

Cross-Cover Curriculum for Senior Medical Students

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Abstract

Introduction: Cross-cover, the process by which a nonprimary team physician cares for patients, usually during afternoons, evenings, and weekends, is common in academic medical centers. With the advent of residency duty-hour restrictions, cross-cover care has increased, making education in effective cross-coverage an urgent need. **Methods:** We implemented a cross-cover didactic activity composed of 18 interactive cases with 29 senior medical students enrolled in an internal medicine residency preparation course. The curriculum was facilitated by one faculty member and one senior medical resident and utilized think-pair-share learning techniques to discuss an approach to a range of common (both urgent and routine) cross-cover scenarios. We analyzed confidence and feelings of preparedness pre- and postintervention. We also examined differences in medical knowledge based on two multiple-choice written cross-cover cases that addressed both medical management and triage. **Results:** This curriculum significantly improved feelings of confidence (from 1.8 to 3.2, $p < .0001$), reduced anxiety (from 4.5 to 4.1, $p < .03$), and improved performance in clinical case scenarios (from 82% to 89%, $p < .02$). **Discussion:** This curriculum covered not only the important medical aspects of cross-cover care (e.g., diagnostics and management) but also equally important roles of cross-cover, such as how to effectively triage cross-cover scenarios. The curriculum was well received by students.

Keywords

Cross-Cover, Triage, Patient Care, Transition to Residency, Boot Camp, Internal Medicine, Simulation

Educational Objectives

By the end of this activity, learners will be able to:

1. Identify clinical situations that require the cross-cover provider to examine the patient.
2. Demonstrate appropriate triage of common cross-cover issues (e.g., when it is appropriate to defer an issue to the primary team, write an order, or seek additional information/assistance).
3. Discuss considerations for choice of therapy for common cross-cover complaints such as pain, nausea, pruritis, and insomnia.

Introduction

Cross-cover is when physicians cover for a primary team's patients in the hospital setting, usually on afternoons, evenings, and weekends. These periods of cross-cover are marked by the covering physicians continuing the plan set forth by the primary

medical team. However, unanticipated patient issues often arise, leaving the cross-covering physicians to determine whether to continue the plan or take action, such as ordering new tests or medications or canceling planned tests or medications.

Since the institution of residency duty-hour restrictions, cross-cover and handoffs have become more commonplace in academic medical centers.¹ To address this, many medical schools and academic centers have begun to teach standardized handoff practices to medical students and residents.¹⁻⁵ However, while some efforts are being made to standardize cross-cover practices,⁶ to our knowledge there is no published curriculum to teach cross-cover. Indeed, one study suggests that a majority of incoming interns are not trained in cross-cover in medical school, nor have they cross-covered patients during their medical training.⁷ This lack of confidence can persist into residency: residents working shorter shifts (a common occurrence with duty-hour restrictions) feel less prepared to cross-cover than those working longer shifts.⁸ In addition, data suggest that residents perform worse on cross-cover documentation tasks compared to faculty clinicians.⁹

Lack of training in cross-cover can lead to flawed decisions, such as inappropriate deferral to the primary team or actions that

Citation:

Bongers KS, Heidemann LA. Cross-cover curriculum for senior medical students. *MedEdPORTAL*. 2020;16:10944. https://doi.org/10.15766/mep_2374-8265.10944

needlessly disrupt the primary team's clinical plan. This has the potential to affect patient care. In one study, nurses noted that a minority of cross-covering residents were familiar with patients' cases and management plans and often had poor promptness and communications skills.¹⁰ In the worst scenario, these traits can ossify into the "cross-cover mindset," where the covering physicians defer important decisions to the primary team and do not invest in knowing the patients under their care.¹¹ This can be further compounded by reduced supervision of residents during periods of cross-cover,¹² as well as resident reticence to ask for help when needed.^{13,14} Cross-cover places increased demands on residents compared to normal shifts, and most medical students receive little formal training in cross-cover despite the widespread practice of having incoming residents perform cross-cover on day one of residency. In order to address this gap, we devised a formalized cross-cover curriculum utilizing think-pair-share techniques for senior medical students.

