Overextending: A Qualitative Study of Trainees Learning at the Edge of Evolving Expertise

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ABSTRACT

Background The challenge of graduate medical education is to prepare physicians for unsupervised practice while ensuring patient safety. Current approaches may inadequately prepare physicians due to limited opportunities for autonomy. Recent work on how trainees gain autonomy shows that they actively influence their supervisors' entrustment decisions. If program directors more clearly understand how trainees experience increasing independence, they may better sensitize trainees to the deliberations they will face during patient care.

Objective The authors sought to explore how trainees experience lessening supervision as their clinical training advances.

Methods Using constructivist grounded theory, the authors recruited trainees from various specialties and training levels via email and conducted 17 semi-structured interviews from 2019 to 2020 to solicit clinical experiences during which their perceived autonomy changed. Through constant comparison and iterative analysis, key themes and conceptual relationships were identified.

Results Seventeen trainees from 4 specialties described novel clinical situations that required "overextending," or going beyond their perceived edge of evolving expertise. This move represented a spectrum based on perceived locus of control, from *deliberate overextending* driven by trainees, to *forced overextending* driven by external factors. Trainee judgments about whether or not to overextend were distilled into key questions: (1) *Can* I do it? (2) *Must* I do it? (3) Do I *want* to do it? and (4) Is it *safe* to do it? More advanced trainees posed a fifth question: (5) *Am I missing something?*

Conclusions Decisions to move into the realm of uncertainty about capabilities carried weight for trainees. In making deliberative judgments about overextending, they attempted to balance training needs, capability, urgency, and patient safety.

Introduction

The major challenge of graduate medical education (GME) is to prepare physicians for unsupervised practice while guarding patient safety. Progressions from wholly supervised to unsupervised work was previously assumed to occur via an apprenticeship model[1] and led supervising physicians to infer they could leave trainees unattended during overnight hours and surgical procedures. Now, an increased emphasis on patient safety has resulted in work hour restrictions and enhanced faculty supervision,[2,3] measures which may limit progressions in autonomy.

Learning theories help explain the developmental trajectory to manage increasingly complex situations with decreasing supervision. For example, Vygotsky conceptualized the "zone of proximal development" as a space in which learners achieve maximum gains when they function with support just beyond a skill that has been fully mastered.[4,5] This perspective suggests that trainees realize their full potential only when they perform skills at the dynamic edge of their expertise, aka their "learning edge."

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Editor's Note: The online version of this article contains the interview guide used in the study.

Dynamic processes characterize entrustment at the point of care. Factors that influence entrustment decisions relate to: (1) trainees, (2) supervisors, (3) situations, (4) tasks, and (5) the relationships between trainees and supervisors.[6,7] While many aspects of entrustment lie outside of trainees' locus of control, recent research has shown that physicians-in-training actively shape perceptions of their trustworthiness through specific behaviors that may influence their supervisors' decision-making.[8] Kennedy and colleagues described 4 foundational dimensions of trustworthiness as understood by supervisors: (1) knowledge and skill, (2) conscientiousness, (3) truthfulness, and (4) discernment of limitations.[9] Further, Robinson et al[10] described diminishing opportunities for decision-making influenced by multiple factors while also highlighting the role of a sense of ownership.

What remains less clear is how trainees experience and shape their work environment[4] to learn at the edge of their evolving expertise, as well as how they experience their own agency to do so while providing patient care. Novel clinical situations provide valuable learning opportunities, yet *when* and *how* trainees capitalize *on which* opportunities[11] requires more exploration.

Our objective was to better understand how trainees' experience learning beyond the boundaries of their current abilities, which could benefit GME in 2 ways: (1) to guide future trainees in gaining progressive autonomy efficiently, and (2) to support supervising physicians in making entrustment decisions.

Objectives
To further characterize how trainees develop clinical practice at the edge of evolving expertise.

Findings
When confronted with novel clinical situations, trainees go beyond the edge of evolving expertise, defined as overextending. This occurs on a spectrum from deliberate to forced. During deliberate overextending the locus of control lies with the trainee; during forced extending the locus of control is in external factors.

Limitations
Our study was completed at one large academic center and the findings may be unique to the culture of our institution; trainees may be more likely to report on procedural instances of overextending than others.

Bottom Line
Clinician educators can sensitize trainees to the notion of overextending and the deliberations they will face through explicit discussions about the relationship between entrustment, autonomy, and their learning.

