

Effectiveness of a Course Designed to Teach Handoffs to Medical Students

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INTRODUCTION: Handoffs of patient care are increasingly common and are known to contribute to medical errors. A significant number, if not the large majority, of first-year Internal Medicine residents have not received formal education pertaining to handoffs during medical school.

AIM: To develop a program designed to teach handoffs to medical students entering their fourth year of training.

SETTING: University of Colorado Denver School of Medicine.

PROGRAM DESCRIPTION: Our Handoff Selective was first offered in April 2007 as part of a 2-week Integrated Clinician's Course conducted once yearly between the third and fourth years of medical school. The Selective consisted of a didactic session in which communication theory and elements were discussed and a practicum in which students used faculty-developed case scenarios to practice both giving and receiving handoffs.

PROGRAM EVALUATION: Sixty (the maximum number of spots available) out of 150 students participated in the course, although many more students chose the course than spots available. Prior to taking the Selective, medical students' confidence in performing handoffs was poor, but it improved after the course ($P < 0.001$); 92% of students felt the Handoff Selective was "useful" or "extremely useful." While both components of the course were thought to be useful to the large majority of students, the practicum portion was thought to be more useful ($P < 0.001$).

DISCUSSION: Formal education on handoffs is well received by medical students and improves their self-perceived understanding and performance of handoffs. *Journal of Hospital Medicine* 2010;5:344–348. © 2010 Society of Hospital Medicine.

KEYWORDS: communication, handoffs, medical student education, patient safety.

Communication failures are well-recognized as causes of medical errors.^{1,2} Specifically, handoffs of patient care responsibilities, which are increasingly prevalent in academic medical centers,³ have been cited as the most frequent cause of teamwork breakdown resulting in the harmful medical errors found in malpractice claims.¹ The Institute of Medicine has recently identified patient handoffs as the moment where patient care errors are most likely to occur.⁴ A survey of 125 U.S. medical schools, however, found that only 8% specifically taught students how to hand off patient care.³

In July 2003, the American Council of Graduate Medical Education (ACGME) mandated that residency programs decrease resident work hours to improve patient care and safety by reducing fatigue,⁵ and a recent Institute of Medicine report suggests that they be decreased even further.⁴ Studies examining outcomes during the first 2 years after reducing duty hours did not find reductions in risk-adjusted mortality.^{6–8} One proposed explanation for this lack of improvement is that the reduction in fatigue-related medical errors is being offset by discontinuity of care with due to the increased number of patient handoffs resulting from

shortened duty hours,^{9–11} one recent study found that omission of key information during patient sign outs frequently resulted in adverse patient care outcomes.¹²

In 2007, the Joint Commission developed a new National Patient Safety Goal that requires organizations to improve communication between caregivers.¹³ We recently developed an approach by which Internal Medicine residents hand off patient care using a structured process, written and verbal templates, formal training about handoffs, and direct attending supervision.¹⁴ Because fourth-year medical students perform the duties of interns when working as sub-interns, we recognized that education about handoffs should occur prior to the time students became interns. Accordingly, we developed a course designed to teach patient handoffs to medical students at the transition between their third and fourth years of training.

Setting

The Handoff Selective was developed by faculty of Denver Health and the University of Colorado Denver School of Medicine.

Program Description

The Selective was first offered in April 2007 as part of an Integrated Clinician's Course (ICC), a 2-week course for students beginning their fourth year, which starts in April at the University of Colorado. The ICC includes both mandatory and selective sessions that are focused on developing clinical skills and preparing them for their subinternships. The Handoff Selective was conducted in a computerized teaching laboratory, lasted a total of 2 hours and consisted of 2 parts. Each of the 5 Denver Health Hospital Medicine faculty members versed in handoff education taught 2 sessions of 6 to 8 students.

Part 1: Didactic

During the first hour of class, the faculty presented a lecture that summarized the relevant literature on handoffs and explained the importance of the topic. The objectives of the didactic were to: (1) understand the importance of handoffs; (2) explore different communication elements and structures; (3) gain exposure to handoffs outside of healthcare; and (4) learn a structure for handoffs of patient care in hospitalized patients.

