



A Pediatric Preintern Boot Camp: Program Development and Evaluation Informed by a Conceptual Framework

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ABSTRACT

OBJECTIVE: Boot camps are being developed and implemented by a growing number of medical schools to facilitate medical students' transition to internship. However, there is limited conceptual understanding of how this facilitation occurs.

METHODS: We developed and piloted a 1-week pediatric boot camp in 2015, then significantly revised and evaluated the program in 2016-2017 using a conceptual framework of self-efficacy. Consistent with this framework, the revised boot camp focuses on enhancing practical skills that can ease medical students' transition to internship. Observations and course evaluations informed process evaluation, whereas learner assessments immediately after and at 6 months after the boot camp informed outcomes evaluation in terms of both perceived self-efficacy and confidence.

RESULTS: Medical students valued sessions that were "hands on," and program improvements were made to include a

variety of interactive curricular activities. Data from course evaluations provided evidence of increased perceived self-efficacy. Learner assessment showed a medium to large effect size for confidence in nearly all specific skills that were queried and a positive, albeit attenuated, effect on perceived self-efficacy at 6 months.

CONCLUSIONS: Program evaluation of a pediatric boot camp informed by a conceptual framework of self-efficacy shed light on how it might facilitate medical students' transition to internship. A similar conceptual framework may be useful for other trainee preparatory courses.

KEYWORDS: boot camp; fourth-year curriculum; intern preparatory course; program evaluation; self-efficacy

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WHAT'S NEW

In evaluating a pediatric preintern boot camp, we used self-efficacy as a conceptual framework to better understand not only whether boot camps work, but also how boot camps may facilitate the transition from medical student to physician.

THE FOURTH-YEAR MEDICAL school curriculum, which presumably prepares students for internship, varies widely across institutions and lacks clarity, organization, and quality control.¹ To address this potential gap in training, intern preparatory courses, commonly referred to as boot camps or capstone courses, are being increasingly implemented.^{2–4} For example, in our national survey of pediatric educators, one half of the responders reported that their medical school had at least 1 intern preparatory course.⁵

In contrast to the variability of the fourth year of medical school, it is commonly accepted that the transition from medical school to internship is uniformly a

challenge for trainees, due in large part to an increase in clinical responsibilities. Practically overnight, interns are expected to "hit the ground running."³ To effectively transition to pediatric residency, medical students need to acquire an armamentarium of cognitive, psychomotor, and affective skills needed to care for children and families.³

A meta-analysis on the effects of postgraduate boot camps concluded that boot camp completion was associated with improvements in clinical skills and medical knowledge, along with increases in confidence.² Just how confidence increases is unknown, however, owing in part to a lack of program evaluation informed by a conceptual framework.

From an educational standpoint, self-efficacy is the perceived ability to learn or perform at a certain level based largely on past accomplishments.⁶ The foremost source of self-efficacy beliefs is mastery experiences (personal performance accomplishments); other sources include vicarious experiences (observing role models), verbal persuasion (being persuaded by influential people that

success is within reach), and emotional states (positive emotion).⁷ Increasing self-efficacy through personal performance accomplishments can bolster one's ability to deal with potentially aversive events as they arise through time; this could include challenging transitions occurring over the course of medical training.^{7,8}

Based on input from learners in our pilot year about the need to build confidence through hands-on practice, we came to see our pediatric boot camp at The Children's Hospital of Philadelphia (CHOP) as an opportunity to apply program evaluation informed by a conceptual framework of self-efficacy.⁹ Confidence and self-efficacy are not identical constructs, but both refer to strength of belief; self-efficacy specifies what that belief is about.⁷ Our program goals were not aimed at increasing competency per se, but rather at increasing confidence and perceived self-efficacy. We propose that self-efficacy can be a useful lens for others to develop and evaluate courses implemented near the transition from undergraduate to graduate medical education and for understanding, at least in part, how these courses might increase confidence and self-efficacy.

METHODS

In this section, program description is organized around key components of a modified logic model, a systematic way to show the relationships among program inputs, activities, and outcomes (Figure). The Institutional Review Board at CHOP reviewed the program evaluation protocol and deemed it was not human subject research (IRB 16-013542).