Methods

The study took place at a large, university-affiliated, quaternary care medical center comprising 3 hospitals and 840 resident trainees at an accredited US medical school in Chicago, Illinois. Residency program directors and the Vice Dean for Education supported our recruitment of participants from their programs by allowing investigator access to their trainees via email. One investigator (A.K.) sent 2 recruitment emails to trainees in pediatrics, emergency medicine, internal medicine, surgery, and obstetrics and gynecology residency programs asking them to participate. Ensuring a mix of training year and specialty, we consented and interviewed 17 participants in total. Our aim was not to achieve a representative sample but an informative sample for this qualitative study. Each participant provided informed consent and received a $10 gift card after participation.

For this exploratory study, we used a constructivist grounded theory (CGT) approach, which explores complex social processes that can benefit from further theorization.[12] We chose CGT because this approach is well suited to help explore trainees' subjective clinical experiences. Further, CGT encourages researchers to reflect on their own backgrounds and perspectives that could impact the research process.[13] In examining our reflexivity, all authors are physicians who experienced their own journeys to independent clinical practice. One author (A.K.) completed advanced specialist training during most data collection and analysis. All authors are versed in medical education research, and 2 authors (P.W.T., W.J.E.) have extensive backgrounds in qualitative methodologies.

One investigator (A.K.) conducted all individual semi-structured interviews[14] between June 2019 and November 2020 to solicit residents' accounts of influential patient care experiences. Open-ended questions invited participants to describe their experiences while practicing at the edge of their capabilities. For instance, trainees were asked what tasks they regularly completed unsupervised. See online supplementary data for the interview guide. Initial sampling was purposive to include diversity in gender, training level, and medical specialty. Later sampling was guided by theoretical considerations in line with CGT.[12] Individual interviews were conducted either in person or via videoconferencing. Following CGT methodology, we collected and analyzed data iteratively. Interviews were audio-recorded, transcribed, reviewed for accuracy, and deidentified.

The analysis proceeded first with line-by-line coding and using constant comparative analysis of initial interviews to create focused codes. Two authors (A.K., W.J.E.) coded a subset of interviews to ensure consistent coding; disagreements were resolved through discussion. Analytic meetings served to elevate and combine key concepts and to identify major themes. The entire team met to examine the relationships among major themes to theorize how trainees practiced at their learning edge. In later stages of iterative data collection and analysis, we recruited additional participants whose specialty and training level allowed us to refine aspects of our conceptual model. Data collection ended when our analysis achieved theoretical sufficiency.[15] We used MAXQDA 2018 (VERBI Software, Berlin, Germany) to facilitate data management and coding.

The Office of Research Integrity and Compliance at Ann & Robert H. Lurie Children's Hospital of Chicago reviewed this study and determined that it was exempt from institutional review board review.

Results

We interviewed 17 physicians-in-training (7 men, 10 women) from clinical postgraduate year (PGY) 1 through 5 in pediatrics, emergency medicine, internal medicine, and surgery residency programs. Fifteen participants were from one academic center; 2 were clinically active during research fellowships at this center but were primarily enrolled in clinical training

TABLE 1
Participant Characteristics

Participant	Age	Male/Female	Postgraduate Year (Clinical)	Specialty
P01	28	M	3	Pediatrics
P02	31	F	3	Pediatrics
P03	30	M	2	Emergency medicine
P04	28	F	3	Pediatrics
P05	29	M	2	Emergency medicine
P06	28	F	3	Pediatrics
P07	34	M	4	Emergency medicine
P08	26	F	1	Pediatrics
P09	28	M	1	Emergency medicine
P10	29	F	4	Emergency medicine
P11	27	F	1	Pediatrics
P12	32	M	2	Emergency medicine
P13	28	F	3	Emergency medicine
P14	26	F	1	Internal medicine
P15	30	F	4	Surgery
P16	31	M	4	Surgery
P17	31	F	4	Surgery

programs at other academic centers. See TABLE 1 for an overview of participant characteristics. Anonymous participant codes identify representative quotations and year of training (eg, P08, PGY-1). All trainees reported regularly encountering novel clinical situations that required judgments about making decisions just beyond their own perceived level of current ability. These situations required trainees to either go beyond (P01, PGY-3) their current known ability, or, conversely, to remain at the level of their current known ability. We defined practice at or just past the learning edge as "overextending" and used this term to describe situations in which trainees experienced uncertainty and continued to care for patients despite being outside their comfort zones.