We used 3 video clips of handoffs from 2 football games to demonstrate the importance of practice, training, and 2-way communications in handoffs. The first video clip showed a runner trying to make a spontaneous handoff while being tackled. The "receiver" was not expecting the handoff and was preoccupied with blocking another player. This attempted handoff resulted in a fumble, which we related to an adverse patient event.

The next 2 video clips showed 2 complex, seldom used, but well-known football handoffs—the "hook and lateral" and the "Statue of Liberty." Both handoffs were successfully executed presumably as a result of education, practice and the active participation of both players (handing off and receiving) in the process. We then related the teaching and practicing of complex communication to the Joint Commission on Accreditation of Healthcare Organizations (JCAHO; now simply the Joint Commission) data suggesting that most sentinel events have their root cause in communication and training failures.²

Basic communication elements and process structures were then explored using scenarios from everyday life and evidence from fields outside of medicine. We emphasized that structures for communication (modes, vehicles, and settings) must be chosen according to the occasion and that handoffs are common and important in all occupations. In discussing modes (verbal, written, or nonverbal), vehicles (paper, telephone, or e-mail), and settings (face-to face, virtual, or disconnected), we emphasized that the most effective structures for communication (verbal, face-to face meetings, with written materials and other visual aids at the patient's bedside) were also the most time-consuming (Figure 1). While our standard for resident handoffs is a face-to-face verbal interaction with preprinted written

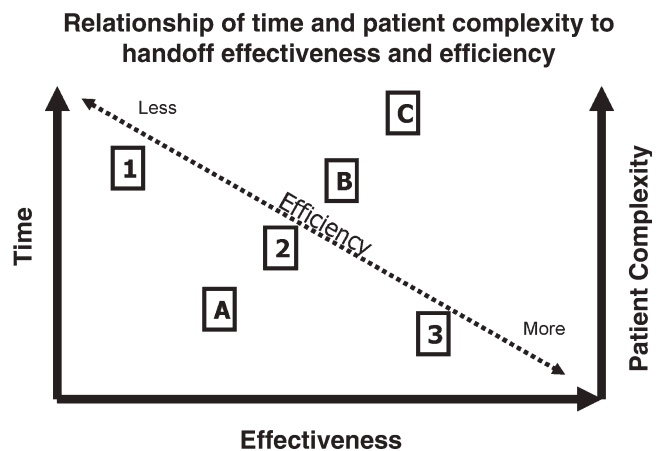


FIGURE 1. A: Setting = disconnected; Mode = written; Vehicle = e-mailed sign-out. B: Setting = virtual; Mode = verbal, written; Vehicle = phone conversation with e-mailed sign-out. C: Setting = face-to-face at bedside; Mode = verbal, written, nonverbal; Vehicle = preprinted signout sheet, simultaneous physical exam. 1: Written sign-out using 3 × 5 index cards, newly hand-written each day. 2: Written sign-out using word processor template on hospital server, manually updated at the end of shift. 3: Written sign-out automated using integrated hospital computer systems to populate latest patient information. The letters (A, B, and C) represent different approaches to the handoff of patients. The numbers (1, 2, and 3) represent one aspect of a handoff (written sign-out). This figure demonstrates how changes in the approach may require increased time but also increase effectiveness.

materials as an aid, we also emphasized that for complex patients (eg, mental status changes, concern for an acute abdomen) more robust communication is often needed. Accordingly, a more time-consuming bedside handoff with simultaneous, focused physical exam and history-taking by both oncoming and off-going providers may be most appropriate.

As real-life examples, we asked our students to communicate a happy birthday wish to their mother, who lives in another state. Almost uniformly, in addition to a written aid (birthday card), they choose the telephone as a vehicle for their verbal mode in a virtual setting with 2-way communication possible. In contrast, when asked to propose marriage to a significant other in another state, students felt that a face-to-face meeting with verbal and nonverbal (ie, ring) modes was appropriate. This time-consuming mode of communication was felt to be necessary to create a sentiment of importance and avert any possible miscommunication.

