The Training Room

A Novel Framework for Routine Versus Critical Communication in Surgical Education—Don't Take It Personally

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ABSTRACT

Despite their impressive academic track records and mastery of controlled classroom-based didactic learning, many orthopaedic surgery residents struggle to adjust from learning in the classroom environment in medical school to learning in the operating room as surgical residents. Instead of learning in lectures, surgical residents take on a more apprenticeship-based role with the goal of mastering technical skills in an experiential learning environment. Yet, no framework has been explicitly described in the literature to help learners make this transition. Consequently, we feel there is a need to clearly define the different learning environments and modes of communication, such that the residents can better understand how information is acquired and retained as well as how feedback is delivered in the operating room compared with more traditional spaces (eg, medical school classroom). The objectives of this summary are to (1) identify the major differences between learning in the classroom environment and the operating room and (2) introduce the concept of routine versus critical communication. We hope that by better defining the new learning environment with an emphasis on communication styles that may be encountered in this setting, learners can more easily make the transition from high-performing academicians to high-performing surgeons.

Matriculation into orthopaedic surgery residency remains extremely competitive. Despite medical students applying to orthopaedic surgery having some of the highest average United States Medical Licensing Examination scores compared with other specialties, approximately 35% of US senior medical students failed to match into the field in 2022.[1,2] Given the competitive nature of the process, those fortunate to secure residency positions in orthopaedic surgery tend to be academically high-performing individuals, as measured by undergraduate accomplishments, clerkship grades, standardized test scores, and research productivity.

Despite their impressive academic track records and mastery of controlled classroom-based didactic learning, many residents struggle to adjust from learning in the classroom environment in medical school to learning in the operating room as surgical residents. Instead of learning in lectures and the library, surgical residents take on a more apprenticeship-based role with the goal of mastering technical skills in an experiential learning environment. Success is no longer dictated by individual performance on written tests but rather through team-based performance, patient outcomes, and the ability to perform actual tasks in a live, often unpredictable environment. The learning environment and learning goals in surgical residency are vastly different from those in medical school (Table 1).

Perhaps one of the starkest differences between the two learning environments is the manner in which individuals communicate. Through their work observing cardiac surgical teams, researchers at the Mission Critical Team Institute (MCTI) have identified two prevailing communication modalities in the operating room, which they have labeled "Routine" and "Critical."[3] Routine communication is what is expected within the tempo-

rally unconstrained classroom environment. In the controlled classroom where events follow a predictable course, effective communication is nearly always accomplished with empathy, courtesy, and respect, with a conversational tone.

Although routine communication principles absolutely have a role in the operating room, there are also times where urgent or emergent problems will act to constrain the amount of time for communication, thus requiring a different form of communication with greater clarity and efficiency. In these situations, teams shift to critical communication during the key portions of a case or during unforeseen events that require improvisation. Under these different and often unpredictable circumstances, effective communication may require a level of brevity that ignores tone, tempo, volume, and many of the accepted characteristics of routine communication. However, it is important to emphasize that labeling communication as critical is not an excuse for unprofessional behavior by bad actors.

Considering that most new surgical residents have primarily practiced routine communication as individuals in temporally unconstrained low-consequence

Table 1. Learning as Medical Students Versus Learning as Surgical Residents

	Medical School	Residency
	Learning as Medical Students	**Learning as Surgical Residents**
Learning environment	—	—
Physical space	Classroom (familiar)	Operating room (unfamiliar)
Pace of learning	Temporally unconstrained	Temporally constrained/fast paced
Instructor	Singular instructor	Formally there is a singular instructor (attending surgeon), but can also learn from others in the operating room through the "nonsurgeon pathway"
Peers	Homogenous group of learners with similar knowledge and experience	Heterogenous group of peers with differing levels of knowledge and experience, including circulating nurses, scrub techs, anesthesia staff, and implant/device sales representatives
Curriculum	Individually focused didactics	Team-based experiential learning
	Job is strictly to learn	Apprenticeship: learn and work (learner identity vs. worker identity)
Goals	Learn knowledge to pass the test to earn Doctor of Medicine	Technical aptitude
		Decision making
		Leadership
Familiarity with the means of achieving goals	Familiar	Unfamiliar
Mindset	Fixed	Growth
	Errors and failure discouraged	Failure as part of the developmental process
		Errors allow for learning to occur

environments throughout their years of education, it is not surprising that adjusting to team-based critical communication in a foreign learning environment is challenging intellectually, emotionally, and socially. Yet, no framework has been explicitly described in the literature to help learners make this transition. Consequently, there is a need to clearly define the different learning environments and modes of communication, such that residents can better understand how information is acquired and retained as well as how feedback is delivered in the operating room compared with more traditional spaces (eg, medical school classroom).