We identified a spectrum of overextending with 2 extremes: (1) deliberate overextending, driven by trainees, and (2) forced overextending, driven by factors beyond the trainees' direct control, such as supervisor, patient, or environmental factors. Although all instances of overextending were influenced by situational aspects, we differentiated these extremes of overextending in relation to trainee perspectives of agency: either they deliberately managed the situation or the situation forced their hand. Both agency and situational factors influenced trainees' deliberations and affected when and how overextension occurred. We now discuss each of these main findings in greater detail. See TABLE 2 for representative quotes that highlight the overarching concepts and themes described in this section.

Deliberate Overextending

Trainees reported feeling agency during deliberate overextension, characterized by perceived confidence, presumed trust from their supervisors, and familiarity with the task at hand. Importantly, deliberate overextension typically required some back-and-forth with supervisors. These negotiations could become quite nuanced and often included multiple strategies, including trainees demonstrating their readiness through preparation and explicitly communicating their preferred level of supervision. When asked why these discussions were important, trainees cited anticipated future unsupervised practice as a main motivator.

Demonstrating Readiness for Less Supervision: Rather than simply stating readiness, trainees recognized the need to demonstrate readiness to take on tasks with less supervision in key ways, such as (1) performing an initial and complete-as-possible patient evaluation independently, (2) formulating and committing to a plan, and (3) preparing for procedures by gathering supplies, obtaining informed consent, etc. Trainees communicated their preferred level of supervision both explicitly and implicitly. This sometimes took the form of completing a task with implicit permission as supervisors watched, for example, in the operating room.

Anticipating Future Unsupervised Practice: Trainees were often mindful of performing future tasks

TABLE 2
Major Themes and Representative Quotes

Concept and Overarching Theme	Quote
Deliberate overextending	
Deciding that you're ready	"I was in the MICU a couple months later [after my onc rotation]. By then, I felt comfortable leading goals of care discussions on my own. I think gaining confidence with the skill set to do a goals of care discussion was important for me." (P14, PGY-1)
	"I said I could do an ultrasound-guided IV, though I didn't feel that comfortable with it and then ultimately didn't get it. . . I poked this guy a couple times and it probably wasn't the best thing for him or for me. I apologized to the guy and then found a nurse who was trained to do ultrasound-guided IVs. I realized that I could have asked for help sooner, but it's a 'lesson learned' kind of situation." (P03, PGY-2)
	"Most of the history is just taken on my word, and the initial assessment of sick versus not sick. Most workups I start independently; now there are many imaging studies that I feel very confident in knowing are indicated. Things I do all the time that are now unsupervised that used to be supervised—really, once they know you, every patient encounter is unsupervised." (P05, PGY-2)
Demonstrating readiness for less supervision	"I just told the senior: 'Lac[eration], needs to be repaired. I'm going to get the stuff to wash it out, have lidocaine at the bedside, and suture with Prolene 5-0...' And the senior heard all the things he wanted to hear . . . and I got myself ready and told him, I'm gonna do the lac myself and let you know when I'm done." (P09, PGY-1)
Communicating a preferred level of supervision	"Within cases, you'll ask for instruments as you know that you need them. . . That's one of the ways that you can try and show autonomy. Otherwise, the attending is just assuming that you don't know how to do it." (P16, PGY-4)
Anticipating future unsupervised practice	"I really wanted to get good at procedures so that I could be a good senior and teach my interns. . .So I was pretty aggressive with trying to get [central venous] lines. . . because that's how you're gonna find your limits." (P14, PGY-1)
Experiencing supervision during deliberate overextending	"[The laceration] was relatively simple and I could have. . . done it alone, but having the attending there hovering. . .led to less confidence on my part. . . and so the attending, because they're watching closely, kind of quickly jumped in to take over." (P01, PGY-3)
	"I think when people hover it shows a lack of trust. . . when people are kind of micromanaging and checking in on you very frequently before you have time to get things done it can get really annoying to the point where—why don't you just do it yourself?" (P09, PGY-1)
	"She [said], 'I would have done everything that you're doing and you seem to be doing it right and if you can't get it, I don't think I'm going [to] be able to get it'. . .she trusted that I had done my best. . . and was confident enough in my abilities. . . that she didn't feel like she needed to do it." (P10, PGY-4)
Forced overextending	
Feeling pushed by external factors to take on more responsibility	"I am getting pushed a bit at. . . one of our community sites. . . It was really busy, and we had 3 traumas come in. The attending had to take one and I had to take one. At [the academic center] I'm responsible for [only] the airway. Whereas [at the community site] I guess I just didn't realize that I'm responsible for all the different parts." (P12, PGY-2)
	"[I felt like I was] in [a] situation where there was no possibility of supervision. . .I think the first time I was in that situation I was [going to feel like] I wasn't ready. . . [but] if I'm able to reason through and understand [the clinical situation], it's safe and needs to be done." (P01, PGY-3)
Experiencing tension between wanting supervision and autonomy	"It's kind of the point [of training to] put your foot down and come up with a plan. . .they encourage you to try to come up with something and know that you'll be wrong sometimes, but then they're. . .the backstop to make sure you don't [affect patient safety]." (P03, PGY-2)
	"I think I have more responsibility for not only updating families but having more difficult conversations with them. It was a Friday night, we found a lesion on a leg MRI, and I was the one to sit down with them, explain to them all of our concerns including cancer and then convincing them to stay. I think it was harder on my own. I felt a lot more pressure because there wouldn't be someone else sitting with me if I said something that wasn't you know clear or could have been worded better." (P04, PGY-3)

