A PHENOMENOLOGICAL APPROACH TO EXPLORING THE EXPERIENCE AND TRAINING OF HMS AFFILIATED ANESTHESIA RESIDENTS THAT FACILITATE DEVELOPMENT OF TEACHING SKILLS

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A PHENOMENOLOGICAL APPROACH TO EXPLORING THE EXPERIENCE AND TRAINING OF HMS AFFILIATED ANESTHESIA RESIDENTS THAT FACILITATE DEVELOPMENT OF TEACHING SKILLS

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A phenomenological approach to exploring the experience and training of HMS affiliated anesthesia residents that facilitate development of teaching skills

Abstract

**Background:**

The majority of anesthesia teaching and training occurs in a one-on-one manner. Residents are often first-line teachers to medical students and junior trainees from other specialties. While their skills as clinicians are developed through residency, their skills as educators are not always formally developed. Using a phenomenological approach, our study aimed to explore the current status of anesthesia residents’ training in teaching skills and to better understand their perceptions of preparedness for teaching medical students and peers. A secondary aim was to explore residents' perceptions of what characteristics make an effective clinical educator and how these characteristics may change as residents progress through training.

**Methods:**

Our study was carried out within the anesthesia departments of three Harvard-affiliated hospitals: Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, and Massachusetts General Hospital. Fifteen CA-1 to CA-3 anesthesia residents volunteered to participate. Using a phenomenological approach, open coding was done by two members of the research team which led to the development of a codebook, construction of categories and central themes, and interpretation of the data.
Results:

Our main findings showed that anesthesiology residents are often front-line teachers for junior learners who rotate through the specialty. While residents were responsible for teaching medical students and junior residents, little formal teaching training was offered to all residents throughout their residency. Many residents felt comfortable teaching junior learners who were less knowledgeable than themselves, but few residents sought feedback from their learners about their teaching skills. Furthermore, residents defined effective clinical educators as those who know their learners, those who come prepared to teach, and those who provide mentorship to their learners.

Conclusions:

Our findings show that anesthesiology residents are currently teaching junior learners in the clinical environment, yet no formal teaching curriculum currently exists to develop their skills as clinical educators. As with clinical skills, teaching skills must be actively developed in order to ensure that residents are trained as effective educators. Anesthesiology residency programs should consider incorporating teaching skills as a core competency throughout residency training.
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1. Chapter 1: Background

As in many procedural specialties, anesthesia trainees receive the majority of their clinical education through patient encounters while paired one-on-one with an attending physician. Residents act as both trainees and trainers within the specialty. Medical students who rotate through anesthesia often shadow residents, and it is often up to residents to provide the educational opportunities for medical students on their clerkship. A survey conducted by Curry showed that anesthesia residents are responsible for teaching medical students approximately 50% of the time. Meanwhile, 69% of programs across the US did not offer teaching training for their medical student teachers, and approximately 34% of medical schools did not have a formal anesthesia curriculum for their medical students. Although the paper does not explicitly define who medical student teachers are, it does infer that residents are included in that group by mentioning that they are the primary source of students’ educational exposure.

Due to their important role as educators, it is imperative that we train residents to become effective clinical educators in the same way that we train them to become effective clinicians. There are known benefits of residents-as-teachers programs in improving teaching skills, including delivery of feedback as seen in surgical and medical specialties. In addition to improved teaching delivery, residents directly benefit from teaching opportunities as they have been shown to have better knowledge acquisition when compared to self-study or lecture attendance. Further, there is evidence to suggest that resident job satisfaction is increased by teaching duties. While ample evidence exists for the efficacy of residents-as-teachers programs in surgery, medicine and obstetrics and gynecology, there is little evidence pertaining to any type
of resident teacher training programs in anesthesiology. Additionally, it is unknown what current practices in anesthesia training exist to help residents become effective teachers as this is not well documented in the literature. This gap in the literature has been present for some time as a single pilot study conducted in 2012 identified the same issues. A study conducted at The George Washington University anesthesia residency program adapted the obstetrics and gynecology residents-as-teachers curriculum at their institution and implemented it over the course of two years. Results of this study showed improved resident self-assessment in teaching skills, improvement in resident writing and using teaching objectives, teaching at the bedside and in leading case-based discussions. By improving residents’ ability to teach, it not only improves residents’ own learning but it can benefit the learner they are teaching and may extend benefit to patient care. Furthermore, the Accreditation Council of Graduate Medical Education (ACGME) has increasingly required education training for residents who teach students.

Using a phenomenological approach, our study's primary aim was to explore the current status of anesthesia residents' training in teaching skills and to understand their perceptions of preparedness for teaching medical students and peers. A secondary aim was to explore residents' perceptions of what characteristics make an effective clinical educator and how these characteristics may change as residents progress throughout training.
2. Chapter 2: Methods

2.1 Short introduction

Our study was carried out in the anesthesia departments of three Harvard-affiliated hospitals: Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, and Massachusetts General Hospital. Anesthesia residency consists of an internship year followed by three years of anesthesia training, made up of CA-1, CA-2 and CA-3. The study design was a phenomenological qualitative study using semi-structured interviews to explore the current state of experience and training of anesthesia residents that facilitate the development of teaching skills to prepare them to become effective clinical educators. A phenomenological study allows meaning and significance of experiences to be studied.10 This was facilitated through the use of semi-structured interviews that allow for the exploration of participant experiences and the meaning they attribute to them with the interviewer conducting the interviews using open-ended questions to elicit responses.10 Due to the COVID-19 global pandemic, these interviews were conducted virtually using Zoom (Zoom © Version: 5.4.7 2012-2020 Zoom Video Communications, Inc.).

2.2. Methods

2.2.1 Study design

Using qualitative methods, semi-structured interviews were conducted of fifteen residents at three sites. An interview guide was developed to help answer the research questions and study aims (see Appendix A). The interview guide was piloted and refinements were made.
2.2.2. Study eligibility

Inclusion Criteria:

Current first, second, and third year anesthesiology residents (CA-1, CA-2 and CA-3) at Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital and Massachusetts General Hospital.