The objectives of this summary are to (1) identify the major differences between learning in the classroom environment and the operating room and (2) introduce the concept of routine versus critical communication. By better defining the new learning environment with an emphasis on the communication styles that may be encountered in this setting, learners can more easily make the transition from high-performing academicians to high-performing surgeons.

Learning in Medical School

Medical school, like the years of college and grade school that precede it, largely takes place in a controlled classroom environment. Within the classroom, there is usually one teacher/lecturer and a homogenous group of learners who have a similar level of knowledge and training. There is a well-defined predictable curriculum that covers the material that all aspiring physicians must learn to pass the test. Success is ultimately based on individual performance on written examinations, with particular emphasis on the United States Medical Licensing Examinations. Even when medical students advance to clinical rotations during their third and fourth years, where some learning is done outside of the physical classroom in the operating room or clinic, clerkship grades are still heavily affected by performance on written shelf examinations at the end of each core clerkship.

Owing to the years of didactic learning in the classroom environment before ever starting medical school, medical students arrive to medical school familiar with the process of going to (or watching) class, reading supplemental texts, memorizing these materials, and then performing on written examinations. That is to say by the time they reach medical school, most students know what they need to do to process and retain information to do well on traditional tests.

Years of schooling in this manner that emphasizes rote memorization and high test scores promotes a fixed mindset.[4] Under the concept of mindset theory as described by Carol Dweck, individuals with a fixed mindset view particular attributes, such as intelligence, to be unchangeable and inherent to an individual.[5] Those with the fixed mindset tend to focus on validating their ability and thus often become concerned with besting others to demonstrate intelligence.[5,6] Clearly, the fixed mindset is reinforced by medical education in its current form, as excellence, and the opportunity to become an orthopaedic surgeon is largely defined by test scores. Mistakes are discouraged in this setting, as they translate to lower scores on examinations and a lower sense of self-worth. Consequently, fixed mindset learners tend to eschew challenging learning opportunities where there is a chance of failure because of the fear of appearing incompetent.[4]

Learning in the Operating Room

Learning in surgical residency largely takes place in a team-based operating room, which is inherently very different from the controlled classroom environment experienced by the individual learners before starting residency. It is a complex, dynamic environment with many participants from multiple different backgrounds. Rather than being surrounded by a homogenous group of medical school classmates, surgical residents find themselves intertwined with a perioperative team made up of circulating nurses, scrub techs, anesthesia staff, implant/device sales representatives, and attending surgeons, all with different levels of experience and training. Although this group of individuals in the operating room functions as a team, the surgical resident, at least early in their training, may paradoxically feel very alone. Junior residents have reported feeling that they are guests in the operating room rather than feeling that they belong, a form of imposter syndrome.[7] Despite the fact that surgical residents spent periods of time in the operating room as medical students, it clearly remains an unfamiliar and, at times, uncomfortable environment when starting residency. Navigating this complex hierarchical web in a relatively foreign environment can be stress inducing and limit the ability to learn at an early stage in training.[7]

Within this new learning environment, surgical residency strives to prepare trainees with the technical skills and knowledge base to provide high-quality patient care.[8] Surgical residents must develop the technical skills

to perform surgery while also learning how to make decisions under pressure, often with incomplete information, both in and out of the operating room.

These complex goals demonstrate that surgical residency requires much more than the ability to pass the test. Although it should be acknowledged that a component of classroom-based didactics and written tests persist in surgical residency (i.e. Annual Orthopaedic In-Training Examination & American Board of Orthopaedic Surgery Part I Examination), ultimately there is a shift from pure knowledge acquisition and retention to performance and technique.[9] This requires a higher-level order of understanding on the subject matter to allow for translating knowledge into performing an action or skillset.

In contrast to the controlled, temporally unconstrained, didactic curriculum in medical school, learning in the operating room is temporally constrained, experiential, and accomplished through an apprenticeship model. Surgery often proceeds at a fast pace, with limited time to pause for questions or breaks.[10] In an analysis of video-recorded common general surgery procedures, Roberts et al found that 13 to 29 teaching topics were covered per procedure, and 25 to 330 seconds were spent per topic.[11] Although there is clearly variability depending on the topic and the surgical case, this study illustrates the pace at which learning may be expected to occur. The pace of learning is particularly relevant in the current climate of surgical education, where multiple factors including resident duty-hour limits, financial pressures, and supervision regulations have diminished the amount of time surgical residents spend in the operating room.[11,12]

