

ORIGINAL RESEARCH ARTICLE

Paediatric anaesthesiology education: simulation-based 'attending boot camp' for fellows shows feasibility and value in the early years of attendings' careers



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Abstract

Background: Established simulation-based 'boot camps' utilise adult learning theory to engage and teach technical and non-technical skills to medical graduates transitioning into residency or fellowship. However, the transition from trainee to the attending role has not been well studied. The primary aim of this study was to design and execute a simulation-based educational day, exposing senior trainees in paediatric anaesthesia to commonly encountered challenges and teaching critical technical skills relevant to their new role. Secondary aims included assessment of its value and relevance in early years of graduated fellows' new careers as attendings.

Methods: An 'attending boot camp' day comprised the following: two crisis simulations, an otolaryngologist-taught cadaver cricothyroidotomy laboratory, and a difficult conversations workshop. There was a debriefing after each section. Data were collected using end-of-day and early-career e-mail surveys for five consecutive fellow cohorts from 2016 to 2020.

Results: Forty fellows participated; overall feedback was positive. The end-of-day surveys revealed planned changes in practice for 89% (25/28) of fellows, and 54% (15/28) highlighted communication skills as 'most beneficial'. Early-career follow-up surveys found 96% (23/24) identified increased confidence in skill acquisition because of the day; 79% (19/24) experienced scenarios in real life similar to those simulated. The qualitative analysis revealed four high-value themes: delegation, leadership, clinical skills, and difficult communication.

Conclusions: The transition from senior trainee to attending physician remains under-researched. A tailored simulation-based 'attending boot camp' was feasible and valued and may be useful in bridging this transition. Participants identified leadership practice, life-saving technical skills, and difficult communication practice as valuable and relevant in their early careers.

Keywords: boot camp; career transitions; communication; cricothyroidotomy; leadership; paediatric anaesthesiology; simulation

Simulation-based 'boot camps' utilise adult learning theory to engage and teach technical and non-technical skills to medical graduates transitioning into residency or fellowship. Previous work has studied the transition from medical student to graduated doctor or from resident to subspecialty fellowship,¹ but the transition from trainee to consultant or specialist

(referred to in the USA and in this paper as the attending) role has not been well studied. New attendings in paediatric anaesthesia require clinical skills and knowledge, crisis resource management skills, and empathetic and skilled communication tools for difficult conversations, such as postponing a case or handling conflict over clinical decisions.

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One of very few studies examining this challenging transition described how new attendings in a variety of specialties face multiple novel tasks, including acceptance of ‘final responsibility’, leadership roles, and the challenges of a new work environment and new patient population.² In a series of semi-structured interviews with surgical attendings within the first few years of their career, major hurdles for this transition were a change in identity, feelings of vulnerability, building confidence, and gaining experience.³ One new attending described coming to terms with the realisation that ‘I’m it’.

A gap exists in addressing this transition. Intentional teaching of professional behaviour and communication skills is rare in most residency and fellowship training programmes,⁴ despite emphasis by the Accreditation Council for Graduate Medical Education,⁵ and a move towards assessment of communication skills in final examinations, such as the Objective Structured Clinical Examination skills (OSCEs) introduced in the USA in 2018 by the American Board of Anesthesiology.⁶ These non-technical skills may be modelled by experienced attendings in anaesthesia, but structured formal training is often lacking.³ A recent publication, describing an advanced boot camp for senior anaesthesia trainees,⁷ confirmed the usefulness of boot camps in building confidence but highlighted the paucity of information on any longer-term impact.

In the USA, a fellow in paediatric anaesthesia undertakes one additional, optional year of subspecialty training at an academic centre, after the completion of postgraduate anaesthesia training (residency) and before embarking on their attending career. We hypothesised that a simulation-based ‘attending boot camp’ for fellows in paediatric anaesthesia is (i) feasible, (ii) well received, and (iii) useful in early years of attending career. The primary aim of this study was to design and execute a simulation-based educational day, specifically to meet commonly encountered challenges in the transition from fellow to attending in paediatric anaesthesia and provide an opportunity to practice rare but life-saving technical skills. Secondary aims included the assessment of its value and relevance in the early years of graduated fellows’ new careers as attendings.

