Development, Implementation, and Dissemination of the I-PASS Handoff Curriculum: A Multisite Educational Intervention to Improve Patient Handoffs

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Abstract

Patient handoffs are a key source of communication failures and adverse events in hospitals. Despite Accreditation Council for Graduate Medical Education requirements for residency training programs to provide formal handoff skills training and to monitor handoffs, well-established curricula and validated skills assessment tools are lacking. Developing a handoff curriculum is challenging because of the need for standardized processes and faculty development, cultural resistance to change, and diverse institution- and unit-level factors. In this article, the authors apply a logic model to describe the process they used

from June 2010 to February 2014 to develop, implement, and disseminate an innovative, comprehensive handoff curriculum in pediatric residency training programs as a fundamental component of the multicenter Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs (I-PASS) Study. They describe resources, activities, and outputs, and report preliminary learner outcomes using data from resident and faculty evaluations of the I-PASS Handoff Curriculum: 96% of residents and 97% of faculty agreed or strongly agreed that the curriculum

promoted acquisition of relevant skills for patient care activities. They also share lessons learned that could be of value to others seeking to adopt a structured handoff curriculum or to develop large-scale curricular innovations that involve redesigning firmly established processes. These lessons include the importance of approaching curricular implementation as a transformational change effort, assembling a diverse team of junior and senior faculty to provide opportunities for mentoring and professional development, and linking the educational intervention with the direct measurement of patient outcomes.

Communication and handoff failures are among the root causes in nearly two-thirds of "sentinel events," which are serious, often fatal, preventable adverse events in hospitals.[1] In response to this issue, the Accreditation Council for Graduate Medical Education (ACGME) now requires that residency training programs provide formal instruction about patient handoffs and that faculty monitor handoffs and ensure adequate handoff skills through direct observation.[2–4] Yet despite these

requirements and patient safety concerns, well-established handoff curricula and validated tools to observe and assess trainees' handoff skills are lacking.[5–8]

Developing a handoff curriculum is challenging for multiple reasons. Handoffs often involve individuals with varying levels of skill, training, and responsibility. Although various approaches may be used to teach handoff skills (e.g., in-person didactic sessions, simulated clinical scenarios, video- and Web-based teaching modules),[6,9–15] prior reports suggest that such skills are not traditionally taught in a formal way and that comprehensive curricular approaches are needed.[8,16] Additionally, there is substantial variability across (and sometimes within) institutions regarding preferred formats and processes for verbal and written handoffs.[17] Handoff practices may be so deeply entrenched that efforts aiming to improve them require transformational change of an institution's culture.[18,19]

In June 2010, the Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs (I-PASS) Study was launched as part of a collaborative effort involving 11 pediatric academic medical centers (1 curriculum pilot site, 1 data coordinating center, and 9 data collection sites) to determine the effectiveness of the I-PASS Handoff Bundle, a package of curricular interventions, in standardizing and improving handoffs of care.[20,21] (For a list of participating sites, see Supplemental Digital Appendix 1 at http://links.lww.com/ACADMED/A201). This project combined rigorous curricular design, traditional health services research, and quality improvement efforts to standardize the complex process of resident inpatient handoffs, with the goal of improving patient safety.

As members of the I-PASS Education Executive Committee (EEC), on behalf of all members of the I-PASS Study Group, we describe here the process we employed from June 2010 through February 2014

to develop, implement, and disseminate the I-PASS Handoff Curriculum. We also report preliminary learner outcomes. We use a logic model to frame our reporting and evaluation of this curriculum, because it offers a systematic and visual way to describe the trajectory from the early stages of planning, to the middle stages of implementation, and through the final stages of comparing intended with actual results.[22,23]

Approach: Development of Conceptual and Logic Models

To create among I-PASS Study Group members a shared mental model for developing the handoff curriculum, implementation strategies, and assessment methods, we began by creating a conceptual model of high-quality patient handoffs. To this end, a panel of investigators reviewed existing literature and identified the key elements and factors that could influence handoff quality. These items were sorted, categorized, and reduced to common terms through an iterative process. We used these terms to create a graphic depiction of our conceptual model, which served as the overarching guide for the development of the curriculum and assessment tools (Figure 1).

