

Article

Preparation for Residency: Effect of Formalized Patient Handover Instruction for Fourth-Year Medical Students

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Abstract: A major aspect of transition of care is the patient handover, during which miscommunication can significantly cause medical error and harm in patient care. Few medical schools in the U.S. offer formalized instructions on patient handovers, with most medical students learning from interns and residents through unstructured teaching. The aim of this study was to assess the effectiveness of a patient handover curriculum we developed for fourth-year medical students to increase their confidence and skills. Graduating fourth-year medical students ($N = 98$) enrolled in a two-week Transition to Residency (TTR) course attended an interactive session on patient handovers. During this session, students were presented with the I-PASS (illness severity, patient summary, action items, situation awareness and contingency planning, synthesis by receiver) mnemonic, went over case vignettes, and practiced giving and receiving handovers with a partner using the I-PASS template. At the end of TTR, students participated in an OSCE (Objective Structured Clinical Exam) activity that consisted of two standardized patient cases on blood transfusion and informed consent. Overall, our students did well with including important information in their Patient Summary (P: Case Scenario 1 Mean Score 56%; Case Scenario 2 Mean Score: 68%) and Action List (A: Case Scenario 2 Mean Score; 78%; Case Scenario 2 Mean Score: 87%) in their simulated patient case scenario. Pre-and-post survey results also indicated a significant improvement on student level of confidence (agreed or strongly agreed) in giving a patient handover (Pre: 53.1%; Post: 93.6%, $p < 0.001$), in receiving a patient handover (Pre: 58.2%; Post: 92.5%, $p < 0.001$), and in knowing what pertinent information to include in a patient handover (Pre: 62.2%; Post: 89.4%, $p < 0.001$). This study underscores the importance of systematic and repeated patient handover education throughout medical school training.

Keywords: patient handover; residency readiness; residency preparedness; medical student; medical education; I-PASS method; simulation-based learning; objective structured clinical exam (OSCE); transition to residency



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1. Introduction

Transition of care involves the transfer of care of a patient between medical practitioners and/or settings. A major aspect of the transition of care is the patient handover, during which miscommunication is a significant cause of medical error and patient harm [1–3]. For example,

medical errors from inadequate patient handovers between inpatient to outpatient settings include medication continuity errors, work-up errors, and test follow-up errors, ultimately resulting in the discontinuity of care and thereby requiring rehospitalization in some cases [4]. Multiple interventions have been developed and implemented in various healthcare settings to assess their efficacy. One such intervention, the I-PASS method, was originally developed for use with acute-care pediatric patients, and has since been implemented in other hospital settings [5].

I-PASS includes illness severity, patient summary, action list, situation awareness/contingency planning, and synthesis by the receiver (Table 1) [6]. According to the I-PASS institute, many hospitals and health systems in the U.S. have incorporated the I-PASS method into their clinical practice at an institutional level, including, but not limited to, Boston Medical Center, Dartmouth Health, and Kentucky Hospital Association [7]. A relative decrease of 23% in medical errors and a relative decrease of 20% in adverse events was observed following the implementation of the I-PASS method in a pediatric inpatient population [8]. Furthermore, when compared to a policy mandate on task accountability, Plan-Do-Study-Act (PDSA), and didactics (control), I-PASS demonstrated the best improvement in sign-out quality when assessed using a standardized sign-out checklist [9]. Another handoff tool, SBAR (Situation, Background, Assessment, Recommendation), is commonly used to convey information when escalating care. However, SBAR lacks the specificity needed for a comprehensive yet concise handoff. As such, I-PASS is the preferred handoff tool in teaching hospitals that often treat complex patients requiring more detailed action and contingency plans [10,11].

Table 1. Elements of the I-PASS Method and Description of Each Element.

I-PASS Element	Description
I: Illness severity	- Stable, Watcher, or Unstable
P: Patient summary	- Summary statement
	- Events leading up to admission
	- Hospital course
	- Ongoing assessment
	- Plan
A: Action list	- To do list
	- Timeline and ownership
S: Situation awareness and contingency planning	- Know what is going on
	- Plan for what might happen
S: Synthesis by receiver	- Receiver summarizes what was heard
	- Asks questions

In recognition of the importance of patient handovers in clinical settings, the Association of American Medical Colleges (AAMC) included giving and receiving patient handovers as one of their 13 Core Entrustable Professional Activities for Entering Residency (Core EPAs) that all medical students should be able to perform upon entering residency regardless of specialty [12]. Despite this, few medical schools currently offer formalized instruction and assessment of patient handovers, with most medical students learning from interns and residents through unstructured teaching [13,14]. As a result of their lack of training in this skill, medical students often start residency without confidence in their ability to give and receive patient handovers [15,16]. In this study, we developed formalized instruction of the I-PASS method and created a strategy to assess the patient handover skills of fourth-year medical students.

