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### **Are medical students trained in cross-cover?**

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#### **Abstract**

**Purpose:** To examine the current state of cross-cover education in undergraduate medical education and intern perceived readiness to provide cross-cover.

**Method:** An electronic survey was distributed to 126 incoming interns in surgery, internal medicine, family medicine, and pediatrics residencies at a single academic center.

Information regarding prior cross-cover training, experience, confidence, and responses to a sample cross-cover case were obtained.

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**Results:** Survey response rate was 88/126 (69.8%), which included both partial and complete responses. Fifty-seven interns out of 85 (67.1%) had no formal training and 51 (60.0%) had no experience performing cross-cover. They reported feeling unprepared to take cross-cover, with an average score of 1.8 on a 5-point Likert scale (1=Not at all confident, 5=Extremely confident). Interns had more confidence in performing cross-cover tasks if they had prior direct cross-cover experience ( $P=.001$ ) and were the least confident in performing initial evaluation and management of urgent issues (Likert score = 1.6)

Scores on the sample case were correlated with the amount of prior patient experience ( $P=.06$ ). Only 77% of interns indicated they would notify their senior resident in two urgent scenarios. Those that reported higher confidence in knowing when to ask for help were more likely to appropriately notify their senior ( $P=.005$ ).

**Conclusions:** We identified gaps in the cross-cover training and preparedness of incoming interns. This has important implications for the first day of residency when interns are often asked to perform cross-coverage, yet feel unprepared to do so and express the greatest concern in urgent cross-cover scenarios. Addressing this curricular gap is crucial in assuring safe cross-cover care.

## Introduction

Cross-cover is the practice of caring for hospitalized patients when the primary team is absent from the hospital (1). The initiation of Accreditation Council for Graduate Medical Education (ACGME) restricted duty hours has led to increased patient hand-overs and discontinuity of care for hospitalized patients (2,3). As a result, the amount of time that physicians spend providing cross-cover has increased significantly. A common example of cross-cover is when interns working overnight (night shift) care for patients admitted by the day team of their respective specialties (e.g. general surgery night intern caring for general surgery day time patients).

Providing cross-cover encompasses several unique challenges (1). First, interns are not intimately familiar with the patient's circumstances and often have not participated in development of the care plan. Second, interns must determine the urgency of addressing the concern (i.e. when they can defer an issue to the primary team versus the need to see a patient immediately) and when to notify their senior (supervising) resident. Finally, the

cross-cover mindset is such that “quick fixes” may be considered acceptable given a feeling of lack of ownership for the patient (1).

Extensive literature exists describing end of shift handovers (4,5), however, the training that medical students receive about cross-cover care (i.e. how they *utilize* the handover) is unknown. Our purpose is to describe the current state of cross-cover education of interns who are starting residency at a single academic institution from a broad range of medical schools. The research questions addressed are:

- (1) Do students receive cross-cover training, and if so, what types of training?
- (2) Does previous cross-cover experience during medical school impact intern confidence levels?
- (3) Does cross-cover training and/or experience during medical school result in greater knowledge?

## Methods

**Setting.** An anonymous survey was distributed electronically using Qualtrics (Provo, UT) to incoming interns in internal medicine (n=44), internal medicine preliminary year (e.g. neurology residents spending their first year in internal medicine, n=8), medicine-pediatrics (n=8), pediatrics (n=24), family medicine (n=11), general surgery (n=7), and general surgery preliminary year (e.g. urology, orthopedic surgery residents spending their first year in general surgery, n=24) at a single academic tertiary care center in 2017 during intern orientation prior to patient care responsibilities.

**Survey instrument.** Demographic data were collected including gender, medical school, and residency specialty. The survey inquired about cross-coverage training and experience and perceived readiness to perform cross-coverage (Table 1).

Interns were also presented with a case of an 18-year-old patient hospitalized with a severe ulcerative colitis flare. They were asked to respond to seven cross-cover scenarios and to choose from the following actions: (1) No action, (2) Enter order for diagnostic test or therapy, (3) Evaluate and/or discuss with patient at bedside, (4) Defer to primary team. The interns were also asked if they would notify their senior resident for each scenario. The survey was reviewed prior to distribution by program leadership in surgery, pediatrics,

internal medicine, family medicine, and medicine-pediatrics. Using this input, the physician investigators (LH, SH) assigned points to each response ranging from: +2 for most appropriate response to -2 points for potential harm. The survey is published online as supporting information (Appendix S1).