To provide a visual representation of the rationale behind the process we used to develop the I-PASS Handoff Curriculum, we created a logic model (Figure 2). The components of a logic model typically include *resources*, *activities*, *outputs*, and *short-* and *long-term outcomes*. These components, when viewed together as a whole, explain the resources available to support activities that, when implemented as intended, should produce outputs (or deliverables) that indicate the curriculum is on target to achieve the intended outcomes and have a lasting impact.[24] The advantage of using a logic model to frame the description of our curricular development process is that the model helps highlight the assessment, monitoring, and management of the implementation process. A potential shortcoming of the logic model is its linearity.[25] Therefore, other curricular development teams seeking to use a logic model such as ours should remain open to modifying the logic model in response to contextual and environmental factors. In this article, we present a description of each component of the logic model as
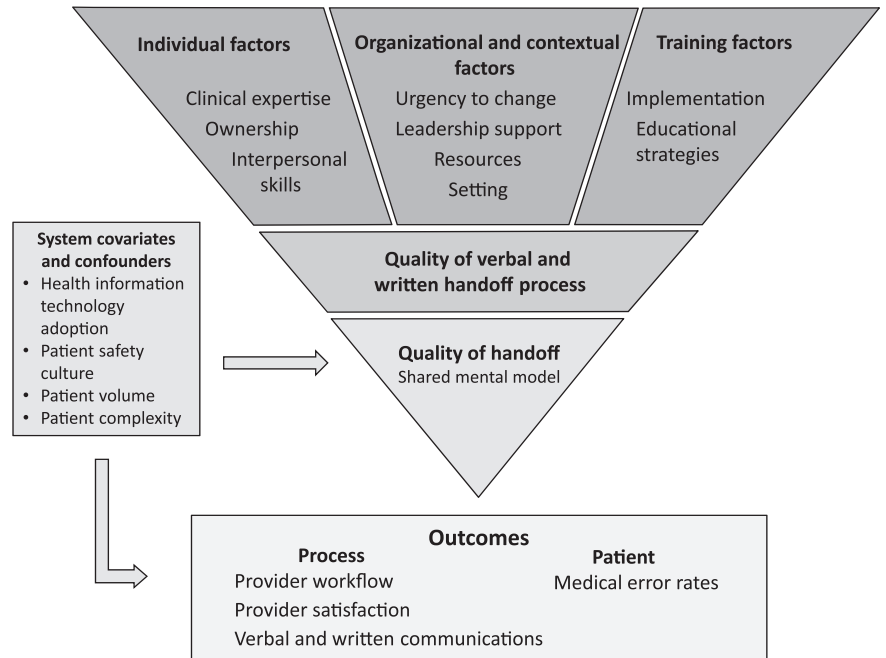

Figure 1 Conceptual model used during the development of the I-PASS Handoff Curriculum. The curriculum is a product of the Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs (I-PASS) Study Group.

it relates to our experience developing, implementing, and measuring the impact of the I-PASS Handoff Curriculum.

Resources

To initiate the process of curriculum development and address the anticipated complexities, the I-PASS Study Group leaders began by identifying needed resources. They first established the EEC, consisting of individuals with expertise and skills in curricular design, assessment, simulation program development, clinical hospital medicine, health services research, and residency training.

Once the members of the EEC were identified, we sought support from two organizations with the interest and capacity to foster a multicenter educational improvement effort: the Pediatric Research in Inpatient Settings (PRIS) Network and the Initiative for Innovation in Pediatric Education (IIPE). The PRIS Network conducts large, multi-institutional pediatric research studies with the mission of improving the health of and health care delivered to hospitalized children and their families.[26] Its organizational structure and processes provided critical guidance and scientific oversight during the early stages of our protocol design and site team assembly. The IIPE initiates, facilitates, and sustains ongoing innovative change in

pediatric education.[27] Its support helped raise the profile of this project, as its endorsement was contingent on evidence of high-level institutional support from the participating sites, including letters of support from each hospital's chief executive officer, department chair, designated institutional official, and residency program director. Additionally, to support effective local implementation of the curriculum, we ensured that each site had study team representation from the residency program and a leader in hospital medicine. The coupling of a dedicated group of educators, clinicians, and investigators with institutional leadership ensured that all participating sites were invested in the project before it began. The EEC also established an early partnership with national leaders from the Agency for Healthcare Research and Quality's Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) initiative.[28] TeamSTEPPS has an established communication and teamwork skills curriculum from which we drew key principles and content for a portion of the I-PASS Handoff Curriculum.