Methods

Ethical approval

The Institutional Review Board at the University of Michigan reviewed this study and determined that it did not require regulatory approval (HUM00169818). All results are reported in accordance with Strengthening the Reporting of Observational Studies in Epidemiology guidelines.

Setting and timing

The setting for the educational day was the university hospital’s Clinical Simulation Center, with a high-fidelity operating theatre (OT) and Post Anaesthesia Care Unit (PACU), or ‘recovery room’ plus a wet laboratory and cadaver laboratory for clinical skills training, and interview rooms with real-time video viewing for the communication workshop.

Scenarios used a paediatric infant mannequin (SimBaby™; Laerdal Medical, Laerdal, Norway), a Datex Ohmeda GE Avance S5 Carestation® (GE Healthcare, Chicago, IL, USA) anaesthesia

machine, and equipment to replicate the perioperative environment.

A Saturday in February was intentionally selected each year for the session, being over halfway through the North American academic fellowship year, with no examination conflicts and when most fellows had an attending job plan established after graduation. The day concluded with a team dinner.

Educational content

Two high-fidelity scenarios were designed by a core faculty group experienced in simulation and peer reviewed by non-simulation faculty. The scenarios were adapted from Managing Emergencies in Paediatric Anaesthesia and focused on crisis resource management.⁸ Adaptations were informed by fellows’ feedback on established simulation classes over the previous four years. This led to the inclusion of an out-of-OT scenario and a ‘challenging a senior colleague’ exercise. The first crisis scenario involved simultaneous resuscitations of two young siblings with parental presence in PACU. In the scenario, a child developed a supraventricular tachycardia after the placement of an intravenous long line. During the resuscitation, the child’s younger sibling (a second mannequin, held in the arms of the mother, a role played by a staff member) developed acute respiratory failure, requiring resuscitation. The second scenario involved local anaesthetic toxicity in the OT, where an inadvertent overdose was given via caudal anaesthesia. This was complicated by inaccurate advice from a more senior colleague during the resuscitation. Thus, the case required effective treatment of local anaesthetic toxicity and challenging the behaviour of a senior colleague. Both scenarios were designed to present clinical challenges, but the focus was the leadership, delegation, communication, and teamwork skills required. The debrief sessions focused on these crisis resource management skills (Supplementary Appendix 1).

Surgical airway access was taught by experts (faculty otolaryngologists), who devised the lecture and hands-on experience format, and human cadavers were used for both demonstration and skills practice. This procedure was selected using peer-identified gaps in training from previous fellowship groups.

The afternoon was devoted to a ‘difficult conversations’ workshop. Scenarios for the workshop were designed to reflect challenging but common anaesthetist–parent or anaesthetist–surgeon interactions. Scenarios involved distrust, negotiating care plans, and direct conflict.

The expectation of fellow performance was informed by the Accreditation Council for Graduate Medical Education’s expectations on interpersonal and communication skills and professionalism for a graduating resident.⁵ We chose to use parents from our Patient and Family Centered Care (PFCC) group as the actors and educators, rather than using standardised patients, to bring their real-life experiences to the debrief. All parent educators taking part had children with chronic medical conditions, who have undergone numerous operations or anaesthetics and were familiar with resident training. Scenarios and potential parent responses were provided to volunteer parents, who were briefed regarding the expectations of participants befitting their experience level.

All scenarios were reviewed annually at the conclusion of each course, and refinements were made after feedback from faculty and fellows. One significant change after the first year

