plan to address those problems
Things to follow up on (e.g., laboratory results, imaging results)
Code status, level of care

their programs, and approximately one-third of the residents recommended implementing courses at the start of residency. This recommendation has been supported in the literature; it was found that brief training on patient handoff might improve the handoff process.^{14,15}

Surgical residents reported that receiving handoff from cross-covering or moonlighting residents was most problematic. This could be explained by the fact that the cross-covering residents do not receive a complete handoff about all the patients they are covering, which can lead to poor cross-coverage of the inpatient service by the moonlighter and, consequently, a poor signoff to the primary team when the shift ends. This situation is exacerbated if the moonlighter signs off to a new team. Furthermore, this problem could be due to lack of patient ownership since the cross-covering resident is covering only a shift and will not follow this patient later on.

Surgical residents reported that interruptions during the patient handoff process led to minor and major harm. More than half of these residents reported that they were interrupted during the handoff process some of the time, leading to loss of information that should have been transferred to the other resident, in turn leading to incomplete patient handoff. Paging of surgical residents by nurses during the handoff process was the most common reason for interruptions reported in our study. It has been shown that reducing the number of unnecessary pages decreases disruption of patient care and leads to more rest for the interns.¹⁶ In aviation, many accidents were reported before 1981 owing to distraction of the flight crew with nonessential tasks. As a result, the Federal Aviation Administration enacted “The Sterile Cockpit Rule,” which entails that pilots and crew members are prohibited from doing nonessential activities during critical moments of the flight, including the taxi, landing and takeoff. Nonessential activities include eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews.¹⁷ In health care, there are critical situations, such as patient handoff, surgical timeout and a patient code or trauma resuscitation, where a “sterile medical rule” should be applied, avoiding all nonessential tasks, discussions and distractions to ensure patient safety and the best possible care for the patient. Each health care institution should implement their own new protocols to minimize those interruptions during those times.

One method for improving the learning process and performance is the use of feedback. However, certain rules must be followed to maximize the benefits of feedback.¹⁸ We found that approximately 40% of the Canadian surgical residents didn't discuss the problematic patient handoff that led to minor harm with the residents who gave the handoff. Although the reasons differ between the American and Canadian surgical residents, feedback should be part of the daily patient handoff to improve the process.¹⁹

We asked the surgical residents about how to improve the patient handoff at their institutions. We divided their

responses into 2 categories: program-related and resident-related (Table 7). More effort from the residency programs is required to optimize the patient handoff. All the factors that are resident-related could be taught in a course or workshop about patient handoff.

Limitations

We acknowledge the study's limitations. First, we had a very low response rate from the surgical residency programs, particularly in the United States, and responses were from junior surgical residents only, which limits the generalizability of our findings. The survey was anonymous and lacked any identifiers. Thus we could not compare responders to nonresponders in this study. Second, the measurement of patients' harm was subjective and broadly divided to either minor or major harm based on junior residents' impressions. Given the anonymity of the survey, these perceptions were not correlated with more standardized objective assessment of complications. Third, our study was restricted to junior surgical residents and did not include senior-level residents, which may overstate the lack the training and/or inexperience with handoffs.

CONCLUSION

Despite these limitations, surgical residents self-report that the current patient handoff system still contributes to patient harm. More efforts are needed to establish standardized forms of verbal and written handoff to ensure patient safety and continuity of care.

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