TABLE 2
Major Themes and Representative Quotes (continued)

Concept and Overarching Theme	Quote
Supervisors' expectations influencing forced overextending	"I think I've definitely got a longer leash now that I'm a PGY-2 versus a PGY-1... There are attendings I've worked closer with and had more formative experiences with and they are more willing to be trusting." (P12, PGY-2)
	"I remember ... a baby who had sepsis [transferred at night] and needed an LP...I was...the only person who could possibly do it and it needed to be done...so I was feeling nervous... if you had asked me, 'Do you feel like you're ready to just do this by yourself?' I probably would have thought no, but I did it, and actually ... we got spinal fluid." (P01, PGY-3)
Meeting patient expectations	"It was hard to communicate uncertainty [about bleeding in the brain of a neonate] to parents... I think [the supervisors] felt comfortable because... they had seen me talk to some people and I had heard their own speeches about head ultrasounds. I had talked with the parents before, so [the supervisors] thought I knew them... and were trusting me to hopefully not goof it up too bad." (P11, PGY-1)
To overextend or not to overextend?	
Conforming to expectations within a specialty	"[The supervisor would say] 'Do you feel comfortable doing this?' [And I would say] 'yeah,' but think 'I don't know if I'm gonna be able to but I feel comfortable in trying.' I think that's the expectation. [I heard a pediatric trainee say] they were scared that they weren't gonna be able to get the airway and it was received very well... [in my program] I think the attending would have said 'Okay, well I'm just gonna intubate.'" (P16, PGY-4)
Having a backup plan	"I was doing a central line in the NICU and it didn't quite look right...but I knew that I had a viable plan B and C... and knew I could just seamlessly move on to [plan B] as if it was part of the plan the entire time. In this case, it was fine. It was in the right spot. The extra 2 to 3 steps [get you to] 100% [confidence]." (P07, PGY-4)
Failing when overextending	"I didn't tell anyone about [the patient's drain coming out] and I got a call from a chief that morning. Oh they were so mad, and I'm sleeping and they're [saying] 'What were you thinking? You're an intern, you don't know what's going on, you tell everyone everything. This was sepsis control for this patient, luckily they're okay but what were you thinking?'" (P15, PGY-4)

Abbreviations: MICU, medical intensive care unit; onc, oncology; PGY, postgraduate year; IV, intravenous; MRI, magnetic resonance imaging; LP, lumbar puncture; NICU, neonatal intensive care unit.

without supervision. Especially toward the end of training, they began putting themselves in their supervisors' shoes. This anticipation of unsupervised practice transformed how they approached overextension. Their future selves loomed large in their minds and motivated them to seek out situations at their learning edge to then extend it.