**Definitions.** The fourth year of medical school (M4) was defined as the final year of medical school. Sub-internship was defined as a M4 rotation where students take on the responsibilities of an intern in a supervised setting. “Formal training” was defined as lecture-based or simulated paging scenarios and “informal training” as observing others provide cross-coverage or discussion with faculty member or senior resident. “Low experience” was defined as providing cross-coverage for 15 or less patients and “high experience” as 16 or more patients. Regarding the case, “urgent” scenarios were defined as those that could cause potential patient harm if not addressed promptly; all others were considered “routine”.

**Statistical analyses.** Participant demographic information and nominal data are reported as frequency; Likert scales and test scores are report as means and standard deviations. Analyses of variance (ANOVA) were used to analyze the mean differences for interns’ confidence levels by prior training received and by level of experience. ANOVA was also used to analyze test scores and sub-scores by prior training received and by level of experience. Post hoc differences were determined by Tukey-Kramer HSD (global  $P=.05$ ). All analyses were completed using JMP Pro version 13.1.

The study was determined exempt by the University of Michigan Institutional Review Board (HUM00131005).

## Results

Response rate was 88 of 126 (60.8%); 78 completed the entire survey and 10 provided partial responses. Response rates varied by department (Table 2). Interns represented 39 medical schools across the United States.

**Prior cross-cover training.** Eighty-five respondents answered the question on prior cross-cover training. Of these, 37 (43.5%) reported no prior formal or informal training in cross-coverage. Of the 47 interns (55.3%) that received training, 36 (76.6%) had informal teaching by resident or faculty member, 36 (76.6%) observed others providing cross-cover, 18 (38.3%) had received a lecture(s), and 18 (38.3%) participated in simulated paging exercises.

Only 33 interns out of 85 (38.8%) had provided direct cross-cover on hospitalized patients in medical school, most frequently during their sub-internship (N=24, 72.7%) (Figure 1). Twenty-nine of the 33 interns reported the extent of their experience; 17 (58.6%) had low experience and 12 (41.4%) had high experience.

**Intern confidence.** Using the 5-point Likert scale (1=Not at all prepared, 5=Extremely prepared), the mean score ( $\pm$  SD) reported for overall preparedness was 1.8 ( $\pm$  0.7). Interns felt least prepared in performing initial evaluation and management of emergent situations (1.6  $\pm$  0.7). Confidence in global cross-cover preparedness was greater for interns with high experience in medical school compared to those with no experience (P=.001, Table 3).

**Sample cross-cover case.** The mean percent correct ( $\pm$ SD) on the practice cross-coverage case was 75.8% ( $\pm$  10.3%). While total scores tended to improve with greater experience, there was no significant differences among interns with no prior experience, low experience, and high experience (74.0% vs. 76.8% vs. 82.4%, P=.06).

Interns notified the senior resident 77% of the time for urgent cross-cover issues. There was no difference based on previous training regarding appropriate notification of their senior resident. However, interns with increased confidence in knowing when to ask for help were more likely to notify their senior appropriately (P=.01) (Figure 2).

## Discussion

This study highlights several gaps in the perceived and expected training of incoming interns in regard to cross-cover care. First, experience in providing cross-coverage varies

broadly, with most interns reporting no experience or formal training. Second, incoming interns report low confidence in many areas of cross coverage regardless of previous training, with the lowest self-reported confidence in the ability to perform initial evaluation and management of urgent scenarios. Third, interns vary in their threshold to notify a senior resident about cross-cover issues.

The majority of interns surveyed feel unprepared to take cross-cover, especially in urgent scenarios. Possible explanations include that medical students are not given the opportunity to manage urgent scenarios, they are protected from taking cross-coverage on sicker patients, or that the acuity of the situation leads to greater anxiety and therefore less confidence. This represents a gap in the perceived and expected requirements of graduated medical students despite being included as an entrustable professional activity by the Association of American Medical Colleges (6).

The sample cross-cover case revealed that almost a quarter of interns would not notify their senior residents about urgent clinical scenarios. Interns are often the front-line physicians; if they do not identify that a patient has an urgent problem this may lead to adverse outcomes (7). Prior survey data from both internal medicine program directors (8) and residents (9), indicates that knowing when to seek assistance is one of the most important skills for new interns. Our data demonstrates that interns with increased confidence in asking for help are more likely to do so appropriately. Hence, it may be worthwhile to assess incoming interns' self-perception of performing this task to identify those that may need additional intervention in this area.