Methods

Development

We surveyed internal medicine interns at the University of Michigan to identify common cross-cover scenarios and incorporated these scenarios into our cross-cover curriculum. We then developed the curriculum and handouts over the course of 2 years as a small-group teaching session for third-year medical students on their internal medicine clerkship, incorporating informal student feedback into subsequent iterations. This curriculum was ultimately incorporated into the internal medicine residency preparation course (RPC) for fourth-year medical students. In order to preserve a safe learning environment, we opted to use think-pair-share techniques so students could discuss their plans with one another before discussing in the larger group setting.

Setting

Participants included senior medical students enrolled in an internal medicine RPC in the spring of their final year of medical school at the University of Michigan Medical School. The RPC course was 4 weeks long and consisted of a blend of interactive didactic sessions on medical emergencies, outpatient topics, simulated procedures, rapid response, and mock code simulations, as well as a simulated paging curriculum that addressed inpatient medical emergencies (focused on cross-cover) and outpatient phone calls.¹⁵

Intervention

The intervention consisted of a 1-hour small-group session facilitated by a faculty member in hospital medicine and a

medicine resident discussing 18 common cross-cover scenarios. The groups consisted of 14-15 students at a time. We provided students with a mock handoff as well as a list of pages about the cross-cover patients and asked them to determine what they would do in each situation (Appendix A). Students had 1-2 minutes per case to engage in a think-pair-share exercise; then, the instructor randomly chose a group to share what it had elected to do. This was followed by a group discussion and teaching points given by the instructor alternating with the medicine resident (Appendix B).

Assessments

We surveyed students about attitudes toward cross-cover before and after participation in the curriculum on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*; Appendix C). We also surveyed the students about their confidence in a variety of cross-cover scenarios (1 = *not at all confident*, 5 = *extremely confident*). The students completed the same surveys both before and after finishing the curriculum. In addition, on a computer using an electronic survey platform (Qualtrics, Provo, UT), students completed a cross-cover quiz consisting of two written clinical cross-cover cases about a patient with a severe ulcerative colitis flare and one with congestive heart failure exacerbation. The ulcerative colitis case had been previously published,⁷ and we developed the additional case on congestive heart failure to further evaluate the curriculum (Appendix C). These cases provided a series of mock pages received by the student, to which the student would respond how he or she would triage each page. Options for responses included: enter order for diagnostic test or therapy; evaluate and/or discuss with patient at bedside; defer to primary team; or no action, confirm that you received the page. We preassigned points for each option, ranging from -2 to 2, with -2 denoting an inappropriate action that would be potentially harmful to the patient and 2 denoting the most appropriate action in the scenario. For actions that were neither the most appropriate action nor potentially harmful to the patient, intermediate point values of -1, 0, or 1 points were awarded (Appendix D). The students completed the same cross-cover quiz both before and after finishing the curriculum.

Evaluation

Within a week of students' completion of the course, we distributed an anonymous electronic survey to them inquiring about the overall quality of the cross-cover curriculum (1 = *poor*, 2 = *fair*, 3 = *good*, 4 = *very good*, 5 = *excellent*). Additionally, students rated their level of agreement with the statement "This session made me feel more prepared for residency" (1 = *strongly disagree*, 5 = *strongly agree*).

Statistics

We compared pre- and postintervention cross-cover quiz results using two-tailed paired *t* tests and the pre- and postintervention Likert scale surveys using two-tailed Wilcoxon signed rank tests. For the pre- and postsurvey data, we included in the analysis only those students who completed both surveys (*n* = 28).

This intervention was determined exempt by the University of Michigan Institutional Review Board (HUM00154582).

Results

Twenty-nine students completed the curriculum. After completing the curriculum, students noted increased comfort and decreased anxiety with making cross-cover decisions (Table 1). Most notably, they reported significantly improved feelings of confidence regarding cross-cover in general (from 1.8 to 3.2, *p* < .0001), as well as reduced anxiety about cross-cover going into residency (from 4.5 to 4.1, *p* < .03). When presented with specific scenarios they might face while cross-covering patients (e.g., a patient with insomnia or a patient with a new oxygen requirement), they likewise expressed significantly increased confidence in the postsurvey compared to the presurvey (Table 2).