Exclusion Criteria:

Residents that did not respond to the recruitment email to volunteer for the study were excluded.

2.2.3. Ethics approval and data safety

The study protocol was reviewed by the Harvard Medical School (HMS) Institutional Review Board (IRB) and was deemed exempt. The interviews were recorded on Zoom, and were de-identified of personal data prior to the start of the recording. Recordings were transcribed using Otter (Otter.ai © Version 2.3.93 - f028ba22 2021), and fifteen transcripts were stored on a password protected computer and shared securely with research team members through Kiteworks.

2.2.4 Recruitment

Recruitment took place over a three-month period between February and May 2021. Purposive sampling was used in selecting participants who share a particular characteristic, in this case anesthesia residents in their first to third year of training, to provide relevant data relating to the research question. Residents from Harvard-affiliated anesthesiology residency programs at Beth
Israel Deaconess Medical Center, Brigham and Women’s Hospital, and Massachusetts General Hospital were recruited by email through their program directors and were invited to attend virtual interviews to explore training surrounding teaching. Recruitment material describing the study, including consent forms, were sent to eligible participants. The aim was to have a representative sample from each year of anesthesiology residents. Participation was voluntary and participants were allowed to withdraw at any point throughout the study. Participants were offered an Amazon or Starbucks gift card in the value of $10 for participating in the study. Fifteen study participants across all three sites were recruited and interviewed over a three-month period. Following three rounds of recruitment, no further participants volunteered.

2.2.5. Data collection

Individual participant interviews were conducted virtually using Zoom by HK and were estimated to last between 45 to 60 minutes. Verbal consent was gained prior to the start of the study and recording. Interviews were recorded through Zoom. Data was collected until data saturation was reached.

2.2.6. Data analysis

The qualitative interviews were transcribed using Otter. Anesthesia resident demographics were collected noting their training year. Using a phenomenological approach, open coding was done by the principal investigator (HK) and a second researcher (AB) which led to the development of the codebook, construction of categories, central themes and interpretation of the data. Open coding of the raw data was done using one interview from each training year for a total of three interviews by both the principal investigator (HK) and a member of the research team (AB). Open
coding led to the development of the initial codebook which was piloted on a single interview by both research team members. The codebook was revised accordingly, then the final codebook was used to code the entire dataset using Dedoose (Dedoose© 2018, LLC) (see Appendix B). Both reviewers independently read all transcripts and coded the data. The two reviewers reached consensus through discussion. Categories and themes were analyzed to derive the final themes after data saturation was reached and informed the interpretation of the data. These were reviewed by the second coder for consensus.

3. Chapter 3: Results

Fifteen anesthesia residents volunteered to participate in our study, four CA-1, seven CA-2 and four CA-3 residents. The average interview time was approximately 53 minutes (range 37-72 minutes). Participant demographics are summarized in Table 1. All participants had previous experience in teaching prior to starting residency and variable exposure to teaching opportunities during their anesthesia residency. The main findings are summarized in five themes: rotating learners taught by anesthesiology residents, teaching topics and learning environment, availability of teaching resources, residents’ role as teachers, and perceived qualities of an effective clinical educator. Results are described by training year where possible to help show the progression of residents as teachers throughout their residency.
Table 1. Study Participants Demographics

<table>
<thead>
<tr>
<th>Study Participants (n=15)</th>
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<tr>
<td><strong>By hospital</strong></td>
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<tr>
<td>Beth Israel Deaconess Medical Center</td>
<td>3</td>
</tr>
<tr>
<td>Brigham and Women’s Hospital</td>
<td>5</td>
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<tr>
<td>Massachusetts General Hospital</td>
<td>7</td>
</tr>
<tr>
<td><strong>Anesthesiology training year</strong></td>
<td></td>
</tr>
<tr>
<td>CA-1</td>
<td>4</td>
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<tr>
<td>CA-2</td>
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<td>CA-3</td>
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3.1. Theme 1: Rotating learners taught by anesthesiology residents

Anesthesiology residents are often responsible for teaching learners that rotate through the anesthesia department. Residents teach medical students and junior learners in the same way they are taught, in a one-on-one fashion.

3.1.1. Interactions with learners

Residents described interactions with a variety of learners from medical students, to peer residents in other specialties (for example, plastic surgery, emergency medicine and oral maxillofacial surgery residents), junior anesthesiology co-residents, and student registered nurse anesthetists (SRNAs). The frequency of interactions with learners is greatest among medical students and peer residents in anesthesia, particularly when residents are in their third year of training when there are more teaching opportunities available to them. Fewer teaching
interactions were reported with SRNAs. While attendings may be in the operating room with residents while they are teaching, they often allow the resident to take the lead on teaching the learner.

3.1.1. Illustrative quote

_We work with medical students, we're often paired ahead of time with med students under anesthesia rotation. Also, we work with junior residents, especially during the summer, when the new CA-1s come in, they have an intensive six to eight weeks of one-on-one in the operating room called tutorial. So half the time they're paired with an attending and the other half, they're paired with a senior resident, which is a CA-3, or sometimes a CA-2, so that gives us a chance also to teach the junior residents._ (Participant 10, CA-3)

3.1.2. Exposure challenges

While most residents expressed enjoyment in teaching others in the operating room, many residents expressed that they would have liked more opportunities and continuity in teaching junior learners in the operating room. Fewer medical students rotate through anesthesia than other specialties such as internal medicine and surgery, therefore limiting resident interactions with medical students. Some residents described teaching medical students during their anesthesia week in their surgical clerkship, while others described having medical students in other specialties express enthusiasm in learning about anesthesia while they are on their obstetric placement for example, allowing residents short and non-continuous interactions with these students.