Experiencing Supervision During Deliberate Overextending: In instances of deliberate overextension, close supervision was perceived as "hovering," which we defined as supervision perceived as unhelpful, unwanted, or overbearing. Deliberate overextending sometimes appeared to be an attempt to escape hovering that evoked feelings "like someone is expecting you to fail, so you just feel the spotlight" (P05, PGY-2). To illustrate this worry, trainees reported situations in which supervisors took charge of procedures while supervising closely, prompted by lack of trainee confidence. Trainees predicted that hovering supervisors would transition from supervision into direct clinical care. These experiences undermined trainees' sense of responsibility, agency, and perceptions of supervisors' trust. Participants endorsed feeling trusted by their supervisors and the clinical team when they were allowed to assume some unsupervised tasks, even if they were unsuccessful.

Forced Overextending

Trainees engaged in forced overextending during clinical events that pushed them beyond their perceived learning edge, situations characterized by unique tensions. On the one hand, trainees realized that their patients had clear and immediate care needs; on the other hand, they faced uncertainty and discomfort in their ability to meet those needs without the supervision and support they perceived necessary but which may not have been immediately available. For example, emergency medicine residents frequently rotated away from the academic hospital to gain exposure to other practice settings and encountered different expectations at different sites.

Trainees understood that their supervisors expected them to complete tasks without direct supervision. These expectations appeared to stem from: (1)

supervisors' direct knowledge of and experience with the trainee, or (2) supervisors' expectations based on training level. Trainees also recognized acute or complex medical situations that required urgent action. They described forced overextension as "being thrown into the fire" (P05, PGY-2), whether they were ready or not. These uncomfortable experiences, however, contributed to their learning, especially early in training.

During forced overextension, trainees recognized obvious tensions between their desire for supervision to ensure patient safety and pressure to fulfill urgent patient care needs. Supervisors provided a safety net; trainees appreciated having someone to check their clinical work and "bounce ideas off of" (P13, PGY-3). Their supervisors' presence helped ensure that committing to the wrong plan did not result in adverse patient outcomes, allowing them to fail safely. Although forced overextension represented one end of the spectrum of overextension, most clinical situations trainees described included both elements of negotiation and external factors. We will discuss these external factors in turn.

Factors Influencing Overextension

Supervisor Expectations: Trainees often learned about their supervisors' expectations at the beginning of a new academic year. These expectations were explicitly stated by supervisors, implied, or constructed through discussion with other trainees. Urgent clinical needs demanded overextension, and trainees' perceived lack of readiness collided with a sense that they *should* be ready to manage certain aspects of patient care without supervision at their current level of training.

Patient Expectations: Trainees' close contact with patients and families engendered trust, feelings of responsibility, and patient ownership. Further, family members often expected trainees to manage primary tasks. Their close patient contact placed the onus to communicate difficult news squarely on trainees, whether they felt ready or not.

Expectations Within a Medical Specialty: A trainee's specialty seemed to influence overextension behaviors, specifically: (1) which tasks to try unsupervised, and (2) how to talk about comfort and discomfort with particular tasks. For example, both surgical and emergency medicine trainees identified expectations to state comfort in novel clinical situations, regardless of their actual comfort or discomfort, to minimize risk of losing learning opportunities.

Specialty also shaped perceptions about which tasks comprised overextending at given training levels. This could represent unsupervised conversations regarding difficult diagnoses in pediatrics or unsupervised central line insertions in surgery. Awareness of these variations across specialties helped trainees construct how they practiced at their learning edge as they moved through different areas of the hospital. This awareness influenced:

- what trainees perceived as acceptable to say, ask for, and do on their own,
- how trainees interacted with supervisors, and
- how trainees determined acceptability of deliberate overextension.

To Overextend or Not to Overextend?

Trainees were often explicitly aware of opportunities to overextend, some of which resulted from deliberative judgments and others that arose from acute patient care needs in particular patient care contexts. They used an in-the-moment risk-benefit analysis of contextual requirements and their current perceived clinical abilities. We distilled these deliberations to 4 fundamental questions that captured the main factors in residents' considerations related to capability, urgency, accountability, clinical development goals, and patient safety:

- *Can* I do it?
- *Must* I do it?
- Do I *want* to do it?
- Is it *safe* to do it?

Trainees leaned into opportunities for overextending when patient safety was not in jeopardy, they were sufficiently confident in their abilities, and they had demonstrated competence in prior supervised situations. When thinking about clinical situations that demanded more urgent responses, trainees' internal deliberations about "Can I do it?" were sometimes "I think so." Importantly, questions around "Must I do it?" for the sake of patient care led to unsupervised actions. Therefore, these judgments appeared interrelated, and often depended on external factors such as patient care setting or supervisor preference. Of course, getting to "yes" in these deliberations did not guarantee success. Overextension demanded vulnerability and acceptance of possible failure.