2. Materials and Method

2.1. Study Design and Participants

This prospective study involved a convenience sample of graduating fourth-year medical students ($N = 98$) enrolled in the mandatory two-week Transition to Residency

(TTR) course at Stony Brook University Renaissance School of Medicine (RSOM) during Jan–Feb 2023. Participation in the study was voluntary, no student was excluded from the study, and there were no penalties for non-participation. Prior to the TTR course, there was no standardized didactic curriculum that included the I-PASS method offered to the medical students at RSOM. No other formal teaching and/or assessment on patient handover methods were part of the clerkship year, and handover education during clerkships varied widely depending on the supervising residents or attendings.

2.2. Curriculum and Intervention

During the TTR course, students received a 60-min didactic instruction on the I-PASS method and participated in role-play scenarios where they practiced handovers with peers (Figure 1). As part of the debrief of the role-play activity, the scenarios were reviewed as a group, and examples of appropriate handovers were provided.

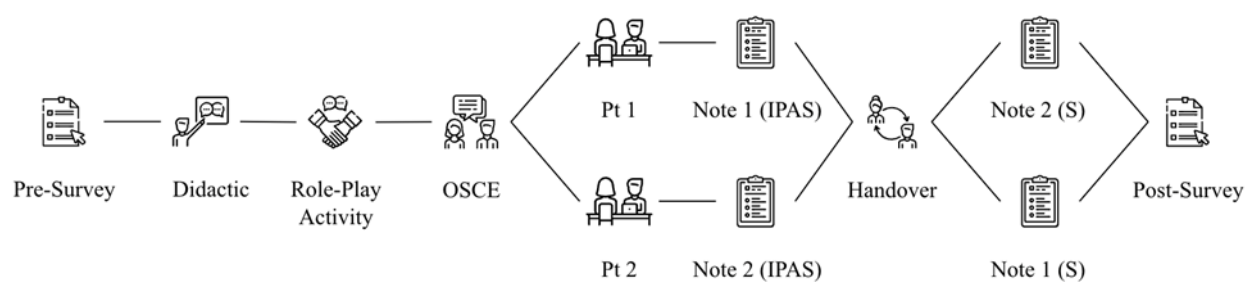


Figure 1. Flow Diagram of the TTR Curriculum.

Adopting Miller’s pyramid of clinical competence as the conceptual framework for assessing clinical skills, at the conclusion of the course, students participated in a 60-min summative OSCE (Objective Structured Clinical Exam) that offered them the opportunity to demonstrate competence at the “Shows How” level [17]. The summative OSCE involved standardized patient encounters with two possible scenarios: (1) a 64-year-old patient with hemorrhoids presenting for evaluation of rectal bleeding (Pt1), and (2) a 58-year-old post-colectomy patient with postoperative anemia (Pt2). As depicted in Figure 1, the student who sees Pt1 writes a note containing IPAS for Pt1, hands off Pt1 to another student, receives the handover for Pt2, and then writes the synthesis for Pt2, and vice versa. Both scenarios involved discussing blood transfusion risks and obtaining informed consent. These cases were created by the simulation center at RSOM to assess EPA 11 (obtaining informed consent). We used these cases in collaboration with the simulation center to also assess students’ skills with EPA 8 (patient handovers) [13].

2.3. Data Collection

Student Surveys: At the beginning of the course, students completed a pre-course survey developed specifically for our students and reviewed for face validity. The survey included questions about prior experience with giving and receiving patient handovers (Yes/No responses) as well as statements regarding their confidence and perception of giving or receiving patient handovers (Likert scale ratings; 1 = Strongly Disagree, 5 = Strongly Agree). Students were also presented with a patient vignette and instructed to write the handover they would give using the I-PASS method. Students were given one point each for listing the illness severity, patient summary, action list, and situation awareness/contingency planning, for a total of four maximum points. Students were given credit as long as they included a component of I-PASS even if their response was incorrect.