Beyond the temporal constraint associated with the fast-paced learning environment, the means of acquiring and retaining information in the operating room is highly unfamiliar to early surgical residents. Rather than learning solely from PowerPoint presentations and textbooks, trainees learn by directly observing the techniques of skilled mentors and then imitate those actions when asked to perform parts of the case.[13] The attending surgeon functions as the primary instructor, but resident learners can also learn through the "nonsurgeon pathway" by interacting with experienced scrub techs and circulating nurses.[14] As learners transition from purely knowledge-based learners to tacit skill–based learners, they must seek out independent means to deliberately practice and hone these skills. As far as assessments go, learners are no longer taking tests on paper but instead performing complex tasks on real people. The curriculum is much less well-defined than in medical school. Although the curriculum can be guided by the American Board of Orthopaedic Surgery Knowledge, Skills, and Behavior Program, it still requires the learner to take an active role creating their own self-directed learning plan.[15]

Despite the need to learn in the operating room, learners in surgical residency are no longer purely learners. Rather, they face the challenge of balancing the competing priorities of the learner with that of the worker as they transition their identity from one of a learner to one of a teammate and clinician.[16] In contrast to medical school where the students are there entirely to learn, residency is also a job. The job requires that service-based tasks be accomplished in addition to learning. Not surprisingly, residents have cited floor responsibilities and inadequate time to prepare for cases as barriers to learning in the operating room.[16] Some residents report avoiding the operating room entirely because of the anxiety associated with not being fully prepared, suggesting that a pattern of avoidance behavior develops from a fear of failing.[16]

These fears leading to avoidance of the operating room highlight another challenge learners face going from medical school to surgical residency: transitioning from the fixed mindset to the growth mindset. Although a fixed mindset in medical school can lead to high test scores and thus success as dictated by current medical school standards, it can actually impair growth in surgical residency because learners avoid learning experiences out of fear of appearing incompetent.[4]

Rather, it is critical for learners to recognize that becoming a surgeon is a lifelong learning process. Changing one's mindset from viewing failure as an inherent lack of ability to understanding failure, or errors, as an inherent part of the developmental process can change how learners interpret learning opportunities. Instead of avoiding challenging situations that have a chance of failure, the growth mindset learner gravitates toward difficult tasks and welcomes feedback from multiple sources because they understand the potential for growth and improvement.[4,6] The growth mindset emphasizes learning goals over performance goals. Along these lines, accepting self-imperfections so that they can be addressed, rather than hiding them, is also key to the growth mindset.[4,6] Those with the fixed mindset may shut down after making an error and dwell on the mistake because it is such a deviation from their typical state of being right. Conversely, those with the growth mindset learn to process the error, reset, and move forward with the surgical case because they begin to understand that mistakes can actually allow learning to occur. Being wrong or making mistakes in residency is okay, and to a

degree expected, provided the learner learns from the error and is open to becoming better from the experience.

Perhaps Denyse Richardson puts it best in her 2021 paper entitled *Growth mindset in competency-based medical education*, in which she writes, "They [fixed-mindset learners] see residency as a hurdle that may prevent them from reaching the level of unsupervised practice. Those with the growth mindset view their residency as the once-in-a-lifetime opportunity for supported learning and guided development required for unsupervised practice, but certainly not the end point of their ongoing pursuit of excellence in practice."[4] This statement emphasizes the process-oriented nature of the growth mindset. The earlier in residency that the learner can make the transition from the fixed mindset to the growth mindset, the sooner they will be able to take advantage of the once-in-a-lifetime opportunity as they learn to run toward challenges and translate failures into growth.

Communication in the Operating Room: Routine Versus Critical Communication

Understanding how individuals communicate in the operating room is particularly relevant to new resident learners as they transition from medical student to surgical resident. In contrast to the communication between a professor and a medical student in the controlled classroom environment, communication in the operating room has been characterized by Sutkin et al[12] as "highly adaptive, verbal and physical, rapid, repetitive, [and] cooperative." Given that surgical teaching can involve intense moments of communication, establishing clear communication guidelines is vital so that instructions are not misinterpreted.[10] Patient safety may be jeopardized, progress can slow, and, ultimately, resident learning can be impaired without accurate communication.[10,17] Moreover, if residents or other perioperative team members are unaware of the communication tactics in the operating room, and how they can differ from normal day-to-day communication strategies, unnecessary conflict can ensue, decreasing the effectiveness of the entire team.[3]

As the importance of communication in the operating room has gained traction in the literature, authors are specifically calling for the surgical training curriculum to include an emphasis on human communication tactics within the operating room.[14,18,19] In an effort to address this idea, the concepts of routine and critical communication are offered as a framework to help new resident

Table 2. Routine Versus Critical Communication Principles

	Routine Communication	Critical Communication
Principles	Intention Courtesy Active listening	Brevity (using small words) Clarity Frankness Directive
Volume	Conversational	Loud
Affect	Emotive	Flat
Voice	Modulated	Projected
Body language	Engaged	Assertive

learners adjust to communication styles they may encounter in their new environment (Table 2).