This study has several limitations. It was performed at a single academic institution. The survey was distributed during intern orientation, a time that can be anxiety-provoking. Lastly, the sample case was not validated based on training level. The strengths of this study include representation from a broad range of medical schools and residency programs and a high survey response rate.

In conclusion, the diversity in cross-cover training, low confidence of trainees, and difficulty in knowing when to ask for help when transitioning into the intern role highlight gaps in preparation for the first day of internship. Based on this data, we suggest that formal cross-cover curricula be implemented in medical schools and intern orientation, with a focus on urgent scenarios as well as guidance on when to ask for help. This could be

performed through incorporation of supervised cross-cover into sub-internships, or simulated paging curricula where cross-cover decision-making skills can be formally assessed (10). Until this is implemented there is a need for increased awareness in graduate medical education about diversity of cross-cover preparedness of incoming trainees and a need to assess whether a trainee will seek assistance when needed.

#### References:

1. Kakarala K, Jain SH. The “cross-cover” mindset. *J Patient Saf* 2012;8(1):1–2.
2. Desai SV, Feldman L, Brown L, Dezube R, Yeh H-C, Punjabi N, et al. Effect of the 2011 vs 2003 duty hour regulation-compliant models on sleep duration, trainee education, and continuity of patient care among internal medicine house staff: a randomized trial. *JAMA Intern Med* 2013;173(8):649–55.
3. Drolet BC, Khokhar MT, Fischer SA. The 2011 duty-hour requirements--a survey of residency program directors. *N Engl J Med* 2013;368(8):694–7.
4. Vidyarthi AR, Arora V, Schnipper JL, Wall SD, Wachter RM. Managing discontinuity in academic medical centers: strategies for a safe and effective resident sign-out. *J Hosp Med* 2006;1(4):257–66.
5. Starmer AJ, Spector ND, Srivastava R, West DC, Rosenbluth G, Allen AD, et al. Changes in medical errors after implementation of a handoff program. *N Engl J Med* 2014;371(19):1803–12.
6. Flynn T, Cali S, Carraccio C, Clearly L, Fulton T, Garrity M, et al. Core Entrustable Professional Activities for Entering Residency. Curriculum Developers’ Guide. Assoc Am Med Coll. 2014;
7. Wilson RM, Harrison BT, Gibberd RW, Hamilton JD. An analysis of the causes of adverse events from the Quality in Australian Health Care Study. *Med J Aust* 1999;170(9):411–5.
8. McQuillan P, Pilkington S, Allan A, Taylor B, Short A, Morgan G, et al. Confidential inquiry into quality of care before admission to intensive care. *BMJ* 1998;316(7148):1853–8.
9. Angus SV, Vu TR, Willett LL, Call S, Halvorsen AJ, Chaudhry S. Internal

Medicine Residency Program Directors' Views of the Core Entrustable Professional Activities for Entering Residency: An Opportunity to Enhance Communication of Competency Along the Continuum. *Acad Med J Assoc Am Med Coll* 2017;92(6):785–91.

10. Frischknecht AC, Boehler ML, Schwind CJ, Brunsvold ME, Gruppen LD, Brenner MJ, et al. How prepared are your interns to take calls? Results of a multi-institutional study of simulated pages to prepare medical students for surgery internship. *Am J Surg* 2014; 208(2):307–15.

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**Figure 1:** Medical School Experience of 84 Incoming Interns Providing Cross-Cover by Rotation Type<sup>a</sup>, 2017

Abbreviations: M3 = Third year medical student, M4 = Fourth year medical student

<sup>a</sup> Percentages do not add up to 100% as interns (n=84) could choose more than one item.