The didactic session concluded by demonstrating how to use standardized written and verbal templates for handoffs of the care of a hospitalized patient. We explore the differentiation between written and verbal handoffs in our discussion below.

TABLE 1. Patient Scenarios for Handoff Practice

Diagnosis	LOS	Active Issues	Cross-Cover
CP	1	CP, HTN, DM	CP, HTN, headache
GIB	1	GIB, alcohol withdrawal	Poor response to red cell transfusion, coagulopathy
Acute pancreatitis	2	Pain, possible pancreatic abscess	Fever, agitation, hypoxia
CHF	2	CHF, DM, nausea	Lack of diuresis, CP, hypoglycemia
Acute kidney injury	3	None, ready for discharge	HTN, hyperglycemia
Community acquired pneumonia	3	Anxiety, discharge pending	Confusion, emesis with hypoxia

Abbreviations: CHF congestive heart failure; CP, chest pain; DM, diabetes mellitus; GIB, gastrointestinal bleeding; HTN, hypertension; LOS, length of stay.

TABLE 2. Student Self-Perception of Handoff Skills, Knowledge, and Attitudes

Competency	Selective	
	Before	After
I know how to hand off patients	2.3 ± 0.8	4.2 ± 0.6*
I know how to make contingency plans for my patients	2.1 ± 0.8	3.9 ± 0.7*
I know what a read-back is	2.3 ± 1.3	4.4 ± 0.9*
I know how to perform a read-back	2.0 ± 1.2	4.2 ± 0.9*
I know when to perform a read-back	1.6 ± 0.8	4.1 ± 1.0*
I am efficient at communicating patient information	2.2 ± 0.9	3.6 ± 0.7*
I am effective at communicating patient information	2.2 ± 0.8	3.8 ± 0.6*
I know a standard written structure for handoffs	2.1 ± 1.1	4.4 ± 0.6*
I know a standard verbal structure for handoffs	2.0 ± 1.1	4.2 ± 0.6*
I can choose appropriate modes of communication	2.7 ± 1.1	4.4 ± 0.6*
I can choose appropriate vehicles of communication	2.6 ± 1.1	4.5 ± 0.6*
I can choose appropriate settings for communication	2.9 ± 1.1	4.4 ± 0.6*
Handoffs are well taught in my medical school	1.6 ± 0.8	3.5 ± 1.0*
Standardization is important in handoffs	4.3 ± 0.9	4.6 ± 0.5
Handoffs are safer with attending supervision	3.7 ± 1.0	3.9 ± 0.8
I feel comfortable cross-covering on patients	1.6 ± 0.7	3.0 ± 1.0*

NOTE: Values are means ± SD. Scores are reported using a Likert scale (1 = strongly disagree, 5 = strongly agree).

Abbreviation: SD, standard deviation.

* $P < 0.003$.

Part 2: Practicum

The second hour was devoted to practicing handoffs as a group. The faculty developed 6 case scenarios that differed with respect to diagnosis, length of stay, active medical issues, and anticipated discharge (Table 1). The scenarios included extensive admission information as well as evolving issues for each patient that were specific to the day of the intended handoff. Students were given Microsoft Word table-based handoff templates to use when creating written sign-outs for their patients. Verbal handoffs were performed between students and sign-outs were exchanged. The faculty then role-played cross-cover calls that were specific for each scenario to test the students' inclusion of integral information in their handoffs and their ability to create contingency plans.