After assembling these foundational resources, we applied for and secured an American Recovery and Reinvestment Act grant from the U.S. Department of Health and Human Services to
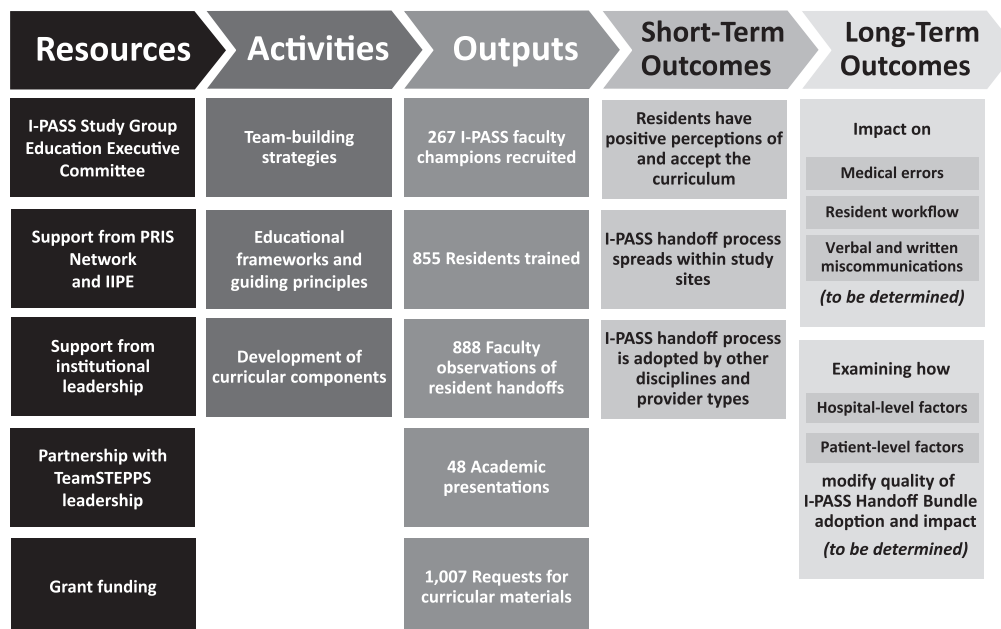
Resources	Activities	Outputs	Short-Term Outcomes	Long-Term Outcomes
I-PASS Study Group Education Executive Committee	Team-building strategies	267 I-PASS faculty champions recruited	Residents have positive perceptions of and accept the curriculum	Impact on
Support from PRIS Network and IIPE	Educational frameworks and guiding principles	855 Residents trained	I-PASS handoff process spreads within study sites	Medical errors / Resident workflow / Verbal and written miscommunications / (to be determined)
Support from institutional leadership	Development of curricular components	888 Faculty observations of resident handoffs	I-PASS handoff process is adopted by other disciplines and provider types	Examining how
Partnership with TeamSTEPPS leadership		48 Academic presentations		Hospital-level factors / Patient-level factors / modify quality of I-PASS Handoff Bundle adoption and impact / (to be determined)
Grant funding		1,007 Requests for curricular materials		

Figure 2 Logic model used to describe the I-PASS Handoff Curriculum development process. The curriculum is a product of the Initiative for Innovation in Pediatric Education (IIPE)–Pediatric Research in Inpatient Settings (PRIS) Accelerating Safe Sign-outs (I-PASS) Study Group. TeamSTEPPS indicates the Agency for Healthcare Research and Quality's Team Strategies and Tools to Enhance Performance and Patient Safety program. Numbers reported in the Outputs column reflect the study intervention period of July 2011 to May 2013 (faculty recruited, residents trained, observations) or the study dissemination period of May 2012 to February 2014 (presentations, requests).

carry out the work of developing, implementing, and measuring the effect of the I-PASS Handoff Curriculum. To accommodate ancillary studies and involvement of additional sites, this grant was supplemented by funding from the Medical Research Foundation of Oregon, Physician Services Incorporated Foundation (of Ontario, Canada), and the Oregon Comparative Effectiveness Research K12 Program (Agency for Healthcare Research and Quality). In addition, an unrestricted educational grant from the Pfizer Medical Education Grant Program aided in the development of computer-based curricular modules to facilitate independent study.