3.1.2. Illustrative quotes

_It is kind of weird because I feel like I had a lot of opportunities to teach last year, when I was even less experienced as a clinician. But there's just more experiences because internal medicine is a required [rotation]...the med students do like two months of that or something, whereas anesthesia is not an elective and I don't think, I think, maybe only a week is required, so there's just like less opportunity._ (Participant 3, CA-1)
3.2. Theme 2: Teaching topics

Residents described how they prioritize teaching topics in the clinical environment. All residents described their teaching environment taking place in the operating room, while some residents also had teaching interactions in the simulation center, a didactic setting, pre-admission testing and/or in obstetrics. Some residents described preparing teaching topics for grand rounds. Teaching topics were often patient-centered, learner-centered, or teacher-centered. Each of these is described in more detail in the sub themes below.

3.2.1. Patient-centered teaching topics

Patient-centered clinical topics were based on patient characteristics, comorbidities and surgical considerations for the operation the patient was undergoing. Residents oftentimes anchored their teaching on the specific patient and the anesthetic considerations for that particular patient and surgery.

3.2.1. Illustrative quote

*I think it starts with the pre-op interview, and when you're going to talk with them, and we go through the patient's history and things that we would consider and worry about. And then when we get to actually interview and do a physical exam on the patient, go through those types, things like the Mallampati, the neck, the asthma, heart disease, different types of things that would be relevant for induction and intubation with our patient. And then, when the patient is asleep, I mean, as far as teaching or teaching procedural skills, if I'm the one intubating, I'd explain everything that I'm doing with the patient as I'm intubating ... I think just from the very beginning of the day and using the patient's history and how that is necessary to form an anesthetic plan and then using the patient's actual body and anatomy to look at different access points.* (Participant 11, Year 2)
3.2.2. Learner-centered teaching topics

Residents described taking a learner-centered approach based on what learners want to know, what specialties they are considering, and applying what is relevant in anesthesia to those specialties. Most residents took the time to ask medical students what future career they are considering and tailored their teaching to benefit the learner in whatever path they chose. Residents also tailored their peer resident teaching based on whether the residents were junior anesthesiologists or residents from visiting specialties to make the learning experience more personalized and relevant.

3.2.2. Illustrative quote

*That emergency medicine person, I taught them like different access points, if you're having a difficult IV, like how you would do an EJ or a saphenous, different ways to intubate and different blades, like things that would be more suited for her and in an emergent situation in the ER. Rather than someone who's coming in as an OMFS person and just needs to learn basic anesthesia so that they can provide anesthesia in their dentistry practice just to do safe anesthesia versus someone who's going into anesthesia, and needs to actually build a foundation for like higher level topics in the future. So like, I didn't focus really on any anesthesia at all with [the] emergency medicine person, or even, maybe like very light subjects. But with someone going in anesthesia, it's more anesthesia heavy and the procedural stuff will come later* (Participant 11, CA-2)

3.2.3. Teacher-centered topics

Residents sometimes described teaching to their own knowledge level. This was particularly cited among CA-1 residents who chose their topics based on their comfort and knowledge with the material they were teaching. Residents also described teaching topics that they felt were relevant to the specialty rather than asking the learner what they wanted to know.
3.2.3. Illustrative quotes

I feel like usually I teach about things that I feel pretty confident in. (Participant 3, CA-1)

My biggest skill set I think is my procedural skills. So I like to talk about that just because I'm comfortable with it. But then from a knowledge base, I kind of ask them, “What are things that they would like to have a better understanding of”... and let them decide what is the priority. But that's definitely a skill set that I'm lacking, is having a solid set of things to talk about and a way to talk about them. (Participant 11, CA-2)

3.3. Theme 3: Availability of teaching resources

Residents described the availability of resources to help develop them as clinical educators. Formal teaching resources were described as didactic lectures and teaching electives. Informal teaching resources were described as resources residents could access such as seeking advice from attendings or co-residents about their teaching skills. Some residents described seeking out online resources or papers to help develop themselves as educators. Finally, exposure to teaching training prior to starting residency is described.

3.3.1. Availability of formal teaching resources

One hospital offers formal didactic, 1-2 hour lectures on teaching skills during the first month of orientation to their CA-1 residents, where residents describe learning about adult learning theory and the best ways for them to learn. Otherwise, no other formal teacher training program was described by participants for all anesthesiology residents. Some formal teaching electives exist for CA-3 residents such as the junior attending elective, the teaching elective, and simulation elective, but these tend to be competitive with only a select few residents participating in them. The junior attending elective was described as an opportunity for CA-3 residents to practice being an attending in their final year of residency. They were given autonomy to make decisions
about managing the operating room(s) and teaching juniors and were mentored through their
decision-making process. The teaching and simulation electives provided CA-3 residents with
the opportunity to teach junior CA-1 residents. These electives were described by residents as
providing excellent experience and opportunities for senior residents to practice their teaching
skills with junior learners, without formal training in educational pedagogy to help prepare them
for their role within the elective.

3.3.1. Illustrative quotes

No, other than like, certain attendings that I know, are teachers and are interested in medical
education ... But no other like, official resource I guess. (Participant 6, CA-1)

The teaching one is very competitive, because there's only three spots. I think when we rank our
electives, you can choose how high you prioritize it. So I think if you put it in your top one or two
choices, you'd be able to get it. (Participant 10, CA-3)

CA-3’s have an opportunity, elective to do an education sim month. There's 12 months in the
year, and there are 18 of us, so not all of us get to do it. If you're lucky enough to do it in July,
you help... run some of the educational lectures for the CA-1s, as well as some of the simulations
for hands-on procedural stuff for the CA-1s. (Participant 8, CA-3)

3.3.2. Availability of informal teaching resources

Many residents reported using informal resources to help with their teaching. These include
conversations with teaching faculty, other attendings and co-residents. Residents felt that they
could reach out to faculty with an interest in medical education or peer residents to ask for advice
when they felt that they needed advice with their teaching skills.
3.3.2. Illustrative quotes