The concepts of routine and critical communication were developed by MCTI researchers observing cardiac surgical teams in an investigation of the high attrition rate of surgical nurses in cardiac surgery at a large academic institution.[3] Through this observational experience, the authors found routine communication, characterized by a conversational tone, empathy, inquiry, and active listening, to be the prevailing mode of communication from the start of the case up until the patient was transitioned to the heart/lung machine. At that point, the team shifted to critical communication, characterized by a level of brevity that ignored tone, tempo, volume, and many of the accepted characteristics (and niceties) of routine communication.[3] By defining the two modes of communication, and the timing at which they occurred during the case, the MCTI researchers began to question whether the high rate of attrition among surgical nurses was due to how the surgeon *transmitted* information or if it was more closely tied to the information *received* by other members of the team.

Building on this idea, we hope that by defining routine and critical communication, and illustrating when these modalities may be encountered in the operating room, new learners will more easily understand how to *receive* information in their new environment. Based on the years of didactic education learners experienced before starting residency, many resident learners are solely accustomed to routine communication. It is effective in situations where events follow a predictable course and there are no major temporal constraints (ie, medical school classroom). Routine communication principles include courtesy, empathy, respect, and a conversational tone. In the operating room, routine communication is often the prevailing mode of communication.

However, during key or critical portions of a case, or during unforeseen events that require improvisation, the amount of time for communication becomes more limited, necessitating a shift to critical communication for greater clarity and efficiency. When the learner is unaware of this transition, they may interpret the communication as abrasive or rude. A large part of this may be because the learner has never experienced critical communication before. In these instances, it is important for the learner to understand that the communication is directed at their *role* in the case, not necessarily their *personal identity*.

Several strategies exist to promote effective critical communication in the operating room. From the attending perspective, the communication should be goal oriented. By this, we mean that the instruction should be limited to moving the case forward or teaching. It should not be a personal attack on the resident learner in which opinions of the resident's performance outside of the case at hand are discussed. For the resident learner, it is important to understand that the brevity, tone, volume, or frankness of a verbal communication from the attending surgeon is not inherently a reflection of the surgeon's opinion of the learner as a person. Given the high stakes of surgery, the learner must comprehend that the surgeon may need to embrace critical communication principles to limit patient safety issues. On returning to a routine environment, it is the responsibility of the attending surgeon to let the learner know that there will be no lasting emotions, or labeling, associated with an episode of critical communication. This will allow the leaner to move from rumination and regret about the event to growth.

In addition, critical communication can help learners better understand when they have shifted from the routine part of the case to a critical portion of the operation. It can therefore serve as a means to help learners develop their own situational awareness such that they understand when to slow down.[20] Developing this awareness is crucial, as it has been shown that attending surgeons are more likely to provide increased surgical autonomy to learners who have demonstrated the ability to slow down when they should.[20]

However, labeling communication, critical communication, is not an excuse for unprofessional behavior by bad actors. Critical communication can go wrong to simply become poor, ineffective communication when an attending delivers a personal attack on a resident but labels it as feedback. The reality is that some attending surgeons may just be poor communicators or unnecessarily abrasive. The behavior among these individuals, which some have characterized as disruptive physicians, can confound the ability of a learner to adapt and perform in their new environment, regardless of their familiarity with critical communication.[21]

On the flip side, critical communication can fail if a learner interprets the critical communication as being personal because they were not familiar with the tone or body language that can be associated with critical communication. Under these circumstances, resident learners may shut down and ruminate about the event rather than resetting and performing the remainder of the case.

Ultimately, however, it is crucial that resident learners develop the skill to distill criticisms down to objective points. Once objectified, the criticisms become data that can be absorbed and used to improve surgical skillset and acumen, regardless of whether an intense interaction was actually a personal attack or just perceived as being personal.

Summary

Learners entering orthopaedic surgery residency tend to be some of the highest performing individuals from their medical school classes from an academic perspective. Despite their impressive test scores and scholarly achievements, it has been observed that many learners entering orthopaedic surgical residency struggle to adjust to learning in their new environment. At present, no curriculum has been described to facilitate this transition.

By defining differences in the learning environments, curriculums, goals, and mindsets in medical school compared with surgical residency, and by introducing the concept of routine and critical communication, new resident learners may be able to adjust to surgical residency more intentionally and comfortably.

Going forward, future efforts should include outcome-based studies evaluating whether formally outlining the differences between learning in medical school and residency, and/or defining routine and critical communication, ultimately affects performance among resident learners. Additional investigation into individual work experience before residency and/or cultural background may also shed light on how new resident learners adapt and perform in surgical residency.

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