PROGRAM INPUTS

In 2014, pediatric faculty involved in medical student education received synergistic support from the

Department of Pediatrics Education Committee at CHOP and the Perelman School of Medicine at the University of Pennsylvania (SOM) to develop an intensive curriculum for the purpose of preparing fourth-year medical students going into pediatrics or a pediatric-related specialty for internship. CHOP and SOM provided the funds necessary to implement the 1-week elective boot camp on site at CHOP. Other participating SOM faculty and CHOP staff were recruited and volunteered their time.

In 2015, the pediatric clerkship coordinator emailed information to all graduating medical students at SOM who were entering pediatrics or a pediatric-involved internship (ie, pediatric neurology, pediatric dermatology, family medicine, and emergency medicine). In subsequent years, the boot camp codirectors (EP Devon, R Tenney-Soeiro, and J Ronan) and the chair of the Department of Pediatrics at SOM also invited students at other medical schools in the region via e-mail to undergraduate medical education leadership, the registrar's office, and pediatric department chairs.

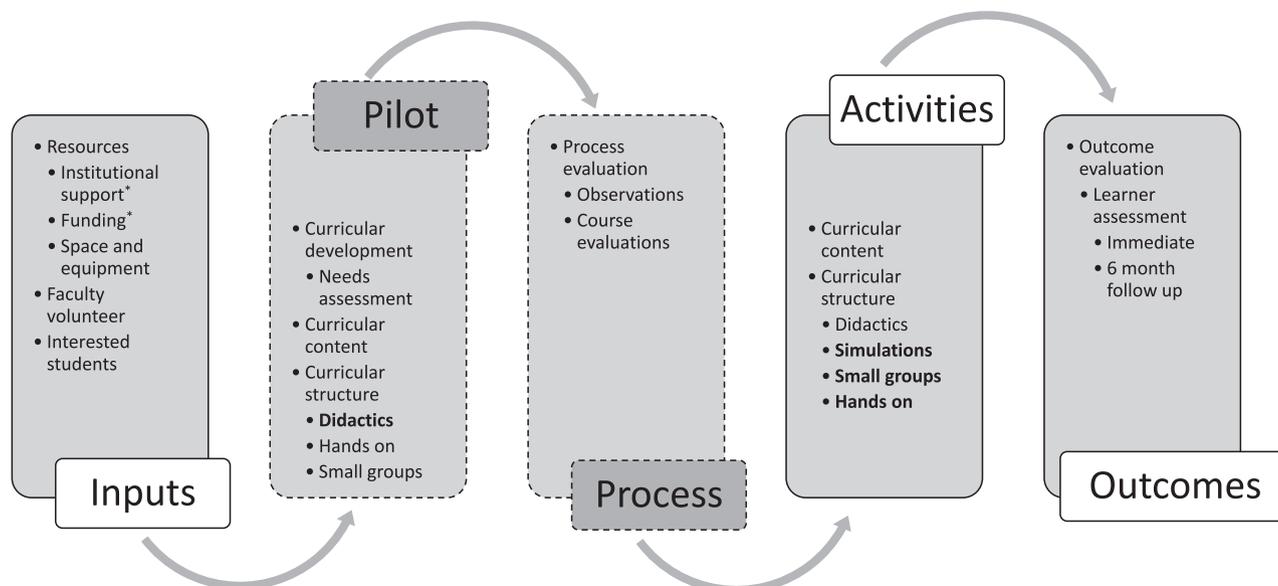
PROGRAM ACTIVITIES

CURRICULAR DEVELOPMENT

Before developing the boot camp curriculum, the codirectors conducted a needs assessment with pediatric interns and residents, residency program leadership, and medical student leadership to identify knowledge and skill deficiencies. They recruited more than 50 content experts to teach each session and oversaw the preparation and delivery of the material.

CURRICULAR CONTENT AND STRUCTURE

Curricular content was divided into 4 interrelated domains: medical knowledge, communication skills,



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Figure. Modified logic model to describe the boot camp program development and evaluation.

procedural skills, and fundamental patient care skills. Learning objectives, teaching activities, and learner assessment were developed for each domain. For example, in the communications skills domain, safe and effective handovers were part of 3 separate sessions. In the fundamental patient care skills domain, students responded to simulated patient emergencies, such as apnea or seizures.