Those are some attendings that I can reach out to and ask them about their approach and what their thoughts are. And what skills, like study skills for instance, have been proven to be more effective than others. (Participant 6, CA-I)

I think just asking really good teachers would be a great resource, because I think that I've had some fantastic clinical educators and I feel like picking their brain about ways that they go about educating would be very helpful. (Participant 11, CA-2)

I try to ask my classmates what they do sometimes. Or other attendings. But ... I haven't sought out any formalized classes on teaching or anything like that. (Interview 10, CA-3)

3.3.3. Self-directed resources to aid with resident teaching

Few residents reported using self-directed resources for learning how to teach. Self-directed resources were defined as published papers, videos or online resources about teaching skills that residents could access on their own time. One barrier described by residents to use self-directed resources was constraints on residents’ time.

3.3.3. Illustrative quote

[Regarding seeking out resources to help with their teaching skills] I don't. And I think that's just because of time constraints... So I haven't necessarily had the time to do those courses. But something that I'm definitely interested in doing next year, [when] I have a little bit more time on my hands. (Participant 11, CA-2)

3.3.4. Prior teaching training experience

Some residents reported having had some teaching training in medical school and in some cases, teaching training prior to medical school. This was infrequent among the residents who were interviewed.
3.3.4. Illustrative quote

Yeah, in med school, we did actually ... It was some combination of my small group leader along with a couple of other people and every time we had, like a new module, we were all required to teach a topic. And we would have these competitions and stuff to see who taught, who had the most effective teaching strategy, and we would all give each other like one positive thing and one negative thing. And then we’d work off that, and then the next week, you could keep building off that. So that was the way we did it in med school. (Participant 7, CA-1)

3.4. Theme 4: Resident’s role as a teacher

Residents described their perceptions of their role as a teacher. The main three sub-themes that emerged were related to residents’ comfort with teaching, assessment of their teaching skills, and barriers to teaching.

3.4.1. Comfort with teaching

Most residents expressed feeling comfortable with teaching more junior learners. Generally, residents expressed feeling more comfortable teaching medical students compared to peer residents because students had less anesthesia knowledge or skills.

Notably the comfort level increased with more years in training. Residents reported that they had fewer teaching opportunities and less clinical experience in their first year of training when compared to their second or third year in training. Residents recalled incidents of high cognitive load that inhibited their ability to teach when they were first year residents. In contrast, third year residents described increased ability to simultaneously teach while performing clinical duties.
3.4.1 Illustrative quotes

I think it depends on what I'm teaching. I think if something like my algorithm for setting up my OR room, I feel like okay there's something I go through every day, I feel very comfortable explaining to a student, “hey, this is exactly what I’m doing ... do you want to help me with this?” ... you know, trying to engage them in what I can, which is nice in the OR because you're very hands on. (Participant 1, CA-1)

Yeah, I would say it's easier and more comfortable teaching medical students. Because I know what I'm teaching them. What I'm teaching them are the fundamentals and I know them pretty solid. Whereas juniors, you know, I have to go a little more in depth and then sometimes I'm not completely sure of the answer or the studies behind what I'm teaching, so that can be a little more challenging. (Participant 14, CA-3)

3.4.2. Assessment of teaching skills

Residents described how they assess each learner’s learning and their own teaching using direct and indirect feedback. This includes the learner’s perceptions about the resident’s teaching.

Many residents did not ask for direct feedback from their learners about their teaching, with a few residents reflecting at the end of the interviews that that is something that they will consider doing going forward.

3.4.2. Illustrative quotes

I think a lot of times, we don't ask for feedback enough or it's, we're not taught to, I mean, we have like an evaluation system for our own attendings on the computer, but rarely do people ask, like, do you have feedback for me? Or what do you think we could have done differently? Or what I could have, like is when your attending asks, but then we're also not taught, I think, to be able to give that feedback in person sometimes if things could have gone differently. So in the same manner, I don't think that I have been active in asking students like, do you have feedback for me as a teacher, and that's something that I can definitely think about more. I think I just kind of gauge by how the day is going. And then if they've had a positive experience, or if they feel like it's too much, or they're not involved enough, I... try to touch base during the day. (Participant 5, CA-2)
Every day, at the end of the day, I'll ask things that went well and went poorly for them. And things that went well went poorly for me. Oftentimes, it's patient focused more than education focused, but it addresses the same thing. And then at the end of the week, I asked things that they've learned things they wanted to learn things that I should have done better, or things that I was doing well, and we usually cover a lot of things, but it's always hard for someone to, you know, they're, they're learning so much in such a small amount of time, it's hard for them to focus on what I'm doing. But I still ask. (Participant 12, CA-3)

3.5. Theme 5: Perceived qualities of effective anesthesia clinical educators

Residents described qualities of effective clinical educators in anesthesia. Emerging themes include balancing autonomy with support, someone who prepares for teaching, and someone who offers mentorship.

3.5.1. Balancing autonomy with support

In addition to their own experiences as educators, residents also discussed their experience with educators in their programs and the ideals to which they aspired within their teaching. Residents identified several key characteristics of effective clinical educators in anesthesia. These include clinical educators who baseline the learner’s knowledge and meet the learner where they are, someone who creates a learning environment for their learner in which they can feel safe to practice autonomously while also feeling supported if and when they need it, and where the learners are appropriately challenged to grow in their skills as an anesthesiologist.