<sup>b</sup> Other = Preliminary year



**Figure 2:** Seventy-One Incoming Interns' Self-Reported Confidence<sup>a</sup> Score and Appropriate Notification of Senior Resident about Cross-Cover Issues (% Correct), 2017

<sup>a</sup>One-way ANOVA test comparing low confidence (Not at all or somewhat confident), moderate confidence, and high confidence (Very or extremely confident),  $p=.01$

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Table 1: Cross-Cover Survey Instrument Distributed to Incoming Interns, July 2017

Questions Domain	Sample Item	Response Options / Scoring
Medical School Training	During medical school, did you receive training and/or education in the care of cross-cover patients?	Yes / No
	<p>What type(s) of training and/or education did you receive during medical school concerning cross-cover patients?</p> <p>I attended a formal lecture on cross-cover evaluation and/or management.</p> <p>I had informal teaching (i.e., faculty member discussed it with me)</p> <p>I observed others providing cross-coverage</p> <p>I participated in standardized patient assessments or mock paging exercises</p> <p>I have not had any training/education</p>	Yes / No
Patient Experience	When were you personally responsible for providing cross-coverage on hospitalized patients?	<p>a. M3 clerkship</p> <p>b. M4 sub-internship</p> <p>c. M4 elective</p> <p>d. Night float rotation</p> <p>e. I was not personally responsible</p>
	How many patients have you directly provided cross-coverage for during your medical school training?	<p>a. None</p> <p>b. 1-15 patients</p> <p>c. 16-30 patients</p> <p>d. More than 30 patients</p>
Confidence Level Entering Internship	<p>How would you rate your level of confidence for the following inpatient cross-cover activities?</p> <p>Triaging cross-cover issues</p> <p>Performing initial evaluation and management of routine cross-cover issues</p> <p>Performing initial evaluation and management of urgent or emergent cross-cover issues</p> <p>Communicating with nurses about cross-cover patients</p>	<p>1 = Not at all confident</p> <p>2 = Somewhat confident</p> <p>3 = Moderately confident</p> <p>4 = Very confident</p> <p>5 = Extremely confident</p>

Knowing when to ask for help with cross-cover patients		
Self-Reported Preparedness	How prepared do you feel to take cross-cover as you start your intern year?	1 = Not at all prepared 2 = Somewhat prepared 3 = Moderately prepared 4 = Very prepared 5 = Extremely prepared
Additional Medical School Training	Would more education and/or practice opportunities with cross-cover during medical school have helped you feel more prepared?	Yes / No

Abbreviations: M3 = Third year medical student, M4 = Fourth year medical student

Table 2: Demographic Data of 88 Incoming Intern Survey Respondents, 2017

Residency program	N=88	% (n)
Family Medicine		10.2 (9)
General Surgery		31.9 (28)
Categorical		8.0 (3)
Preliminary		23.9 (21)
Internal Medicine		38.6 (34)
Categorical		34.1 (30)
Preliminary		4.5 (4)
Medicine-Pediatrics		5.7 (5)
Pediatrics		13.6 (12)
Gender	N=87	
Female		50.6 (44)
Male		49.4 (43)

Table 3: Self-reported Confidence<sup>a</sup> of 85 Incoming Interns Performing Cross-Cover by Previous Experience, 2017

Cross-cover task	No experience <sup>b</sup>	Low	High	P value <sup>c</sup>	Post-hoc
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	(Mean ± SD)	experience <sup>b</sup> (Mean ± SD)	experience <sup>b</sup> (Mean ± SD)		Test <sup>d</sup>
Preparation to take cross-cover (global)	1.6 ± 0.7	2.0 ± 0.6	2.3 ± 0.8	.001	High>No
Triage	1.7 ± 0.7	2.1 ± 0.4	2.4 ± 0.7	<.001	High>No
Initial evaluation and management of urgent or emergent issues	1.6 ± 0.7	1.6 ± 0.7	1.8 ± 1.0	.82	--
Initial evaluation and management of routine issues	1.9 ± 0.8	2.3 ± 0.6	2.7 ± 0.7	.001	High>No
Communication with nurses	2.0 ± 0.1	2.4 ± 0.2	3.0 ± 0.2	.002	High>No
Knowing when to ask for help	2.1 ± 0.1	2.4 ± 0.2	3.0 ± 0.3	.01	High>No