Unsuccessful instances of overextension prompted reflections on how to improve patient care, since failures revealed previously unrecognized blind spots

and familiarized them with the boundaries of their capabilities.

A Fifth Question: Trainees further along their developmental trajectory toward unsupervised practice described asking themselves a fifth question before overextending, distilled as: "What could I be missing?" Some reported that they earned their supervisors' trust if they considered potential complications or contingency plans prior to being prompted, demonstrating more clinical maturity.

Discussion

Based on our analysis, we identified overextending as a specific mechanism by which trainees expanded skills and knowledge at their learning edge. Overextension occurred on a spectrum ranging from deliberate to forced, with multiple factors influencing trainees' decisions on whether or not to overextend. These factors included supervisor expectations, patient and family expectations, and local culture. Future unsupervised practice motivated physicians-in-training to seek and experience opportunities to practice at their learning edge, and they engaged in explicit deliberations about when and how to do so. We see potential in sensitizing trainees to the notion of overextending and the deliberations they will face through explicit discussions about the relationship between entrustment, autonomy, and their learning. Clinical educators can use these 5 key questions to help promote trainees' ability to engage in reflection-in-action[16] about opportunities to overextend and balance patient safety, clinical needs, and trainee ability. These questions may also guide supervisor entrustment decisions. Forced overextension in particular has several implications, specifically around the necessity, inevitability, or desirability for trainees' perceived need to act on their own.

Overextending describes how trainees move tasks from the zone of proximal development[4] into a zone of unsupervised problem-solving. In our conceptualization, overextension describes how trainees take on more tasks with less oversight, representing individual instantiations of progressive autonomy. As described previously, agency and responsibility[17] influence concrete behaviors in clinical practice that contribute to the development of autonomy. Cantillon and Macdermott[18] described how responsibility influenced learning: the trainees "valued opportunities to take individual responsibility for patient care." In some situations, trainees sought agency even when they had to resist pressure to conform to expectations.[19] Perceived agency was related to addressing the deliberative questions we identified above; trainees recognized their ability to shape expectations of supervisors, patients, and families within their learning culture.

Our work also extends findings by Pingree et al[8] who recognized many similar trainee behaviors, specifically highlighting the importance of confidence and self-advocacy. In line with their findings, trainees in our study also intuitively understood that "thinking aloud"[20] could demonstrate entrustability. Further, trainees may feel pressure to act independently in situations characterized by acuity, urgency, or complexity. Kennedy et al[21] reported similar findings, defining some of these expectations as cultural—either endemic to the practice of medicine as a whole or to specific specialties. Our participants identified cultural norms and expectations that shaped their deliberations to earn the right to practice with lessening supervision throughout training. While they reported frequent help-seeking behaviors, they also described barriers influenced by local culture. Trainees were aware of the potential for failure during instances of overextending. Prior work has shown that clinical supervisors occasionally allow trainee failure for educational benefit and attempt to balance patient safety and trainee learning.[22] Trainees acknowledged the importance of supervision that prevented patient harm and enabled them to fail safely.[22]

Our study has important limitations. Our findings may reflect the unique culture of our academic medical center or individual specialties and may reflect trainee tendency to report on procedural tasks more often than others. Members of the research team (A.K., W.J.E.) who coded primary data were medical educators and emergency physicians making their own entrustment decisions, which may have affected data analysis. However, one author (P.W.T.) was from a separate institution, worked in a different specialty, and had a different perspective on entrustment decision-making, which balanced analytic discussions.

Future research should further delineate and enhance skills required for safe and successful overextension, as well as further characterize the nuances of overextending in different specialties. Another important area of inquiry is how sensitizing trainees to these processes may influence entrustment decisions. Finally, faculty development in clinical training programs may aid them in promoting safe overextension behaviors and progressive autonomy.

Conclusions

Overextending represents a concrete mechanism by which trainees actively shape how they push the

boundaries of their learning edge to develop progressive autonomy. It exists on a spectrum from (1) deliberate, when control lies with trainee, to (2) forced, when external factors compel trainees to act. Perceived ability, patient need and acuity, patient safety, and educational value shaped decisions to overextend along the journey toward unsupervised practice.

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