3.5.1. Illustrative quote

What I remember is having a CA-1, calling them the night before, and walking through a craniotomy because it was like their first time doing a craniotomy, going through the anesthetic plan in every little detail and helping them learn how to do turning and flipping was just such a humbling experience to see. I mean it was also cool to see where I've come from, from where I
was... I now look back on the experience and look at my attendings and go “Wow, you really have to be patient” because I mean just watching someone learn and struggle to like intubate and their laryngoscopy skills are just, aren't that strong and it was hard. I had a hard time not stepping in and had a hard time knowing when I had to step in, like having respect for attendings and knowing when is the right time to step in or when is the right time to be like “okay, it's time for me to take over for a second and not hurt their confidence at the same time.” And or how to even just kind of assist them and slowly teach them to how to get into that right, that proper form and get the view they need. It was really difficult for me and I it gave me a whole new perspective on attendings and realizing how hard it is to teach anesthesia in the OR actively in a situation where patients are like de-sating right in front of you and you're like, okay, we need to, you know, take the laryngoscope blade out and then retry masking again and stuff like that. It's a very unique place to educate, I can say that as the perspective I've gained in just the last year of being a CA-2 now and seeing what it was like as a CA-1, or seeing what new CA-1s come in. (Participant 9, CA-2)

3.5.2. Prepares for teaching

Residents described effective clinical educators as doctors who come prepared to teach topics relevant to the cases they are doing and who set aside time to teach.

3.5.2. Illustrative quotes

I always enjoy someone who finds time to... do a pre-op phone call the night before or meet in person to talk about your plan, I find that really helps. And... when they ask you, “is there something that you want to learn or work on?” ... And they will suggest something or like a topic related to the case for the day, and then actually carving out time during the case to talk about that, in ...[a] thought out formatted way, not just like, oh, let's just chat... I'm thinking back to an attending I worked with, in my thoracic rotation...We had a couple challenging cases, like a lot of airway management. But he still found time to... [he] actually had printed out a series of lecture slides on the topic that we were, had planned to discuss, and found time during the day when things were not as crazy to chat about it. And then ...he actually offered at the end of the day to just finish talking about the topic. And I found ... it was a useful subject. I wanted to talk about that. So I was glad that we had the chance to, I appreciated it that he took the effort to print out material, and then still offered to be available to answer questions...after already doing a busy clinical day, so I think that was a really rewarding experience. (Participant 5, CA-2)

I usually look at our patients, look at the cases that we're doing and then try to come up with like, some topic that pulls in something that they should hopefully already know about from their first and second years of medical school, and then like take it to the next level with making it
Anesthesia-focused. So for example, I had a student with me in January and we were doing a big general surgery case and we had an epidural planned as part of our case for the morning. And I said like, “Hey, why don’t you go ahead and read about the anatomy of that region. Like the layers that you would traverse to get to the epidural space, what that looks like and then that's something that we can talk about tomorrow”, because I just felt like that was like an important... topic in anesthesia. But it's also like important anatomy for every physician to know. And something that I guess was like, drilled into me pretty early on in med school and something that I found useful. So that was the like, topic that I sent for her to think about. And then that was, like, the first thing that we discussed that morning, as we drew some diagrams, I got her to try to draw out what she thought was going on. And we just kind of talked through it after the case started. (Participant 2, CA-2)

3.5.3 Mentorship

Residents described effective clinical educators as doctors who provide mentorship toward being an independent anesthesia provider by the end of training. More specifically, providing direction for what the job entails in terms of management and teaching in how to become an effective attending by the end of training.

3.5.3. Illustrative quotes

So she used it to talk about things that I could have done... that could have been more efficient, not necessarily, like unsafe, but just like, move the day a lot faster. One example would be like, because the rooms were right next to each other, and the other room was not the most straightforward. So she mentioned like, right after the tube goes into, in this room, you should immediately just like pop into the other room to see if everything's okay. And then like, come back to finish it, like finish securing the tube and like getting a second IV and all that. So just like those little things. (Participant 14, CA-3)

Empowered, I think that like that's, you know, what we're all working towards at the end, right? Eventually, we're all going to have to be able to feel competent doing that by ourselves. When we become attending, so it yeah, it definitely made me feel empowered, made me feel really like proud of my abilities and just helps push me kind of beyond my comfort level, because previously, that would be something that would have given me anxiety. (Participant 2, CA-2)
4. Chapter 4. Discussion

Our study found that anesthesiology residents play a role as educators for junior learners rotating through the specialty. While residents took on some of the responsibility for teaching medical students and junior residents, little formal teaching training was available to all residents throughout their residency. Many residents felt comfortable teaching junior learners who were less knowledgeable than themselves, but few residents sought feedback from their learners about their teaching skills. Furthermore, residents were able to describe specific characteristics of effective clinical educators in themselves and their teachers, which included those who know their learners, those who prepare for teaching and those who provide mentorship to their learners. Residents’ perceptions of these characteristics can help inform the requirements for teacher training programs.

4.1. Residents as teachers

Worldwide, residents spend approximately 25% of their time educating junior learners including medical students and junior residents.12–15 Medical students report spending more time with residents than with faculty during clinical rotations; therefore, relying on effective resident teaching for their own learning.16–18 Our study’s findings are consistent with previous research suggesting that anesthesiology residents play a role for teaching medical students and rotating peer residents.16–18 Furthermore, our study described how residents prioritize their teaching topics based on patient characteristics, the learners they interact with or themselves as teachers. This was dependent on the resident’s comfort level and their assessment of their learner, rather than a more structured approach in how to teach. Residents often relied on their teaching experience prior to residency and drew from their experiences as a learner for what they felt was
beneficial to their own learning to guide their teaching. This intuitive approach was coupled with ad hoc teaching based on what was happening on the day, with few residents preparing for teaching topics. Many residents in our study felt that their skills as teachers would develop with more experience as both clinicians and teachers. However, studies show that teaching ability and clinical competence do not explicitly correlate.\(^{17}\) Without formal teaching training, residents are likely to adopt ineffective teaching strategies.\(^{17}\)