At the conclusion of the course, students completed a post-course survey to assess their confidence in giving and receiving handovers (same questions as the pre-course

survey), the effectiveness of the didactic education, and their experience with completing the standardized patient encounters.

Summative OSCE: For the summative OSCE, as part of the post-encounter exercise, students were instructed to write up the illness severity (I), patient summary (P), action list (A), and situation awareness/contingency planning (S) for their patient scenario. Once this was documented, the student had to then verbally hand over their patient to another student who did not have the same scenario. Each student was scored on the I-PAS components of their own case and the synthesis component of the received handover, with a grading rubric applied consistently across cases (Appendix A). The OSCE grading rubric was developed by the TTR faculty, highlighting critical action items in each case. The handoff criteria for both cases were made as similar as possible.

2.4. Data Analysis

Descriptive statistics were performed to obtain the mean, count, and percentages of the survey responses as well as the OSCE post-encounter handover exercise write-ups. Independent samples *t*-tests were calculated to identify significant differences between pre-and-post-course survey responses. Chi-square analyses were conducted to identify differences across groups of learners based on survey responses and performance on the summative OSCE activity. To determine the relevance between the giver IPAS score and the receiver Synthesis score, correlation analysis was conducted with a significance level of 0.05. In terms of the summative OSCE, two project contributors independently (MZ and SW) graded either the handover or the synthesis portions to minimize grading inconsistency.

3. Results

A total of 98 fourth-year medical students participated in this study. Most of the students ($n = 60$, 61.2%) had prior experience with both giving and receiving a patient handover, whereas 20 students (20.4%) had experience with either giving or receiving a patient handover, and 18 students (18.4%) did not have any prior experience at all.

3.1. Confidence in Patient Handover and IPAS Score

Chi-square analyses of the pre-course survey indicate that a significantly higher proportion of students who had prior experience with both giving and receiving patient handover agreed that they were confident in giving a patient handover (70.0%), confident in receiving a patient handover (76.7%), and knew what pertinent information to include in a patient handover (78.3%), compared to students that only had experience with either giving or receiving a patient handover (42.1%, 26.3%, 63.2%) and compared to students that had no prior experience at all (10.5%, 31.6%, 10.5%) (Table 2).

Additionally, there was a significant increase in the percentage of students that were confident in giving, receiving, and knowing what pertinent information to include in a patient handover from the beginning of the TTR course (pre-course survey: 53.1%, 58.2%, 62.2%) to after completing the course (post-course survey: 93.5%, 92.5%, 89.2%) [$\chi^2 = 40.7$, $p < 0.001$; $\chi^2 = 30.3$, $p < 0.001$; $\chi^2 = 22.0$, $p < 0.001$] (Table 3).

Regarding the patient vignette written handover in the pre-survey, the percentage of students that received a point for listing the I-PASS elements were as follows: 19.6% (19/97) for Illness Severity, 95.9% (93/97) for Patient Summary, 40.2% (39/97) for Action List, and 46.4% (45/97) for Situation Awareness/Contingency Planning. Eleven students received the full 4 points, whereas 17 students got 3 points, 34 students had 2 points, 33 students received 1 point, and 2 students did not get any points.

Table 2. Comparing Fourth-year Medical Student Level of Confidence in Giving and Receiving a Patient Handover at the Beginning of a Transition to Residency Course Based on Prior Experience ($N = 98$).

Survey Item	Prior Experience in Giving and/or Receiving Patient Handover	n	% for Each Likert-Scale Rating					χ^2	p Value
			SD	D	Neutral	A	SA		
I am confident in giving a patient handover	Experience BOTH giving and receiving	60	1.7	11.7	16.7	63.3	6.7	25.3	0.001
	Experience giving OR receiving	19	5.3	26.3	26.3	42.1	0.0		
	No experience	19	15.8	42.1	31.6	10.5	0.0		
I am confident in receiving a patient handover	Experience BOTH giving and receiving	60	0.0	8.3	15.0	53.3	23.3	31.9	0.000
	Experience giving OR receiving	19	15.8	15.8	42.1	26.3	0.0		
	No experience	19	15.8	31.6	21.1	31.6	0.0		
I am confident in knowing what pertinent information to include in a patient handover	Experience BOTH giving and receiving	60	1.7	3.3	16.7	70.0	8.3	36.3	0.000
	Experience giving OR receiving	19	10.5	15.8	10.5	63.2	0.0		
	No experience	19	10.5	42.1	36.8	10.5	0.0		

Table 3. Fourth-year Medical Student Level of Confidence in Giving and Receiving a Patient Handover at the Beginning and End of a Transition to Residency Course.