Learning from the 2015 pilot, with its curricular focus on medical knowledge, the codirectors changed the focus to confidence and self-efficacy in 2016. To that end, they shifted curriculum activities from a didactics-heavy structure to incrementally difficult simulations, small-group case discussions, and hands-on learning. Revised sessions provided more opportunities for learning new skills, applying medical knowledge, and advancing previously learned skills to enable students to gain a sense of personal accomplishment and success. Topics were presented in a nonthreatening environment with multiple opportunities to ask questions and to get “real-time” performance feedback relevant to both achievements and continued growth. When medical knowledge was required for effective higher-level discussions, short didactics or a flipped classroom approach was used to maximize opportunities to build skills during the boot camp.

PROCESS EVALUATION METHODS

For process evaluation, which concerned program implementation, the codirectors observed and reflected on teaching sessions and reviewed course evaluations collected by the SOM in 2015 to 2017. An evaluation specialist (DF Balmer) reviewed and analyzed qualitative data from the course evaluations.¹⁰ Codes were deduced from the sources of efficacy beliefs and applied to students’ responses ($n = 35$) to the following statement: “Please comment on areas of strengths and weaknesses.”

OUTCOME EVALUATION METHODS

There were 2 sources of learner assessments for our outcome evaluation. First, the codirectors created a retrospective pretest/posttest questionnaire via a secure online data collection tool. This tool consisted of 32 items in 2016 and 34 items in 2017, covering the

4 curricular domains. Medical students were asked to rate their confidence in their capacity to perform a specific skill, as well as their grasp of requisite knowledge for that skill, as indicators of perceived self-efficacy. Given the retrospective pre/post design, ratings reflected perceived self-efficacy before and after participating in the boot camp. Students were sent a link to the survey immediately after the boot camp, and they responded to items on a 5-point Likert scale (from not at all confident to extremely confident).¹¹ Data were analyzed with t tests comparing the means and using small (>0.2), medium (>0.5), and large (>0.8) effect sizes to assess the educational value of boot camp as an educational “intervention.”^{12,13}

Second, the participants (now interns) were sent a follow-up questionnaire at 6 months after completing the boot camp. Instead of asking about confidence in their own capacity, the interns were asked to reflect on the influence that boot camp had on their confidence to perform intern-related tasks, such as giving and receiving a patient handover, and to rate their responses on a 5-point Likert scale (from not at all influential to extremely influential).

RESULTS

PROCESS EVALUATION RESULTS

Based on the pilot year, codirectors implemented changes, primarily increasing the number of opportunities for personal performance accomplishments of specific tasks in controlled environments. For example, in response to students’ consistent positive regard for teaching sessions that involved “doing” and “applying” information, codirectors added a “day in the life of an intern,” a longitudinal simulation of patient-related events that start with a morning handover.

As displayed in [Table 1](#), there was a predominance of comments on the course evaluations pertaining to 2 sources of self-efficacy beliefs: mastery experience and emotional state. Based on this information, as well as on observation, the codirectors believed that the boot camp was being implemented as intended and likely would produce the desired outcomes.

Table 1. Self-Efficacy Beliefs from 35 Course Evaluations Between 2015 and 2017

Category	n/N (% of Total)	Illustrative Quotes
Mastery experience	39/60 (65)	<ul style="list-style-type: none"> • A wonderful mix of topics with very practical focus. • I thought the course was extremely useful! • The simulation sessions were useful and engaging. • I enjoyed how “hands on” the boot camp was.
Vicarious experience	2/60 (3)	<ul style="list-style-type: none"> • It was great to get some exposure to all the other people who work in the hospital.
Verbal persuasion	1/60 (2)	<ul style="list-style-type: none"> • Each person we spoke to, not matter their level or field, always expressed support and encouragement.
Emotional state	18/60 (30)	<ul style="list-style-type: none"> • “Day in the life” was amazing and helped me feel more confident to handle the situations that I will confront as an intern. • Starting intern year is very daunting and this course made the idea a little less scary. • I left the course feeling better prepared and even excited to be a pediatric intern!