### 4.2. Availability of teaching resources

An important finding from our study is that these anesthesiology residency programs do not currently offer a formal teaching curriculum to all of their residents. While teaching electives exist in all three programs, these electives were described as highly competitive with only few senior residents having had the opportunity to participate. Unlike other specialties, particularly psychiatry, surgery, internal medicine, obstetrics and gynecology which have established resident-as-teacher programs, anesthesia resident-as-teacher programs are scarce in the literature.\(^{7,21,22}\) The latest pilot study that showed benefits to residents’ teaching skills in anesthesia dates back to 2012.\(^{7}\) The teaching electives offered by the anesthesia programs in this study provided residents with increased opportunity for teaching, which is one factor that facilitates the development of residents as educators. However, these electives did not offer residents protected teaching time whenever clinical duties took precedence. This finding was in keeping with residents in other specialties, with many programs citing the lack of time available as a barrier to implementing resident-as-teacher programs.\(^{19,20}\) Given that many residents will become clinical educators responsible for teaching patients, families and colleagues throughout their careers, it is important to start training residents how to teach throughout their residency to
not only develop them as clinical anesthesiologists by the end of their training but also as effective educators.

Additionally, there is a regulatory requirement for residency programs to develop residents as educators. The Accreditation Council for Graduate Medical Education (ACGME) outlines a core competency for anesthesia residents to demonstrate competence in “educating patients, families, students, residents, and other health professionals”. It is evident from our study that residents are exposed to teaching opportunities with junior learners, yet there is room for improvement in formally developing their skills as educators. The requirement to develop anesthesia residents as educators should be reinforced within the anesthesiology curriculum by providing residents with formal training resources to develop their skills. Compared to pediatrics, which has an ACGME requirement to have a resident-as-teacher curriculum for their residents, anesthesia does not yet have this requirement. A national survey of existing pediatric resident-as-teacher curricula found that of the 62% of pediatric program directors who responded to the survey, 87% of those programs had a formal resident-as-teacher curriculum. Anesthesia is currently lagging behind other specialties in developing their residents as educators with 31% of programs having formal teacher training. This should be addressed by residency program directors to ensure that residents are meeting their competency requirements as described by the ACGME.

The majority of participants in our study expressed an interest in medical education. While most study participants did not seek out resources to help them develop as educators, many hoped that teaching would be a part of their future career. Barriers to seeking out resources were namely constraints on residents’ time, which was well-described in other studies. Similar barriers were
identified by faculty, where they identified the absence of formal teaching training and the lack of protected time to participate in formal training as barriers to effective teaching.\textsuperscript{26} Thus, one way to overcome the time barrier is to build teaching training formally into the residency curriculum. It should be a priority to integrate the development of residents’ teaching skills into existing formal teaching activities.

4.3. Residents’ perceptions of their role as teachers

Many residents in our study expressed enjoyment in teaching and desired more teaching opportunities. Enthusiasm and enjoyment of teaching by residents as well as their desire to have more teaching opportunities is documented in the literature.\textsuperscript{12,27} Additionally, residents described how teaching positively impacted their own learning, often solidifying the basics of anesthesia as a result of having to think about why they are doing things a certain way when explaining themselves to junior learners. This is supported by other studies exploring pediatric residents’ improved knowledge acquisition when teaching others as compared to didactic learning.\textsuperscript{5}

4.4. Residents’ perception of effective clinical educators

Residents defined what an effective clinical educator means to them. In line with a previous qualitative study describing effective clinical educators in anesthesia, our study’s participants described effective clinical educators as those who know their learners and meet them where they are, those who create the teaching environment, and those who provide mentorship for their careers as anesthesiologists.\textsuperscript{28} In our study, residents described how effective clinical educators take the time to baseline their learner’s knowledge level in order to create an environment where the learner can be simultaneously challenged and supported in a way that protects the safety of
both the patients and the learner. Furthermore, residents described the importance of preparing for teaching and their appreciation for educators who took the time to teach despite clinical pressures and those who explained why they do something a particular way. Our study highlights that the lack of formalized teaching training for anesthesiology residents results in residents experimenting without a formal structure in place. Our study identified that residents have limited feedback opportunities to help them improve their teaching skills. This lack of teaching training, combined with the lack of feedback opportunities can result in ineffective teaching strategies, as clinical competence does not translate to teaching competence. By defining what it means to be a good clinical educator, it can help residency programs inform the future creation of teaching training programs that may target the areas defined by residents.

4.5. Limitations

While our study describes the current status of anesthesiology residents’ teaching training at three anesthesiology residency programs, there were several limitations to this study. First, our study was conducted at three residency programs in a single city and may not be transferable to other anesthesiology residency programs. However, the lack of anesthesiology resident-as-teacher programs has been previously cited as a problem in the literature. Second, despite three rounds of recruitment, participation was low. A total of fifteen residents from across three sites were included in this study. Problems with recruitment may be attributed to the fact that this study was conducted in the midst of a global pandemic in which residents may have experienced fatigue from both work pressures as well as increased virtual interactions or “Zoom fatigue”. Despite a low number of participants, we were able to obtain data saturation. Third, participants in this study were a self-selecting group who had an interest in medical education which may
have affected their responses and created response bias. Finally, as a result of the COVID-19 pandemic, residents reported having fewer teaching opportunities with medical students until the latter part of 2020. This may have significantly affected their experience with teaching due to the reduced interactions with medical students and it may not be an accurate representation of what is normally available to residents in terms of teaching opportunities.