Survey Item	Transition to Residency Course (TTR)	n	% for Each Likert-Scale Rating					χ^2	p Value
			SD	D	Neutral	A	SA		
I am confident in giving a patient handover	Pre-Course	98	5.1	20.4	21.4	49.0	4.1	44.6	0.000
	Post-Course	93	0.0	1.1	5.4	74.2	19.4		
I am confident in receiving a patient handover	Pre-Course	98	6.1	14.3	21.4	43.9	14.3	31.9	0.000
	Post-Course	93	0.0	2.2	5.4	61.3	31.2		
I am confident in knowing what pertinent information to include in a patient handover	Pre-Course	98	5.1	13.3	19.4	57.1	5.1	27.4	0.000
	Post-Course	93	0.0	1.1	9.7	68.8	20.4		

3.2. Giving a Patient Handover

Of the 98 TTR students, 6 students were not present for the summative OSCE due to excused absences (participation rate: 94.9%, 93/98). In the summative OSCE post-encounter exercise, 27 of the 93 participating students (29%) did not include a description of the patients' Illness Severity (I) in their handover write-ups (Table 4). For the Patient Summary (P) section, students correctly listed many of the key information expected in a handoff, averaging a mean P score of 56% for patient scenario 1 (Pt1) and 68% average P score for patient scenario 2 (Pt2). However, regardless of which patient scenario, a lower number of students included discussion about allergy history (19/93 = 20.4%), prior blood transfusions (19/93 = 20.4%), as well as risk factors from their past medical history. Also, not all students noted that the patient had consented for a blood transfusion (32/47 students with Pt1; 33/46 students with Pt2).

Table 4. Number of Students Correctly Listing Key Information in a Written Patient Handover Using the I-PASS Framework: Illness Severity (I) and Patient Summary (P) Answers.

Patient 1 Handover Write-Up (n = 47)		Patient 2 Handover Write-Up (n = 46)	
Illness Severity Answer	# correctly listed	Illness Severity Answer	# correctly listed
• Watcher	30	• Watcher	36
Patient Summary Answers	# correctly listed	Patient Summary Answers	# correctly listed
• 64yo M/F with hemorrhoids presenting for evaluation of 6 months intermittent rectal bleeding	47	• 58yo M/F with hx diverticulitis	46
• Found to be anemic to 6.4 on outside labs by PCP.	45	• CAD s/p stent	25
• Patient also has had 3 months of fatigue	39	• POD #2 after partial colectomy for recurrent diverticulitis	46
• Weight loss	18	• Surgery complicated by significant blood loss	36
• 2 weeks dyspnea on exertion	31	• Found to be anemic to 6.4 on AM labs,	43
• Has family hx of colon cancer	30	• 1d significant fatigue	44
• No prior colonoscopies	12	• 1d significant DOE	38
• No known drug allergies	7	• Normal non-bloody BM today	7
• Patient has been consented for blood	32	• Penicillin allergy (rash)	12
• Never had a transfusion before	4	• Patient has been consented for blood	33
		• Never had a blood transfusion before	15

In terms of items on the Action List (A), almost all students, for both patients, correctly wrote “order 1 unit of blood to be transfused over 2–4 h”. on the to-do list. Whereas approximately half of the students (25/47) with Pt1 listed “post transfusion CBC 2h after transfusion” as an action item; over three-quarters of the students (35/46) with Pt2 included

this in their write-ups. Additionally, for the Pt1 case, 40 of the 47 students appropriately added “consult with GI for rectal bleeding/colonoscopy” (Table 5).

Table 5. Number of Students Correctly Listing Key Information in a Written Patient Handover Using the I-PASS Framework: Action List (A) and Situation Awareness/Contingency Planning (S) Answers.