Activities

Team-building strategies

As previously described,[20] to facilitate organization and delegation of tasks, I-PASS Study Group members were organized into several committees and subcommittees (for the full list of study group members and the organizational structure, see Supplemental Digital Appendixes 1 and 2, respectively, at http://links.lww.com/ACADMED/A201). EEC members engaged in several activities to enhance our capacity to work as a team.

Face-to-face meetings were organized to foster team cohesiveness, facilitate productivity, and drive consensus on shared purpose and vision. Because individual learning styles have been shown to affect performance in academic and work environments, prior to the first in-person meeting, each EEC member completed a learning styles inventory.[29–31] The results of this assessment were shared with the group to encourage reflection regarding working preferences and individual strengths. Given the significant geographic separation of participating study sites and EEC members, Web conferencing was used to facilitate standing weekly meetings to maximize productivity and workflow. A project manager was hired to oversee administrative aspects of both the curriculum development and the research study.

The I-PASS Study Group made it a priority to promote mentorship within the team, both between junior and senior members as well as among peers. With this goal in mind, there was a strategic effort to ensure that the leaders of the subcommittees as well as all teams developing scholarly products included both junior and senior members, who were grouped to facilitate mentorship, support, and guidance.

Educational frameworks and guiding principles

In developing the I-PASS Handoff Curriculum, we used Kern and colleagues'[32] six steps of curriculum development for medical education as a framework (see Table 1). We conducted a targeted needs assessment, using one focus group at each of the nine data collection sites, to determine current and preferred handoff practices, tools, and site-specific educational programs and resources. We found considerable variability across sites in both the handoff training that residents received and current handoff practices. Although five of the nine sites had standardized written tools to facilitate handoffs, few used a handoff mnemonic (one site), a team-based approach for verbal handoffs (two sites), or a supervised handoff process (one site). Most notably, none of the sites employed a formal curriculum to teach residents best handoff practices.

A review of the literature indicated that limited data existed to guide adoption of standardized and evidence-based handoff practices in graduate medical education.[8] To supplement the literature, we relied on the study group members' expert opinions, reaching consensus on how to proceed throughout curriculum development and

Table 1

Application of Kern and Colleagues' Six Steps of Curriculum Development to I-PASS Study Group Curricular Development Activities, June 2010 to May 2013

Curricular development step[a]	Associated I-PASS curricular development activities
1. Problem identification and needs assessment	• Literature on patient safety and medical education reviewed • Increasing frequency acknowledged with regard to accrediting organizations requiring more supervision of the handoff process • Targeted needs assessment conducted via focus group at each I-PASS study site with faculty, residents, and key stakeholders to determine current handoff practices and curricula
2. Needs assessment of targeted learners	• Chief resident focus group conducted with representatives from seven participating sites
3. Goals and specific measurable objectives	• Goals and objectives created for residents and for faculty, by a group of content experts using an iterative process

4. Educational strategies	• Multiple educational strategies considered; those selected were:
	  o Highly congruent between objectives and educational methods
	  o Feasible with existing resources
	  o Multimodal

5. Implementation	• Multifaceted implementation strategy developed, including formation of a campaign subcommittee to review transformational change literature and create innovative strategies supporting the communication, implementation, and sustainability of the curriculum
6. Evaluation and feedback	• Resident and faculty evaluations collected following each training session, resident workshop, and at the end of the online module • Intensive debriefing, evaluation, and curricular revisions following each wave of curriculum implementation

Abbreviation: I-PASS indicates Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs.
[a]Steps adapted from Kern et al.[32]

seeking the input of residents and external advisors at each stage. The curriculum was rolled out across participating study sites in three successive waves (July to December 2011, December 2011 to May 2012, and May to October 2012), with two to four sites per wave. After each wave of curriculum implementation, intensive debriefing, evaluation, and feedback occurred; we sought input from site participants as well as EEC leaders. This iterative process allowed for continuous improvement of implementation activities at successive sites and ensured opportunities to improve and refine the curriculum over time.