4.6. Next steps

Our findings suggest that anesthesia residents are responsible for teaching learners in the clinical environment during residency training. However, little formal curriculum exists to train anesthesia residents in teaching skills. Our study helps inform the need for teaching training in residency programs to intentionally create effective clinical educators. As a next step, a core curriculum in teaching skills should be developed, implemented and tested as part of the anesthesiology residency program. Many anesthesia residents are expected to take on an educator role during their training, yet they are not all formally trained in teaching best practices. To fulfill ACGME recommendations, anesthesia residency programs should consider incorporating teaching skills throughout residency training as teaching is considered a core competency that residents must obtain at least at a basic level. Future research should include the adoption of existing resident-as-teacher programs from other specialties in ways that accommodate anesthesiology residents. These programs should be accessible to all residents. The efficacy of such programs need to be tested to ensure that they are suited for the needs of an anesthesiology clinical educator-- this can be achieved through educational research. Ideally, these programs should be longitudinal in nature to help scaffold resident teaching skills throughout their training. By investing in teacher training in residency, it not only benefits
medical students and junior learners while residents are training, but helps build effective clinical educators for future residents. This has the potential to not only improve the learning experience for residents but also positively impact patient care.\textsuperscript{8}
Bibliography


23. ACGME Program Requirements for Graduate Medical Education in Pediatrics


Appendices

Appendix A: Semi-structured interview guide

Aims of the study

1. Explore the current status of Harvard affiliated anesthesia residents’ training in teaching skills and understand their perceptions of preparedness for teaching medical students and peers.

2. Explore residents’ perceptions of what characteristics make an effective clinical educator and how these characteristics may change during year of residency.

3. Explore who and what residents are teaching and whether this changes over the course of their training.

4. Explore how residents assess the efficacy of their teaching.

Part 1: Obtain verbal consent from interviewees

Part 2: Introduction

My name is Hiba Khaled. I am a Master’s student in Medical Education at Harvard Medical School. I was also an anesthesia resident in Edinburgh, Scotland. Thank you for agreeing to be a part of this study and for joining me in this interview. Your answers will help us with our research and will help us understand how anesthesia trainees are trained to become educators through their residency. Everything we talk about here today will be confidential and will not identify you personally. I am planning to record the study as an audio file, which I will analyze and delete after I am done with the study. There is a small risk of a breach of your confidentiality but we will do everything we can to minimize that risk. You can choose whether to turn your camera on or leave it turned off for the interview. The hope is that this will be published in a manuscript. Do you consent to the recording and do you consent to the study? Do you have any questions before we start?
Opening:

What year are you in in the residency program?

What is your undergraduate degree in? (Probe: did you have any educational training prior to doing medicine?)

One way to describe a clinical educator is as someone who participates in clinical practice, someone who provides bedside teaching and is responsible for your training. I want you to think about an effective clinical educator who taught you at any point in your anesthesia training, what qualities do they possess that makes them an effective clinical educator?

- Probe: In your own words, please describe what an effective educator looks like to you within anesthesia.
- Probe: Can you please explain why you chose those specific words to describe an effective educator.

Middle:

Do you teach any trainees (medical students, CRNA students, other residents) in the clinical environment?

- (Probe: Who? How often? In what setting? Is this formal or informal teaching? Can you describe the teaching? Tell me more about that...)

Can you please explain how prepared you feel when you are teaching?

- (Probe for CA-2+: can you please explain how your feelings, as explained above, have evolved over time?
- (Probe: Tell me about how your comfort level with teaching changes depending on if you are teaching students or peers.) 1,3

How do you prioritize teaching topics for your learners? (Probe: Does how you prioritize your teaching topics change based on who you are teaching? For each of the topics you just shared,
could you please explain how you would incorporate them into teaching that is patient-centered, learner-centered, or teacher-centered.)

How do you assess whether your teaching strategies are effective? (Probe: what feedback do you seek from students about your teaching? How do you assess student learning?)

Have you had any formal teaching training at any point during your medical education? (Probe: when did you have formal training; as a medical student, resident? What did that look like?)

Have you had any informal teaching training at any point during your medical education? (Probe: What did that look like? I.e. from other residents or attendings?)

If teacher training exists in your program, what does that look like? (Probe: how is training delivered? i.e. simulation, didactic lectures, e-learning, other?)

Do you seek out resources to help with your teaching? (Probe: why do you not seek out resources to help with your teaching? Or Why do you seek out resources to help with your teaching? Can you please tell me which resources you have sought out to help you with your teaching?)

What resources or tools in your program are you aware of to help train you in teaching others?

Have you identified good examples of clinical educators in your program that you emulate in your own teaching? (Probe: can you please tell me more about why you emulate that specific person? What is it about their teaching that you particularly find useful?)

Conclusion
What resources or support would you want to have within your department to help you become a more effective educator? (Probe: In your opinion, can you please explain what deficiencies in the teacher training currently exist and how you would make necessary improvements?) 1,2

Is there anything else you want to add to help me understand your experience of teaching in anesthesia?

Do you have any questions about anything we discussed today?

Thank you for your time.
## Appendix B: Codebook

### Parent Code: Teaching resources

<table>
<thead>
<tr>
<th>Child Node (Analytical code)</th>
<th>Description of code</th>
<th>Illustrative example</th>
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<tbody>
<tr>
<td>Availability of formal teaching training</td>
<td>Residents describe the range of teaching training available to them in their departments or through their residency program. This can include the option of no resources available.</td>
<td>“I think we have like a medical education elective that we can do in our CA-3 year.” Interview 5, pg 17 (50:51)</td>
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<tr>
<td>Availability of informal teaching resources</td>
<td>Residents describe informal resources they seek to help with their teaching skills like asking their peers or attendings</td>
<td>“I think that's probably like talking with other residents. I can't really recall any specific conversations about that.” Interview 5 CA-2, pg 16 (45:32)</td>
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<tr>
<td>Self-directed resources</td>
<td>Residents describe their interest or lack thereof in seeking out resources to help with their teaching skills</td>
<td>“I've watched videos on how to give engaging presentations, especially for the two that I recorded. And so that definitely modified my PowerPoint display. And, you know, I think feedback from other, for friends, just like my med school friends that I at times helped with test taking skills. I seek feedback from them about “what do you think would make a better teacher?”, stuff like that. So more like informal things.” Interview 6, pg 13, (29:12)</td>
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### Parent node: Resident teaching topics and learners (focusing on the resident as a teacher)