Patient 1 Handover Write-Up (<i>n</i> = 47)		Patient 2 Handover Write-Up (<i>n</i> = 46)	
Action List Answers	# correctly listed	Action List Answers	# correctly listed
• Order 1 unit of blood to be transfused over 2–4 h	45	• Order 1 unit of blood to be transfused over 2–4 h	45
• Post transfusion CBC 2 h after transfusion	25	• Post transfusion CBC 2 h after transfusion	35
• Consult	40		
Situation Awareness and Contingency Planning Answers	# correctly listed	Situation Awareness and Contingency Planning Answers	# correctly listed
• Observe for signs of transfusion reactions as the patient has never had a blood transfusion before	23	• Observe for signs of transfusion reactions as the patient has never had a blood transfusion before	32
		• Monitor for worsening symptoms of fatigue, DOE	42
		• If so, consider getting a CT abdomen to assess for bleeding	8

As for Situation Awareness/Contingency Planning (S), 59% (55/93) of the students indicated that they needed to “observe for signs of transfusion reactions” as part of their contingency plan. This should be expected for both cases as this may be a major adverse event from a transfusion. For the Pt2 case, almost all students (42/46) also noted that they need to “monitor for worsening symptoms of fatigue and dyspnea on exertion” (Table 5). Overall, the mean IPAS score was 56.5% for students who had Pt1 and 66.5% for students who had Pt2.

3.3. Receiving a Patient Handover and Comparisons Between Giver and Receiver

Students who received Pt1 from their peers had a mean Synthesis score of 54.0%, whereas students who had Pt2 handed over to them had a mean Synthesis score of 55.2%. Correlation analysis between the IPAS score of the giver and the Synthesis score of the receiver showed a significantly positive correlation ($r = 0.336$, $p = 0.001$). Upon a closer look, for Pt1, there was no significant correlation between the giver and receiver scores ($r = 0.142$, $p = 0.348$); however, there was a significantly strong, positive correlation between the IPAS score and Synthesis score for Pt2 ($r = 0.629$, $p < 0.001$). In general, key information that most students had missed in the IPAS write-up was also missing in the Synthesis write-up. Factors that a low number of students listed in their Patient Summary section write-up had an even lower number included in their Synthesis write-up [e.g., prior blood transfusion (9/93)]. For the handoff of Pt1, there was a larger discrepancy of noted risk factors from the patient’s past medical history between the IPAS and Synthesis write-ups.

3.4. Student Feedback

Approximately 87% of the students either agreed or strongly agreed that the didactic education offered in the TTR course was useful, 83% agreed that the role-playing exercise was good, and 88% indicated that the summative OSCE activity was helpful. Common themes from the written comments include: (1) a formal introduction to handoff techniques should be made earlier in the curriculum, (2) allow for more opportunities to practice this important skill, (3) training on calling consults using the I-PASS method is also needed, and

(4) examples of common mistakes made in handoffs that have led to patient harm would be helpful.

4. Discussion

Our study provides a structured framework for educating and assessing medical students' skills in patient handover. We aimed to address a gap in education for the students at RSOM, who, prior to this study, did not have uniform education provided regarding how to give an effective patient handover. During clinical clerkships, although students "learn by doing", the feedback received after giving patient handovers can often be variable depending on the physician supervising them.

We developed formalized instruction and assessment of patient handovers for our graduating medical students as part of their preparation for residency training. By exposing fourth-year medical students to a standardized method of giving patient handovers (e.g., I-PASS) and simulated practice, students can increase their proficiency in transitioning care and thereby reduce the incidence of medical errors in the future. A key innovation of our approach was the integration of patient handovers between students during a summative OSCE, which allowed them the opportunity to "show how" and demonstrate their competence regarding this clinical skill [17]. This integration not only offered students multiple opportunities to practice handover skills in a safe learning environment, but also allowed for immediate feedback using standardized rubrics, enhancing the learning process.

The learning opportunities provided in our study for students to engage in the practice of giving and receiving patient handovers during the Transition to Residency course (TTR) had a positive impact on the student's level of confidence. TTR students with prior experience in patient handovers were more confident than students who had limited experience (only either given or received a patient handover) or no experience at all. Regardless, at the conclusion of our residency training preparation course, students were overall significantly more confident with their patient handover skills (both giving and receiving) and indicated that they knew what pertinent information should be included in a patient handover.