We explicitly employed adult learning principles in the development of the curriculum to ensure that residents have multiple opportunities to learn patient handoff skills in ways that are relevant to their clinical responsibilities.[33] For example, we relied extensively on simulation activities to give residents chances to apply the skills they are learning. Learning activities are generally interactive and designed to build on residents' previously acquired skills. Before participating in the curriculum, residents complete a learning styles inventory; the goal is to increase their awareness of how they learn, how others may learn differently, and how awareness of team members' preferred learning styles may affect the process of learning new patient information during patient handoffs.

We incorporated quality improvement methods as we refined the curriculum on the basis of lessons learned from the single-site pilot study,[34] which occurred at Boston Children's Hospital in 2009–2010, approximately 12 months before the launch of the multisite I-PASS Study. As project leaders, we did a thorough review of the initial curriculum, using evaluation data and focus groups of residents and faculty who had participated in the pilot study. In this way, we identified gaps in the curriculum as well as potential new ways to implement it. As a result of our improvement cycle, we developed a novel mnemonic for verbal and written handoffs that is shorter and easier to remember than the mnemonic used in the pilot study. The new mnemonic also reflects the name of our study, I-PASS: I, Illness severity; P, Patient summary; A, Action items; S, Situation awareness and contingency planning; S, Synthesis by receiver. This mnemonic has been described previously.[21]

Development of curricular components

A key activity in the curriculum development process was the creation of the discrete components of the I-PASS Handoff Curriculum (Table 2), which followed the development and refinement of an extensive list of handoff educational goals and objectives for residents and faculty. We used a modified Delphi process to achieve consensus about parts of the curriculum, such as the elements that should appear within a patient summary and the items that should be included on the written handoff document.[35] We considered multiple educational strategies as outlined by Kern and colleagues'[32] suggested approach to curricular development. We ultimately selected the strategies that we felt had the highest congruence between objectives and educational methods, were feasible with existing resources, and used multiple educational methods to deliver content.[32] Below, we provide a brief overview of the process used to develop each of the components of the curriculum.

Core resident workshop. The core resident workshop is the foundation of the I-PASS Handoff Curriculum.[36] This two-hour didactic and interactive session teaches key principles and communication techniques adapted from the TeamSTEPPS curriculum,[28] as well as best practices for verbal and written handoffs using the I-PASS mnemonic.[21] We developed trigger videos (short film clips to generate discussion and reflection)[37] and interactive guides for large-group discussion to encourage active learning. Although residents' participation in the research study (collection of data from residents) was entirely voluntary, each site expected all pediatric residents to complete the I-PASS training and practice use of I-PASS techniques to comply with

Table 2
Components of the I-PASS Handoff Curriculum[a]

Component	Description	Elements/resources
Core resident workshop	2-hour didactic and interactive session that teaches I-PASS techniques and concepts	• Curriculum goals and objectives for residents • Resident workshop slides (interactive didactic, with trigger videos and small- and large-group exercises) • Resident workshop interactive guide for facilitator • Resident workshop interactive guide for participant • Resident workshop facilitator evaluation • Resident workshop participant evaluation
Handoff simulation exercises	1-hour interactive role-play session to allow for practicing of techniques learned in the resident workshop or online module	• Shared mental model role-play • Handoff simulation role-play (3 live role-play scenarios)
Computer module	Electronic tool that allows for independent learning and review of I-PASS concepts and techniques	• Electronic complement to core resident workshop; integrates illustrative videos and allows for independent learning
Faculty development resources	Set of resources to educate and train faculty or faculty handoff champions for the implementation of the I-PASS Handoff Curriculum	• Curriculum goals and objectives for faculty • Faculty champions guide • Faculty development slides (didactic) • Computer module (electronic version of didactic) • Faculty development module participant evaluation form

Faculty observation tools	Series of assessment tools designed to be used at institutions implementing the I-PASS Handoff Curriculum	• Faculty observation and feedback tools:
		  ○ Assessment of written handoff
		  ○ Assessment of verbal handoff (for giver)
		  ○ Assessment of verbal handoff (for receiver)

Campaign toolkit	Collection of materials designed to ensure adoption and implementation of the I-PASS Handoff Curriculum and change institutional culture	• Slogan and logo • Just-in-time presentation • Pocket reference cards • Computer monitor frames • Posters • I-PASS tips of the day

[a]The I-PASS Handoff Curriculum was developed by the Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs (I-PASS) Study Group. I-PASS is also a mnemonic for the elements of the handoff process: I, Illness severity; P, Patient summary; A, Action items; S, Situation awareness and contingency planning; S, Synthesis by receiver. The curricular materials can be obtained via the I-PASS Study Web site (http://www.ipasshandoffstudy.com/) and MedEdPORTAL.[36,42–45,47]

ACGME requirements for teaching and monitoring patient handoff skills.