OUTCOME EVALUATION RESULTS

LEARNER ASSESSMENT, END OF BOOT CAMP

All 21 students in 2016 and all 19 students in 2017 completed the learner assessment questionnaire at the end of boot camp. Compared with the 2016 pre-boot camp data, the 2016 immediate post-boot camp data indicated increased perceived self-efficacy, with a medium effect size for 4 of 32 items (13%) and a large effect size for 27 of 32 items (84%). A similar increase in perceived self-efficacy was apparent in the 2017 data, with a medium effect size for 9 of 34 items (26%) and a large effect size in 25 of 34 items (74%).

LEARNER ASSESSMENT, 6 MONTHS POST-BOOT CAMP

In 2016, 17 of 21 medical students (81%) responded to the 6-month follow-up questionnaire and reported that boot camp had a slightly positive influence (median, 3.49; range, 3–3.94) on their confidence level in 18 of 23 skills (78%) during the first 3 months of their intern year. In 2017, 13 of 19 students (68%) responded to the 6-month follow up questionnaire and reported that boot camp had a slightly positive influence (median, 3.62; range, 3.08–3.92) on their confidence level in 21 of 24 skills (88%) and a very positive influence (median, 4; range, 4–4.08) on their confidence level in 3 of 24 skills (13%) during the first 3 months of their intern year.

DISCUSSION

Transitions in medical education are complex and involve personal characteristics, task readiness, and contextual factors.¹⁴ Confidence and self-efficacy could be personal characteristics that facilitate transitions.¹⁴ Based on our experience, a pediatric boot camp that intentionally provides opportunities for students to practice specific pediatrics-related skills and improve personal performances helped increase task-specific self-efficacy immediately after boot camp, but had only a modest effect on increasing confidence in performing intern tasks 6 months later. More research is needed to understand the impact of boot camp on self-efficacy over time.

As others have reported, boot camps are as much about the social and cultural processes as they are about knowledge and skills.¹⁵ Personal characteristics like self-efficacy shape and are shaped by social and cultural processes; thus, preparing students for transitions entails more than gaining knowledge and skills in competency-based programs.

We acknowledge several limitations of our program evaluation, including the lack of a comparison group. We purposefully focused on increasing confidence and self-efficacy and not on increasing competence, appreciating the difference between confidence and competence. Although we also appreciate that confidence is not synonymous with self-efficacy, we opted to use confidence as an indicator of self-efficacy because it reflects the

language of our learners. Moreover, we believed that it would serve the purpose of our program evaluation: to help us know whether, and if so how, our program worked. Learner assessments that directly question self-efficacy components, such as asking about feelings of preparedness or level of anxiety, may yield different results. Students from other schools were not a part of our primary needs assessment, and thus we cannot conclude that the curriculum met their specific needs.

As with any educational effort, there are many areas needing improvement. We plan to expand outcome evaluation to include residency program directors' perspective on boot camp graduates' preparedness for internship. The relatively few comments on vicarious experience and verbal persuasion suggest that explicit signposting of specific interactions and feedback could enhance self-efficacy.

Although we acknowledge that our program is faculty- and resource-intensive, it is for us, a win-win. The boot camp provides evidence for the Department of Pediatrics that it is serving its educational mission: to be a leader in pediatric education. It also affords individual faculty and staff the opportunity to meet teaching requirements and to find fulfillment in teaching eager medical students. With ongoing support from the Department of Pediatrics, SOM, faculty, and staff, and with continued positive feedback from students, the boot camp has proven to be feasible and sustainable. Content and structure may vary based on the needs and resources of each individual institution, but a framework of self-efficacy may be useful to guide development and evaluation.

CONCLUSIONS

Our program evaluation of a pediatric boot camp that was informed by a conceptual framework of self-efficacy shed light on how the program might facilitate medical students' transition to internship. Beyond having local and regional impact, our experience adds to the literature by providing insight into how an intern preparatory course might work.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at <https://doi:10.1016/j.acap.2018.08.006>.

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