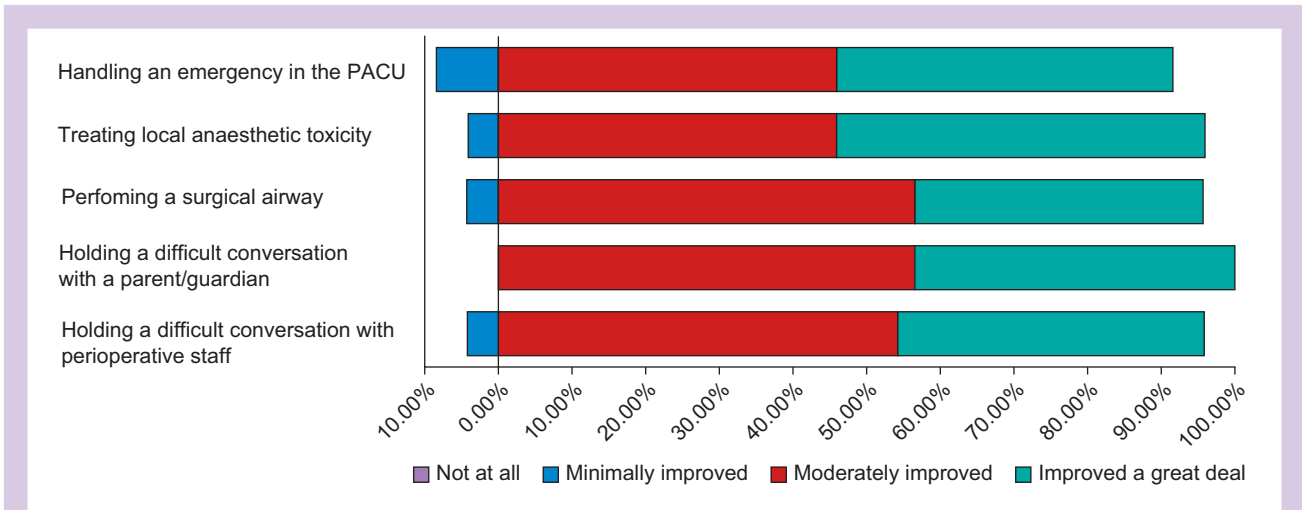


Fig. 1. Confidence in early attending careers. The results for survey Question 4, ‘Whether you’ve encountered these scenarios as an attending or not, to what extent did Simulation Saturday (‘attending boot camp’) improve your CONFIDENCE in managing the following?’ The items for ‘treating local anaesthetic toxicity’ and ‘performing a surgical airway’ had denominator N=23; all other items had N=24.

was to replace a Jehovah’s Witness-based communication station with a disagreement with surgeon station (utilising a volunteer surgeon, trained by the simulation team).

The design of the simulation day encouraged engagement of Kolb’s theory of adult learning, namely providing a concrete experience, opportunities for reflection and conceptualisation of clinical and non-technical skills, and initial experimentation with these new skills in a safe learning environment.⁹ The learning objectives were outlined for every scenario and skills station. Reflection, conceptualisation, and experimentation with new techniques were explicitly encouraged during the day. There was intentionally no assessment.

Debriefing sessions after each crisis resource management and communication workshop were led by trained anaesthesia faculty experienced in debriefing. During the communication workshop, participating members of the PFCC group also actively debriefed, bringing unique perspectives as parents of chronically ill children. Peer involvement was encouraged throughout the debriefs.

Participants

Participants comprised a convenience sample of all paediatric anaesthesia fellows (eight or nine per class), at a large paediatric academic training hospital, over the initial five years of running the boot camp (2016–20).

Data collection

Evaluation comprised a free text survey completed immediately after the course (the end-of-day survey) and an electronic survey sent later to all graduates of the university’s paediatric fellowship programme who had completed the ‘attending boot camp’ (the early-career follow-up survey). The end-of-day survey was in paper format and asked participants to give examples of a planned change in practice after the boot camp and for highlights covered during the day. The early-career follow-up survey was sent using Qualtrics™ (Qualtrics, Provo, UT, USA) via e-mail, at a single time point in 2020,

accompanied by a short e-mail from the simulation director, and non-responders were followed up with a 1 month reminder e-mail. Responses were collected anonymously. Questions comprised a mixture of a yes/no series of questions, a 4-point Likert scale, and open-ended questions. Participants were encouraged to reflect on the intervention and their subsequent clinical encounters since becoming an attending (Supplementary Appendix 2).

Statistical analysis

Quantitative data were presented using frequencies and percentages. Qualitative data were analysed using narrative analysis with an inductive approach. All comments submitted by respondents were coded. Each comment was coded by first developing a list of preliminary codes developed by one author (AEB). Codes were identified and categorised, and categories were refined. An additional review was conducted to combine codes and resolve ambiguities by two authors (AEB and EMP) until an agreement was reached on all coding. The codes were then grouped into themes that were used to quantify the results and report on the frequency of those themes in the data.