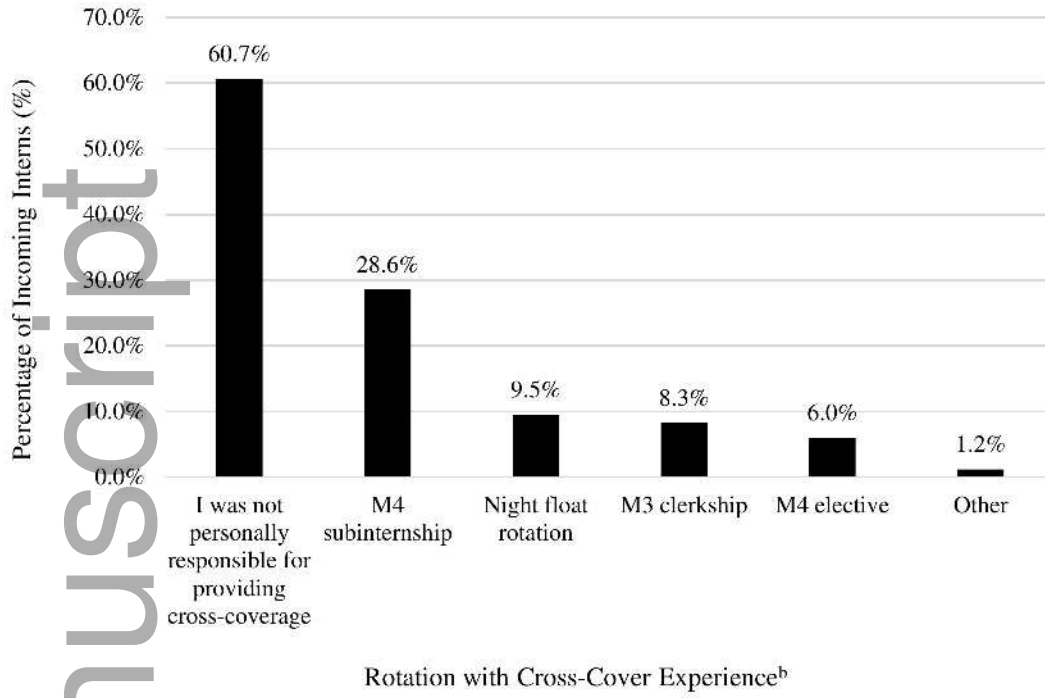
<sup>a</sup> Confidence level assessed using a 5-point Likert scale: 1=Not at all confident to 5 = Extremely confident.

<sup>b</sup> Experience levels: No experience=no prior direct cross-cover care, Low experience=Prior experience crossing covering for 1-15 patients, and High experience=Prior experience cross covering for ≥16 patients.

<sup>c</sup> One-way ANOVA test with post-hoc comparisons using Tukey-Kramer HSD (global p=0.05).

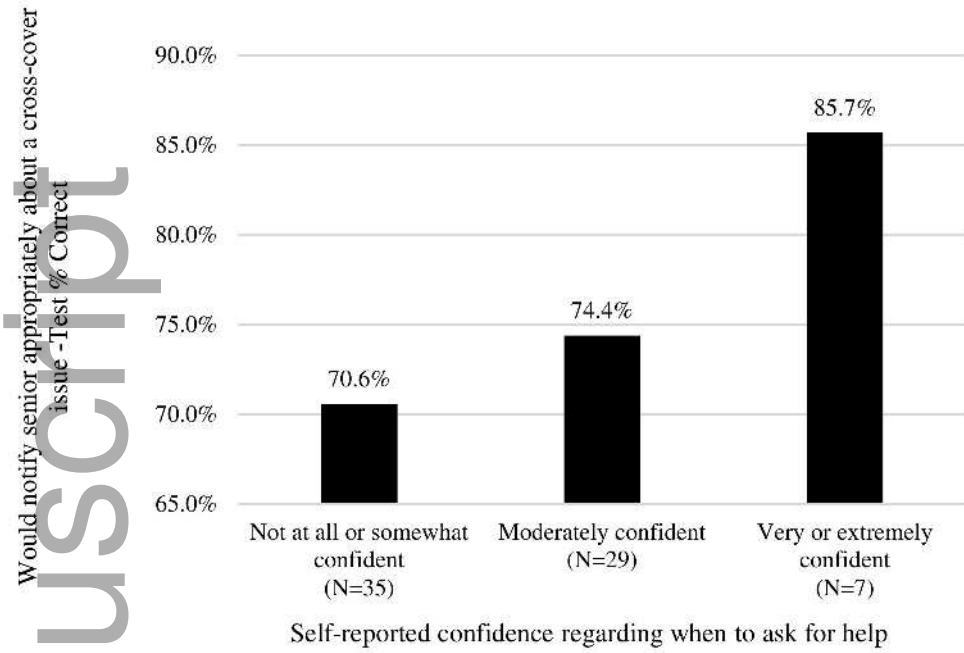
<sup>d</sup> Tukey-Kramer HSD post-hoc comparisons (global P=0.05).

Figure 1



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Figure 2



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