Performances on the cross-cover quiz cases were combined into a total score for each student. Overall performance significantly improved from 82% ± 15% to 89% ± 9% (*p* < .02; see the Figure). Preintervention, 12 of 28 students scored 75% or below on the cross-cover quiz; postintervention, only one of 28 students scored 75% or below (data not shown).

At the conclusion of the session, 25 of the 29 students evaluated the intervention (86% response rate). The overall quality of the session was rated 4.9 out of 5. Students agreed that this was helpful in preparing them for residency, with a rating of 4.9 out of 5.

Table 1. Medical Student Attitudes on Cross-Cover, Pre- and Postintervention

Survey Statement ^a	Average (± SD)		<i>p</i> ^b
	Pretest	Posttest	
I am comfortable making clinical decisions on patients I do not know well.	1.8 (± 0.6)	3.2 (± 0.8)	<.0001
Making clinical decisions on patients I do not know well is a source of anxiety for me as I prepare to start residency.	4.5 (± 0.6)	4.1 (± 0.7)	<.03
Medical school has prepared me well to make clinical decisions on patients I do not know well.	2.2 (± 0.9)	2.9 (± 0.9)	<.0008

^aRated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).
^bCalculated with two-tailed Wilcoxon signed rank tests.

Table 2. Medical Student Confidence in Specific Cross-Cover Scenarios, Pre- and Postintervention

How Confident Do You Feel to Handle the Following Cross-Cover Issues? ^a	Average (± SD)		<i>p</i> ^b
	Pretest	Posttest	
A patient complains of chest pain.	2.4 (± 0.6)	3.4 (± 0.8)	<.0001
A patient has moderate pain that is not well controlled.	2.1 (± 0.8)	2.8 (± 0.8)	<.0007
A patient has insomnia.	2.4 (± 0.8)	3.3 (± 0.9)	<.0003
A patient has developed a new requirement for supplemental oxygen.	2.1 (± 0.9)	3.3 (± 0.9)	<.0001
A patient's potassium level is low.	2.6 (± 0.8)	3.6 (± 0.7)	<.0008
A patient's family member calls and asks for an update on the plan of care.	2.9 (± 1.1)	3.6 (± 0.8)	<.003
A patient is getting agitated and requires restraints.	1.8 (± 0.9)	2.7 (± 1.0)	<.003

^aRated on a 5-point Likert scale (1 = not at all confident, 5 = extremely confident).
^bCalculated with two-tailed Wilcoxon signed rank tests.

Discussion

We developed and implemented a cross-cover curriculum that led to improved student confidence, reduced anxiety, and improved performance in responding to cross-cover pages based on an electronic cross-cover quiz. Our curriculum focused not only on the medical aspects of cross-cover care but also practical aspects such as how to triage pages and when to notify the primary team or reach out to one's supervisor.

We found that medical students had anxiety regarding cross-cover but that their anxiety could be reduced through case-based sessions on cross-cover issues. Moreover, the students chose more appropriate responses on the cross-cover quiz after completing the curriculum. Taken together, these case-based cross-cover sessions provided effective training for medical students, improving both confidence and performance in managing cross-cover patients. This effect was similar across two sessions of the training, demonstrating reproducibility, and was well received by the medical students.

This intervention comes with several limitations and challenges. It was performed at a single institution. The mock patient names were largely Western European in origin; this could be modified in future iterations to include a larger variety of names for the sake of diversity, as well as to introduce discussions of implicit biases. Students were largely matched into either internal medicine or preliminary years; thus, this intervention may not be generalizable to other clinical disciplines. Improvement in written case performance may not translate into improved clinical cross-cover performance; similarly, reduction in anxiety regarding cross-cover in an online pre- and postsurvey may not translate to reduced anxiety getting pages as an intern on night float. In addition, students participated in a concomitant simulated