Results

Forty fellows participated in the ‘attending boot camp’ from 2016 to 2020 with 70% (28/40) fully completing the end-of-day survey. Overall feedback was positive; 28/28 (100%) enjoyed the boot camp, and 89% (25/28) described a change in practice they would make after the boot camp. For the highlights of the day, 54% (15/28) described the communication skills, 50% (14/28) described the emergency surgical airway teaching and experience, 21% (6/28) described crisis resource management skills, and 11% (3/28) described something else. The respondents could choose more than one answer.

Contact information was obtained for 31 graduates for the purposes of the early careers follow-up survey. Of the 31 graduate fellows to whom surveys were sent, 77% replied (24/31). Overall feedback on both surveys was again positive, with

new attendings describing skill acquisition because of the intervention and improvement in confidence levels for all five elements (Fig 1). Some, but not all, of the scenarios simulated had been experienced in real life by the graduated fellows in the early years of their careers. Handling an emergency in PACU 75% (18/24), holding a difficult conversation with a parent/guardian 79% (19/24), and holding a difficult conversation with perioperative staff 75% (18/24) were most frequently experienced, whilst no graduates had experienced treating local anaesthetic toxicity or performing an emergency surgical airway. Combining the free text responses to Questions 1 and 3, four major themes were identified as skills learned and applied from the boot camp. These are displayed with quoted examples in Table 1.

Discussion

A boot camp for attending readiness is feasible, well received, and perceived as useful in early years of attending careers. Our goals in designing this ‘attending boot camp’ day were to teach specific technical skills and develop fellows as crisis leaders and effective communicators. Rarely do trainees assume the role of leaders during a medical emergency or take ultimate responsibility in the final steps of the difficult airway algorithm. Simulation provides a bridge to experiencing critical scenarios in a leadership role. Our goal to empower communication skills in uncomfortable situations, often deferred by trainees to their attendings during training, seems to have had a particular impact. Our survey findings are consistent with other studies that show new attendings across specialities feel

unprepared for many of the non-clinical, non-technical aspects of their chosen field of medicine.¹⁰

Effective, empathetic communication skills improve patient satisfaction and adherence to treatment recommendations¹¹ and can reduce rates of surgical and medical complications amongst patients undergoing surgery.¹² Barriers to compassionate communication skills in the daily routine of perioperative care are numerous and the subject of a recent review.⁴ These include negative or absent role modelling, insufficient formal education for residents, and a lack of training for supervising clinicians to promote sympathetic communication and provide timely feedback.⁹ Attending physicians’ reluctance to address suboptimal communication skills during clinical encounters may stem from the unpleasantness, perceived ineffectiveness, and lack of professional reward for giving negative feedback.¹³ With the goal of closing some of these training gaps, we were able to provide real-time behaviour-specific feedback from faculty experienced in paediatric anaesthesia and parents of children with chronic medical conditions. We provided simulated scenarios demanding clear communication during both crisis management and one-to-one ‘difficult conversations’.

Over the past several decades, simulation has become integral to medical education for trainees, and regular simulation is part of many fellowship training programmes. Kolb’s theory on the experiential learning cycle describes adult learners needing to experience, reflect, conceptualise, and actively experiment.⁹ During ‘attending boot camp’, fellows were able to utilise this cycle for both technical and non-technical skills. They participated in concrete learning experiences (e.g. simulation of resuscitation with parent present, performing cadaver

Table 1 Major themes, identified from free text feedback (combining responses to Q1 and Q3). Quotes are taken verbatim.