TABLE 3. Student-Perceived Usefulness of Course Components

	Useful [n (%)]
Overall composite usefulness	578 (92)
Didactic composite usefulness	254 (84)
Using "fumble" video clips for discussing handoffs	32 (64)*
Discussion of modes of communication	46 (88)
Discussion of vehicles of communication	46 (88)
Discussion of settings of communication	48 (96)
Choosing handoff structures for nonhealthcare handoffs	37 (71)*
Discussing handoffs in industries outside of healthcare	45 (90)
Practicum composite usefulness	324(100)
Role playing	54 (100)
Patient handoff scenarios	54 (100)
Completing computerized templates	54 (100)
Delivering handoffs to peer	54 (100)
Receiving handoffs from peer	54 (100)
Cross-cover questions and discussion	54 (100)

NOTE: Scores are reported using a Likert scale (1 = extremely useful, 4 = not at all useful).

* $P < 0.001$.

Program Evaluation

We developed a 2-part survey to evaluate the effectiveness of the Selective and to solicit feedback about the didactic and practicum portions of the course. The first part of the survey (Table 2) contained 16 items to assess the students' knowledge of, and attitudes toward handing off patient care, along with their comfort with the handoff process. Responses to this section were scored using a 5-point Likert scale with 1 indicating "strongly disagree" and 5 indicating "strongly agree". This part of the survey was administered both prior to and after the Selective.

The second part (Table 3) contained 12 items and was designed to evaluate the perceived usefulness of the different components of the class. This section was only administered at the end of the Selective. It utilized a 4-point Likert scale with 1 indicating that the component was not useful at all, and 4 indicating that it was extremely useful. The first 6 items of the second section allowed students to evaluate the didactic portion of the handoff. The second 6 items allowed students to evaluate the practicum. Responses to all

12 items were then combined to determine an overall composite usefulness for the Selective.

The Selective was also evaluated qualitatively through the use of open-ended, written comments that were solicited at the end of the survey. All surveys were administered anonymously.

Data Analysis

Student paired *t* test was used to compare continuous variables recorded before and after the Selective. A chi-square test was used to assess the students' perception of the usefulness of the didactic vs. the practicum methods of teaching handoffs.

All analyses were performed using SAS (version 8.1; SAS Institute, Inc., Cary, NC). Bonferroni corrections were used for multiple comparisons such that *P* values of <0.003 and <0.004 were considered to be significant for continuous and categorical variables, respectively. All data are reported as mean ± standard deviation (SD).

The survey was approved by our local Institutional Review Board.

Results

More students chose the Selective than we had capacity to accommodate (60 of a class of 150). The pre- and post-course survey response rate was 56 of 60 (93%) and 58 of 60 (97%), respectively. After the Selective, the mean score in response to whether handoffs are well taught in medical school increased from 1.6 to 3.5 (*P* < 0.003). Our students' self-perceived skills and knowledge about handoffs improved after the Selective (Table 2). The greatest changes in perceived knowledge occurred in questions regarding the "what," "how," and "when" of read-backs, and the knowledge of standard verbal and written handoff structures. The responses to the survey elements which assessed our students' attitudes regarding the importance of standardization and whether they felt handoffs were safer with faculty supervision did not change after the Selective (Table 2).

A total of 92% of the students felt that the course was "extremely useful" or "useful." The role-playing activity was thought to be more helpful than the didactic, but 84% of the students still rated the didactic portion as "useful" or "extremely useful" (Table 3). The element which was the least well received in the didactic portion was the use of video clips to demonstrate successful and unsuccessful (fumbled) college football handoffs, although the majority (64%) of students still found it useful.

The major theme generated from the comments section of the survey was that the Selective should be a required course.

Discussion

We know of no previously published literature that has addressed teaching handoffs to medical students. Horwitz et al.¹⁵ developed a sign-out curriculum for Internal Medicine residents and found that none of their house-staff had

any previous training in handoffs during medical school, consistent with the finding that only 8% of U.S. medical schools provided formal instruction on handoffs.³ Prior to taking the Selective, our students had no knowledge of verbal or written templates for patient handoffs, although both before and after the course they felt that standardization was an important component of the process.