Even so, student performance on the simulated patient handover scenarios showed that almost one-third of our students did not provide an illness severity statement regarding their patient. While this is a considerable improvement compared to the 80% of students who did not correctly list the Illness Severity in their pre-survey patient vignette handover write-up, it was surprising to see that there was still such a large number of students who did not simply write down a one-word summary of their patient's acuity. The illness severity (I) component of an I-PASS handover allows the receiver to identify patients at higher risk and helps the receiver prioritize patient care. Both simulated cases involved patients who were in the "watcher" category. Therefore, it is important for educators to emphasize to students the necessity and significance of communicating patient acuity in handovers. Furthermore, students may require more training in determining the acuity level of certain clinical scenarios.

Overall, our students did well with including important information in their Patient Summary (P) and Action List (A) in their simulated patient case scenario. Interestingly, although all students were instructed to obtain the patient's consent for a blood transfusion during their OSCE standardized patient encounter, not all students documented that their patient had consented to a blood transfusion. Obtaining and communicating patient informed consent is another concept that should be highlighted in our training on patient handover.

For the simulated patient scenario case 1 (Pt1: rectal bleeding), although fewer students included a repeat CBC post-transfusion, it could be argued that since the patient was no longer bleeding, a follow-up lab test might not be necessary. In patient scenario case 2 (Pt2: post-op bleeding), although more students ordered a repeat CBC post-transfusion, it could also be argued that this continued monitoring was more important since ongoing bleeding would be less conspicuous as it could be intra-abdominal. Nevertheless, it should be pointed out to students that a critical aspect of a patient handover is to include follow-up on patient outcomes (i.e., ongoing assessment), especially after an intervention. Also, differences in student performance between the two cases could be explained by the fact that it may be clearer for students to know what to include in the handover of post-operative surgery cases compared to the subtleties of more complex medicine cases. Therefore, when designing activities for patient handover training, it would be beneficial to ensure that a good mix of clinical conditions, various healthcare settings, and different levels of patient complexities are presented to students for instruction and practice. These patient handover activities should be introduced early and often in their medical school training with many examples provided and practice opportunities.

Lastly, for both the pre-survey patient case vignette and the simulated patient case scenario, students struggled to articulate a clear plan for further action. This shows that while our students are already proficient at being 'Reporters' or 'Interpreters' [18], there is a gap in their ability to be 'Managers'. This role involves anticipating complications, developing contingency plans, and appropriately communicating this information to the provider receiving the patient. It is worth noting that we had purposefully created patient case scenarios based on obtaining the patient's informed consent, thus we were able to address two of the 13 AAMC's core entrustable professional activities: EPA 8 (give or receive a patient handover to transition care responsibility) and EPA 11 (obtain informed consent for tests and/or procedures) [14]. These specific cases may not be the best representation of the student's ability to develop action plans, and future courses would benefit from a larger variety of OSCE cases.

Overall, while students reported increased confidence in delivering patient handovers after completing the course, their scores on the OSCE assessing knowledge of I-PASS components remain low. This is likely due to limited prior exposure to the OSCE handover format, a lack of formal handover education, and insufficient opportunities for practice cases. Moving forward, we believe that student performance and proficiency may improve by integrating handover education earlier in the medical school curriculum, specifically during third-year clinical clerkships. Introducing didactic instruction and incorporating the OSCE format repeatedly throughout clerkships would give students multiple opportunities to apply their skills. This approach would also expose them to a wider range of cases with varying complaints and acuity, enhancing their ability to assess illness severity and develop appropriate action plans. Furthermore, the additional practice will hone student communication skills, requiring them to deliver complete and pertinent patient information using a standard format, thus reducing the chances for miscommunication and resulting medical errors. We plan to introduce a debrief session for future cohorts following the summative OSCE, where students will receive formal feedback on their I-PASS notes and be provided with an example of an ideal note to reinforce best practices and enhance their skills.

A major limitation of this study is that it was conducted at a single institution with one cohort, limiting the generalizability of the findings. Furthermore, there was significant variability in prior handover experience among students, likely due to the variety of opportunities available to practice the skill of providing a handover. This difference likely influenced their performance and the observed impact of the educational intervention.