Themes	Examples
Delegation and ‘seeing the big picture’	‘... I’m more likely now to allocate tasks to folks during these crises for they feel that they are helping. That seems to have helped the OT staff to feel that I’m aware of their presence and appreciate their skill set’.
Leadership and ownership during a crisis	‘It is helpful to be “in charge” during training and have ownership of the rapidly deteriorating patient’s condition; often we get comfortable in residency being able to lean on seniors or attendings’. ‘Felt more comfortable with communication and directing a team in a crisis’. ‘Unanticipated difficult airway after hours requiring assistance from all team members in the OT required precise and good communication’.
Practicing specific clinical skills	‘Cricothyrotomy lab was very informative and the only chance I have ever had to use the kit in a more realistic setting’. ‘I had never done a cric on an actual larynx, so I felt much more comfortable performing this afterwards’.
Utilising the ‘difficult conversations’ communication training	‘The soft skills involved in difficult conversations I think are very helpful, as we don’t normally have the chance to sit down as a group and observe and review those problems. There’s lots of time and effort dedicated to evaluating clinical measures, but the challenging conversations often happen unexpectedly and are usually pressured on both sides’. ‘Difficult interpersonal conversations happen commonly, and [the bootcamp] provided good practice for these scenarios’. ‘I’ve had multiple episodes of airway emergencies, such as inadvertent extubation, and had to talk to surgeons to stop operating to address that critical issue ... the simulation experience encouraged me to feel that I was “acting” right and not question my thought process as I’ve had simulation experience of what to do’. ‘I remember having to explain an aspiration event to a mother and grandmother that occurred with one of the residents I supervised. Remembering to use simple, non-medical terms allows for responses and questions; all helped the family transition from their state of shock to one of coping’.

cricothyrotomy, and playing the role of attending in difficult conversations). They reviewed and reflected with real-time feedback from experts, peers, parents, and self-reflection. Fellows were encouraged to undergo abstract conceptualisation and ultimately apply this learning experience to active experimentation in the remaining months of their fellowship training and early years of their careers.

Boot camps for senior trainees to prepare them specifically for the leadership, decision-making, and communication responsibilities associated with their approaching role as attending are rare. Our experience mirrors that of Patel and colleagues⁷ by demonstrating a high user satisfaction with a boot camp designed to fill this gap. Additionally, we were able to demonstrate utility in paediatric anaesthesia attendings' early careers. As new attendings, both technical and non-technical skills were used by the majority of those who completed the boot camp, and the self-reported benefits gleaned by the survey emphasise the relevance and application of leadership, delegation, and communication skills training.

Some scenarios are once-in-a-career events; others are much more common. The survey results reflected this—no graduates had used cricothyrotomy skills to date, but 92% (22/24) of respondents felt the experience in the cadaver laboratory had moderately or greatly improved their confidence in doing so if needed. Difficult conversations with family members and colleagues had been experienced by nearly all graduates. The majority of respondents (96%; 23/24) felt simulating challenging conversations had moderately or greatly improved their confidence in these situations.

Limitations include the single institution, single subspecialty nature of this study, which limits generalisability. Encouragingly, other specialties at this institution have expressed interest in utilising our boot camp template. All fellows in the paediatric anaesthesia programme were invited to participate in this project; thus, the lack of a control group with which to compare our findings is another limitation. A pre-/post-test design may have offered some insights into knowledge or attitudes acquisition, albeit with its own limitations. Furthermore, the limitations of a survey include the multiple years included and confounding factors, such as recall and halo bias. The qualitative analysis was performed by the authors and not an independent body. We could use interviews or a focus group method to truly identify theme saturation. The surveys were anonymous, but we recognise that they may be subject to bias because the participants were former trainees of the investigators. All faculty teachers and parents gave their time voluntarily, comprising approximately 34 workhours in total; the total technician commitment was 21 hours at US\$50 per hour, and the day utilised 11 'room hours' at US\$100 per hour. The fellows did not pay to attend the boot camp. Cost restrictions for this amount of time may limit reproducibility at other institutions. Additionally, although we felt using parents as educators for the communications workshop brought a benefit to the debrief discussion, choosing not to use standardised patient actors limited the formal scoring of the communication workshop scenarios.

In conclusion, the transition from fellow to attending physician remains under-researched. Studies examining this transition acknowledge that the challenge may be greatest in non-technical realms.¹ Practicing a leadership role in crisis situations and in the delivery of disappointing or difficult news may be valuable in bridging this transition. The results of this study show that the content of this 'attending boot camp' was relevant and was perceived as beneficial, with real-life

application, by the majority of participants, in a multidimensional skill set.

Authors' contributions

Study design: EMP, AEB.

Data collection: EMP, AEB.

Data analysis: all authors.

Writing of first draft of article: EMP, AEB.

Substantial review and editing of drafts: AL.

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Declarations of interest

The authors declare that they have no conflicts of interest.

Appendix 1 and Appendix 2. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bjao.2022.100115>.

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