A number of verbal structures for handing off patient care have been described in the literature and there is not a consensus as to which functions best. Perhaps the most cited verbal communication format is SBAR (ie, situation, background, assessment and recommendation).^{16,17} This tool was developed by Leonard et al.¹⁸ specifically for use by nurses to provide 1-way communication to physicians pertaining to a change in patient status. We considered teaching the SBAR approach to the students but felt that it did not provide a suitable structure for handoffs because the transfer of care is not generally an event-based situation and the literature on handoffs indicates that an optimal verbal system includes 2-way communication.

Additional mnemonics for handoffs found in the literature include "SIGNOUT" (ie, Sick or DNR, Identifying information, General hospital course, New events of the day, Overall health status, Upcoming possibilities with plan, and Tasks to complete),¹⁴ "I PASS the BATON" (ie, Introduction, Patient, Assessment, Situation, Safety, Background, Actions, Timing, Ownership, Next)¹⁹ and the SAIF-IR system (see boxed text).¹⁴

Verbal Structure for Patient Handoffs: SAIF-IR

Off-going provider performs a SAIF handoff:

- Summary statement(s)
- Active issues
- If-then contingency planning
- Follow-up activities

On-coming provider makes the handoff SAIF-IR:

- Interactive questioning
- Read-backs

We developed the SAIF-IR mnemonic to maximize efficiency and effectiveness while differentiating the verbal portion of the handoff from the written and incorporating 2-way communication into its structure. In the Summary statement, we emphasize that this is not a history of present illness. We ask our students to summarize, in 1 to 3 sentences, the patient's presentation and working diagnosis. When discussing patient issues, we ask our students to only verbalize Active issues, although the written template has inactive, chronic issues listed. Here, we also ask our students to express their level of concern for the active issues and patient in general. If-then's and Follow-ups are usually verbalized together. Based on the offgoing provider's knowledge

of the patient, we encourage the offgoing provider to anticipate potential problems and advise the oncoming provider on potential responses. Much of this advice is difficult to express in the written format and thus may not be found on the written handoff when the verbal handoff occurs. We encourage oncoming providers to take notes on the preprinted handoff sheet as part of the handoff process.

Through Interactive questioning and Read-backs, we train our students and house-staff to use the active listening techniques used outside of healthcare, in settings such as nuclear power plants and National Aeronautics and Space Administration mission control, where poor handoff communication may also result in safety concerns and adverse events.²⁰ Interactive questioning allows the oncoming provider to correct or clarify any information given by the offgoing provider. Read-backs are a method of confirming follow-up activity or contingency plans. Together, the SAIF-IR mnemonic builds a 2-way communication structure into the patient handoff with both offgoing and oncoming providers having predefined roles.

Much of the information on our written handoff (patient identifying information, medications, language preference, code status, admission date) is not verbalized unless it is part of the active issues or the if-then, follow-ups (ie, medication titration for a patient admitted with an acute coronary syndrome or cor status in a patient newly made comfort care). By *not* reading extraneous information, we seek to emphasize the Active issues as well as the If-then, Follow-ups. We feel this emphasis maximizes the effectiveness of the handoff, while the purposeful nonverbalization of written materials such as identifying information maximizes its efficiency. Future work may examine which verbal and written structures for patient handoffs most benefit patient care and workflow through standard communication.

While our students found the Handoff Selective to be useful and to improve their self-perceived ability to perform handoffs, we were not able to determine whether our program affected downstream outcomes such as adverse events relating to failures in handoff communication. Additionally, since we only taught and evaluated our Selective at the University of Colorado Denver School of Medicine, the response of our students may not generalize to other medical schools. Multicentered, prospective, randomized controlled trials may determine whether handoff education programs are successful in reducing patient adverse events related to transfers of care.

While handoffs occur frequently and are increasingly recognized as a vulnerable time in patient care, little is known about how to effectively teach handoffs to medical students during their clinical years. We developed a formal course to teach the importance of handoffs and how the process should be conducted. Our students reported that the Handoff Selective we developed improved their knowledge about the process and their perception of their ability to perform handoffs in a time-appropriate and effective manner. In response to the feedback we received from our students, the

Handoff Selective is the only course in the ICC that has been made mandatory for all students.

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