Additionally, the TTR course was an isolated opportunity for handover education and assessment for RSOM students. In order to provide as close to an equal learning opportunity as possible, two very similar cases were used during the OSCE intervention. However, this limits the exposure to and assessment of the application of I-PASS to patient encounters with varying levels of difficulty. Moreover, the OSCE was administered immediately after the course, which helped maximize student retention for the study. However, this timing significantly limited our ability to assess long-term skill retention. Additionally, we are currently unable to track these students into residency to evaluate the lasting impact of the intervention, though this should be considered for future cohorts.

Despite these limitations, our approach using patient vignettes and OSCE patient cases to assess handover skills shows promise. Incorporating handover exercises into every appropriate OSCE could standardize this critical skill throughout medical education, providing students with repeated practice opportunities in a variety of cases. Introducing patient handovers early and reinforcing them consistently during core clinical rotations could enhance preparedness across all specialties before students enter residency, during which the ability to provide effective patient handovers is crucial for providing quality care and preventing patient harm.

Overall, our study underscores the importance of systematic and repeated patient handover education throughout medical school. By establishing handovers as a standardized component of medical training, we can better prepare students to transition into residency with the essential skills needed to ensure patient safety. Significant room for growth remains in this area, but our study intervention represents a promising step forward in the education and assessment of patient handover skills for medical students. We modeled a curriculum that not only builds student confidence, but, more importantly, emphasizes core entrustable professional activities identified by the AAMC that all medical students are expected to perform with competence upon entering residency, regardless of their specialty.

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Data Availability Statement: The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

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Appendix A. Summative OSCE Patient Case Scenarios I-PASS Grading Rubric

OSCE Patient Case Scenario: Patient 1	Points
Illness Severity—if correct 1 point, if incorrect/no answer 0	
1. Watcher	
Patient Summary—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. 64yo M/F with hemorrhoids presenting for evaluation of 6 months intermittent rectal bleeding, found to be anemic to 6.4 on outside labs by PCP. Patient also has had 3 months of fatigue, weight loss, and 2 weeks dyspnea on exertion	
2. Has family hx of colon cancer, father died of it at 65. No prior colonoscopies	
3. Patient has consented to blood work, questions answered	
Action List—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. Order 1 unit of blood to be transfused over 2–4 h	
2. Post transfusion CBC 2 h after transfusion	
3. Admit to hospital for workup of anemia, rectal bleeding	
4. Consult GI today for rectal bleeding/colonoscopy	
Situation Awareness and Contingency Planning—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. Observe for signs of transfusion reactions as the patient has never had a blood transfusion before	
2. Have appropriate medications ordered to treat possible reaction	
Synthesis by Receiver—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. 64yo presenting with 6mo rectal bleeding, worsening fatigue, weight loss, DOE found to be anemic to 6.4 on outside labs. Has a family history of colon cancer, no prior colonoscopies. NKDA.	
2. Patient has consented to blood work, needs blood and post-transfusion CBC ordered, GI consultation, and admission to hospital. Monitor for transfusion reactions.	
OSCE Patient Case Scenario: Patient 2	Points
Illness Severity—if correct 1 point, if incorrect/no answer 0	
1. Watcher	
Patient Summary—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. 58yo M/F with hx diverticulitis, CAD s/p stent, POD #2 after partial colectomy for recurrent diverticulitis which was complicated by significant blood loss found to be anemic to 6.4 on AM labs, with 1d significant fatigue and DOE, has had normal non-bloody BM today. Has Penicillin allergy (rash).	
2. Never had a blood transfusion before	
3. Patient has consented to blood work, questions answered	
Action List—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. Order 1 unit of blood to be transfused over 2–4 h	
2. Post transfusion CBC 2 h after transfusion	
Situation Awareness and Contingency Planning—all included 1 point, some—partial (0.5 point), incorrect/none—0	
1. Observe for signs of transfusion reactions as the patient has never had a blood transfusion before	
2. Have appropriate medications ordered to treat possible reaction	
3. Monitor for worsening symptoms of fatigue, DOE, if so consider getting CT abdomen to assess for bleeding	

Synthesis by Receiver—all included 1 point, some—partial (0.5 point), incorrect/none—0

1. 58yo with hx CAD, recurrent diverticulitis now s/p partial colectomy c/b intra-operative blood loss found to have symptomatic anemia with Hgb 6.4.
2. Patient consented to blood work, blood and post-transfusion CBC need to be ordered. Monitor patient for worsening fatigue/DOE, consider CT abdomen if worsening.

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