Handoff simulation exercises: Trigger videos and role-plays. We incorporated illustrative videos and role-play simulations into the curriculum to simulate both ideal and less-than-ideal handoff behaviors. These provide learners with an opportunity to observe a concept and then practice new behaviors.[38,39] Simulation has been shown to enhance skill acquisition and behavior change through practice and reflection.[40,41]

A subcommittee of I-PASS members with expertise in simulation developed the role-play and video simulations[42] and revised them on the basis of input from the EEC members and pilot testing. We created short scenarios (approximately five minutes) with relatively simple clinical elements to maintain learners' attention span, allow enough time for feedback, and encourage participants to focus on key communication and handoff skills rather than clinical issues. The role-plays are delivered in a one-hour simulation session that is ideally scheduled in conjunction with the two-hour core resident workshop. They include a shared mental model role-play scenario as well as three scenarios in which three learners rotate the roles of giving, receiving, and observing (and critiquing) a handoff.

Computer module. We developed a computer module[43] to serve as a resource for learners who cannot attend workshops or who want to refresh their skills independently. The computer module integrates illustrative videos to demonstrate techniques and prompts the learner to answer questions and reflect on the video elements.

Faculty development resources. We reasoned that faculty champions would be essential for successful implementation of the I-PASS curriculum; however, most faculty members had never received formal instruction in patient handoffs. To address this issue, we created a set of faculty development resources[44] to teach handoff skills to faculty and to train faculty to teach these skills to residents, assess residents' performance, and deliver feedback effectively. The resources include a faculty champions guide, which serves as a blueprint for faculty and is complemented by a faculty development module. Similar to the core resident workshop, the faculty module uses

interactive didactics, illustrative videos, and simulation exercises. This module is also available in a computer-based format for independent study. To receive the title of I-PASS faculty champion, a faculty member at one of the study sites had to complete the one-hour I-PASS faculty development training module, and then either (1) serve as a facilitator during the two-hour I-PASS resident training workshop and one-hour simulation session or (2) conduct live observations of resident handoffs and give feedback using a direct observation tool (described below). Although the number of observations conducted by each faculty member varied, faculty members were asked to commit to a 30-minute observation period, to complete the assessment tools, and to provide verbal or written feedback to the residents they observed.

Faculty observation tools. We developed direct observation assessment tools for preparing a written handoff, giving a verbal handoff, and receiving a verbal handoff.[45] Our conceptual model (Figure 1) informed the items assessed in each of the three tools. Items and response scales with behavioral anchors describing early-learner through expert behaviors were developed in an iterative fashion. The tools address how well those involved in handoffs determine illness severity, adhere to the components of the I-PASS handoff mnemonic, and engage with one another. In addition, the tools allow the observer to note miscommunications, erroneous information, omissions, the presence of tangential or unrelated conversation, and pace (of verbal handoff).

We pilot tested the initial draft versions of the tools at one institution (Boston Children's Hospital), but the tools lacked interrater agreement. We attributed this to the difficulty in writing valid behavioral anchor response scales for each item that could be rated by a faculty observer in real time. To address this issue, we created a new set of items that describe the expert or desired behavior and are rated on the frequency with which the behavior is observed during the handoff. Pilot testing indicated that this version of the tool was much easier for faculty observers to use. Validity and reliability testing of these observation tools is ongoing.

Campaign toolkit. Early in the curriculum development process, we recognized

that successful implementation of the I-PASS Handoff Curriculum would require fundamental changes to the ways in which providers communicate about patients. After reviewing literature on transformational change efforts,[19] we identified communicating our vision and institutionalizing our intervention as key components in this transformation. We created a Campaign Subcommittee, which was charged with "branding" I-PASS to support the communication, implementation, and sustainability of the curriculum.