<table>
<thead>
<tr>
<th>Learners</th>
<th>Residents describe the different learners they encounter in their teaching interactions including medical students and other residents, etc. This excludes the</th>
<th>“...as CA threes, you get, usually you get assigned medical students or mostly medical students. And then I also did a, an elective called the junior attending elective in</th>
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<tr>
<td>Theoretical or clinical topics</td>
<td>Residents describe various teaching topics centered around patients or their process about preparing teaching topics. This can include topics related to anesthesia, surgical considerations, patient comorbidities or interactions with the learner about theoretical or clinical topics.</td>
<td>“...something related to the case. Typically the surgery and the considerations, the anesthetic considerations of surgery. So one example was very simple one laparoscopic surgery where the hemodynamic changes during laparoscopy, for example. So that's a very general one. And then sometimes it's based on the patient's characteristics. So one day we had someone with neurofibromatosis type one and then so I didn't remember what they were. So I looked it up, and then the next day, we try to teach a little bit.” Interview 14, pg 9 (24:53)</td>
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<tr>
<td>Technical skills</td>
<td>Residents describe teaching hands on skills and/or procedures relevant to anesthesia teaching in the operating room</td>
<td>“I prioritize having them actually get their hands on things, and then explaining everything as we go along. And if there was some type of skill or some type of something technical that we wanted to do, I would talk to them about that prior, and kind of run through it so that when they're doing it, they already have an expectation of what is coming.” Interview 6, pg 9 (17:38)</td>
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<tr>
<td>Feelings about teaching abilities</td>
<td>Residents describe their personal feelings towards teaching peers and medical students. Feelings refers to the resident’s feelings.</td>
<td>“I would say, if it was a case that I'm comfortable with, which, I mean, most cases so far have been like, pretty reasonable. I feel pretty confident and comfortable in teaching them and I feel like I am able to give them the space that they need to try to do things that they want to do. Yeah, I try to not rush them or, you know, fault them for doing whatever because most of the time we can, we can fix whatever happens.” CA-1 Interview 6, pg 7 (13:59)</td>
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<tr>
<td>Barriers to teaching</td>
<td>Residents describe factors that decrease or negatively affect their ability to teach others. This includes lack of opportunities for teaching.</td>
<td>“I think as a CA-1, so much of it is focused on your own learning. And there's such a steep learning curve, from the beginning of CA-1 was just everything is new. It's a new place. I didn't do intern year at my program. So just the hospital, the people, the system, and then all these like skills and the knowledge that you’re supposed to gain and then you start rotating different rotations. And it can just feel like a lot. I think, CA-2 year I have felt like not not necessary, like a plateau in in the sense that like, I don't have anything left to learn, but I feel just things are a little bit more like stable in my own mind. And it's not like a conflict, I feel just feel more confident and comfortable. So I think in that process, I'm also like, more interested and engaged in teaching medical students when they rotate through.” CA-2 Interview 5, pg 12 (33:29)</td>
</tr>
<tr>
<td>Facilitators to teaching</td>
<td>Residents describe helpful factors that increase or improve their ability to teach others. This includes opportunities to teaching. This can also include finding and disseminating resources to their learners.</td>
<td>“Yeah, I think it's very, it impacts me a lot. Because, like I said, one of the examples I gave you before where, you know, I want to teach this one thing, but I actually don't know much about it. So I would have to look it up. So it kind of forces you to, you know, look things up yourself and look at the studies behind it.” CA-3 Interview 14, pg 16 (46:22)</td>
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<tr>
<td>Assessing learning and teaching</td>
<td>Residents describe how they assess learner’s learning and their own teaching styles using direct and indirect feedback. This includes the learner’s perceptions about the resident’s teaching.</td>
<td>“I asked the learner like, at the end of the day I was like, you know, I'm still new at this, If there’s something that you felt that I did well, or something that you think would benefit you or other learners in the future that I do differently, I'd be happy to know because, and this has like no bearing whatsoever on, like, my opinion of you, because I like genuinely just want to know how to be a better teacher. So I like I'm open to hearing from them directly. And I also asked them, What are some things that you're interested in knowing as a medical student are like, what are your peers? What do they think about anesthesia? Like, what do they want to know? I get that feedback from them directly.” Interview 6, pg 10 (22:26)</td>
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**Parent Node: Qualities of teacher (self and others)**

<table>
<thead>
<tr>
<th>Child Node (Analytical code)</th>
<th>Description of code</th>
<th>Illustrative example</th>
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<tbody>
<tr>
<td>Knows their learner</td>
<td>Participants describe effective educators as supervisors that meet the...someone who's sensitive to your level of training, in terms of how much autonomy</td>
<td></td>
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<tr>
<td>Mentorship</td>
<td>Residents describe effective educators as attendings who teach/work to prepare the residents for their role as an attending</td>
<td>...she used it to talk about things that I could have done that was more that could have been more efficient, not necessarily, like unsafe, but just like, move the day a lot faster. One example would be like, because the rooms were right next to each other, and the other room was not the most straightforward. So she mentioned like, right after the tube goes into, in this room, you should immediately just like pop into the other room to see if everything's okay. And then like, come back to finish it into, like finish securing the tube and like getting a second IV and all that. So just like those little things.” CA-3 Interview 14 pg 12 (32:16)</td>
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<tr>
<td>Creates the teaching environment</td>
<td>Residents describe effective clinical educators as attendings who foster a teaching environment through time, preparation and relevant topics that are accessible to the resident within their clinical responsibilities.</td>
<td>“But I’m thinking back to like an attending I worked with, in my thoracic rotation. And that was, we had like a couple challenging cases, like a lot of airway management. But he still found time to like, actually had printed out like a series of like lecture slides on the topic that we were, had planned to discuss, and found time, like during the day, when things were not as crazy to chat about it. And</td>
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then we actually offered at the end of the day, to like, just finish talking about the topic.” CA-3 Interview 14 pg 5