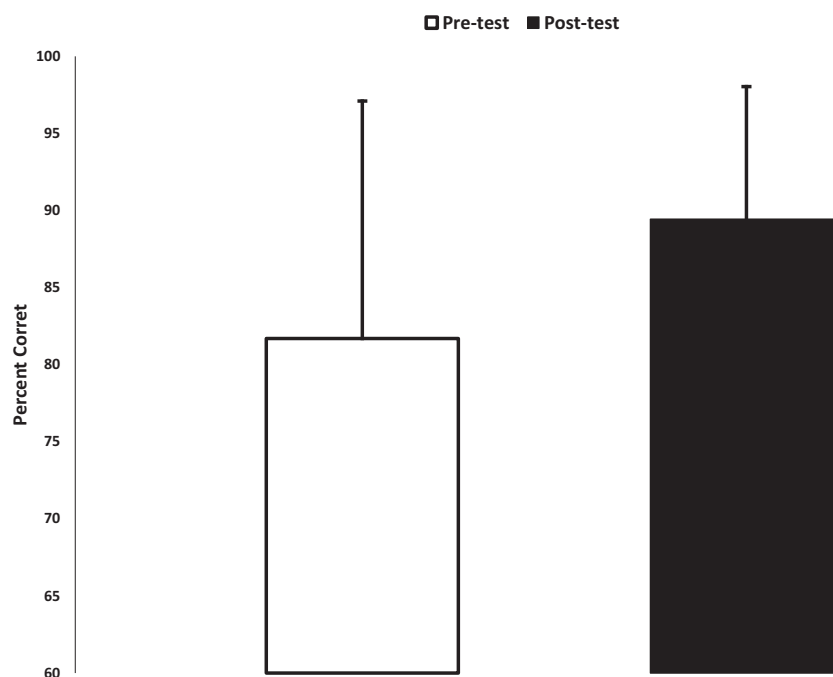


Figure. Medical student performance on cross-cover quiz, pre- and postintervention. Data are the sum of two cases, one patient with an ulcerative colitis flare and one with a congestive heart failure exacerbation. See Appendix C for cases and Appendix D for scoring key. Data are presented as mean percent correct plus or minus the standard deviation. We calculated p values with two-tailed paired t tests. $p < .02$ between the pre- and postintervention quizzes.

paging curriculum as well as other didactics on inpatient medical conditions, which may have influenced results. Lastly, given time restraints of 1 hour, not all cases could be fully discussed at length.

We learned several lessons during the implementation of our curriculum and, based on this, have recommendations for future iterations. First, we recommend the curriculum be expanded to 2 hours in order to more thoroughly discuss all cases. Second, it may be useful to have more than one resident to help cofacilitate the session in order to provide input on the nuances and logistics of cross-cover care. In cross-cover, as in many clinical situations, there are many possible different approaches to a specific situation. While we incorporated the most critical concepts in our facilitator’s guide, there are many nuances for each clinical case. Including more residents in the discussion, as well as increasing the length of the session, may be helpful to foster these discussions in a more in-depth manner and highlight the uncertainty surrounding specific patient scenarios. Lastly, during the case discussions, it was surprising how many students felt discomfort with deferring a cross-cover issue to the primary team, even when clinically appropriate. We recommend referring to specific published guidelines⁶ about when this action is clinically

appropriate, as this seemed to help allay student anxiety about these situations. If institutions have local guidelines about any aspects of cross-cover care (e.g., when to notify an attending physician overnight, when to document a cross-cover note), it may be helpful to incorporate these as well into the case discussion.

In conclusion, our curriculum represents an approach to teaching cross-cover that resulted in improved student confidence and performance on clinical case scenarios intended to mimic common cross-cover scenarios. In a think-pair-share format, students were able to discuss cross-cover scenarios with peers facilitated by more experienced clinicians, which helped to create a safe learning environment for students. Further longitudinal follow-up surveys into residency, as well as repeating the intervention at other institutions, could provide additional support for this curriculum.

Appendices

- A. Activity Packet - Students.docx
- B. Facilitator Guide.docx

C. Survey & Quiz (Pre & Post).docx

D. Quiz Scoring Key.docx

All appendices are peer reviewed as integral parts of the Original Publication.

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Disclosures

None to report.

Funding/Support

None to report.

Ethical Approval

The University of Michigan Institutional Review Board approved this study.

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Received: September 7, 2019

Accepted: January 25, 2020

Published: August 10, 2020