Recognizing the importance of local agents of change,[46] we conducted a focus group with chief residents and other stakeholders from seven institutions to develop "advertising" strategies. On the basis of feedback from this group, we developed the I-PASS campaign toolkit,[47] which includes multiple elements. We chose a slogan—"Better Handoffs. Safer Care"—and designed a logo to represent and brand the curriculum as well as to illustrate its purpose. To communicate and remind providers about key I-PASS concepts, we created point-of-care references, including pocket reference cards and computer monitor frames with I-PASS details. We designed posters and wrote I-PASS "tips of the day" to further reinforce key curricular elements. We formatted these tips in innovative ways to engage residents and encourage review, including fortune cookies and flip books for use by team leaders on daily rounds. We also created a condensed version of the core resident workshop, as a just-in-time presentation, to reinforce key training elements at the start of each inpatient rotation and to orient medical students and visiting residents who may not receive the full curriculum.

Finally, we provided guidelines for the implementation of the campaign toolkit elements. As the I-PASS curriculum was implemented at the nine data collection sites, site investigators kept logs of the extent to which various campaign elements were implemented.

Outputs

The I-PASS Study was designed to facilitate multiple outputs at multiple time points during the curriculum development and implementation phases. These "deliverables" have provided early evidence that we are on target to achieve

our intended outcomes and impact. Our strategy of recruiting teams of faculty champions—respected faculty members actively involved in patient care and resident education—at each of the nine data collection sites has enabled rapid and early adoption of the I-PASS curriculum. Ethical approval for the I-PASS Study was granted by the institutional review board of Boston Children's Hospital, which served as the study's primary site and coordinating center. Additional approval was granted by the institutional review boards at each participating study site.

Overall, we recruited 267 faculty participants, an average of nearly 30 faculty members per data collection site. During the I-PASS Study's intervention period (July 2011 to May 2013), through 32 three-hour sessions (two-hour workshops followed by one-hour simulation sessions), a total of 855 residents (91% of all pediatric residents at the nine study institutions) were trained in the I-PASS handoff process. Over the same period, 20 faculty development training sessions were conducted, and faculty carried out 888 observations of resident handoffs. As an incentive, faculty champions received 25 points of maintenance of certification (MOC) credit from the American Board of Pediatrics if they met the following requirements: (1) attended I-PASS resident and faculty training activities; (2) participated in at least four monthly site MOC team meetings and plan–do–study–act (PDSA) activities aimed at improving resident utilization of the I-PASS handoff process; and (3) completed 12 resident handoff observations and provided feedback on the direct observation forms.

Once the curriculum was fully developed, EEC members managed a process of curricular dissemination that began with the launch of the I-PASS Study Web site (http://www.ipasshandoffstudy.com/), from which curricular materials can be obtained free of charge by any interested individual or institution. Additionally, the curricular materials have been published at MedEdPORTAL.[36,42–45,47] To further facilitate dissemination beyond the initial nine data collection sites and the pilot intervention site, study leaders have participated in national and international presentations and workshops. For example, from May 2012 to February 2014, we completed 48 academic presentations

(13 workshops, 3 plenary presentations, 1 platform presentation, 26 invited grand rounds and other lectures, 4 posters, and 1 webinar).

By monitoring requests for our curricular materials on both MedEdPORTAL and the I-PASS Study Web site from May 2012 to February 2014, we found that 1,007 individuals requested access to the materials, representing 517 unique institutions and organizations (noninclusive of study sites) in 48 states and the District of Columbia and 20 countries outside the United States. Individuals requesting the curricular materials indicated an interest in applying them across a range of provider types (physicians, 69.6%; nurses, 10.3%, medical students, 5.1%) and clinical settings (pediatrics, 33.4%; internal medicine, 11.4%; intensive care, 11.6%; emergency medicine, 7.3%; surgery, 7.1%; family medicine, 6.5%; obstetrics–gynecology, 4.9%; and several other subspecialties). On the basis of the early success of this dissemination plan, we believe it provides a model by which educational curricula can be disseminated rapidly to training programs involving medical students, residents, and fellows in the United States and beyond.

Short-Term and Long-Term Outcomes

We collected evaluation data from resident participants and faculty facilitators following the I-PASS Handoff Curriculum Resident Workshops and Simulation Sessions at each of the nine data collection sites participating in the I-PASS Study's intervention period (July 2011 to May 2013). With regard to learner outcomes, the main results of our preliminary assessment of the I-PASS Handoff Curriculum are as follows:

• High levels of self-reported ability: 91% to 99% of residents agreed or strongly agreed that they were able to perform all aspects of a standardized handoff process following the workshop (Table 3).

• Effectiveness of the curriculum: 81% to 96% of residents agreed or strongly agreed that the workshop promoted the acquisition of relevant skills for patient care activities (Table 3).

Notably, in open-ended questions asking participants to list the most

Table 3

Pediatric Residents' and Faculty Facilitators' Perceptions of the I-PASS Handoff Curriculum Workshop[a]

Evaluation question	No. (%) responding "agree" or "strongly agree"	
	Residents (n = 663)[a]	Faculty facilitators (n = 65)[a]
After participating in the workshop I am able to:		
Describe the relationship of situation monitoring, situation awareness, and the development of a shared mental model	637 (96)	60 (95)
List the circumstances in which you would utilize briefs, huddles, and debriefs	625 (94)	57 (89)
Recite and describe the individual elements of the I-PASS mnemonic	600 (91)	62 (95)
Compare and contrast the differences of a verbal handoff and a written handoff document	616 (93)	61 (95)
Articulate the features of a high-quality patient summary, such as the use of semantic qualifiers	638 (96)	62 (95)
Describe the importance of using contingency plans in verbal and written handoffs	653 (99)	62 (97)
This workshop:		
Provided me with knowledge and skills relevant to my patient care activities	637 (96)	63 (97)
Was designed with an appropriate balance of didactic and interactive elements	610 (92)	59 (94)
Had an appropriate pace	554 (84)	55 (86)
Seemed to be the correct length to address the content	536 (81)	50 (81)

Abbreviations: I-PASS indicates Initiative for Innovation in Pediatric Education–Pediatric Research in Inpatient Settings Accelerating Safe Sign-outs. I-PASS is also a mnemonic for the elements of the handoff process: I, Illness severity; P, Patient summary; A, Action items; S, Situation awareness and contingency planning; S, Synthesis by receiver.
[a]Data from evaluation questionnaires completed by residents and faculty following the I-PASS Handoff Curriculum core resident workshops and simulation sessions conducted at the nine data collection sites participating in the I-PASS Study intervention during July 2011 to May 2013.

effective elements of the workshop, the elements of the curriculum most often cited were the use of trigger videos and the opportunity to practice giving and receiving handoffs using new skills in simulation exercises.

At present, we are encouraged that the implementation of a standardized approach to handoffs appears to have spread within our study sites and has been incorporated into the existing systems of care. At some sites, the I-PASS handoff process has been adopted by other disciplines, provider types, and units to become the preferred method of standardized communication for handoffs, demonstrating the potential for adaptations and use beyond pediatrics. In the future, we will address the critical step of linking the assessment of the impact of

the I-PASS Handoff Curriculum with the direct measurement of patient outcomes by analyzing rates of medical errors. We will also assess rates of verbal and written miscommunications and use time motion data to examine resident workflow before and after the intervention. We also plan to examine how the quality of I-PASS Handoff Bundle adoption and its impact are modified by key hospital-level and patient-level factors. However, until we have analyzed these data in detail, we will not be able to describe the long-term outcomes of the I-PASS Resident Handoff Bundle.

Conclusions

The comprehensive I-PASS Handoff Curriculum offers a standardized approach to teaching and monitoring

verbal and written patient handoff skills. The development and implementation of this curriculum offers an example of a large-scale collaborative quality improvement effort in which a diverse group—junior and senior faculty, educators, hospitalists, and health services researchers—contributed their creativity, expertise, and energy to design and implement an educational intervention with the goal of improving patient outcomes. As no handoff curriculum previously existed at any of the participating study sites, faculty and residents had to be trained simultaneously, making the I-PASS curriculum implementation a transformational change effort in each institution.[46] In this article, we have provided a logic model for the development, implementation, and dissemination of a large-scale curricular innovation that could serve as an example for others. Moreover, our rigorous process of curriculum development and implementation has positioned us well to study the impact of this intervention on patient outcomes when the main I-PASS Study outcomes data become available for analysis.

We envision a future health care environment in which there is a shared common language for patient handoff communications across provider types, practice settings, and handoff types. We believe the I-PASS Handoff Curriculum will be an option that residency programs can adopt to comply with the ACGME's requirements to provide formal instruction about patient handoffs and to ensure and monitor adequate handoffs through direct observation.

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