Remediation Strategies for the Struggling Resident: Technical Skills and Beyond

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INTRODUCTION

Surgery is both a high-performance discipline and an intellectual pursuit. The transition from medical student to surgical resident involves a significant shift in responsibility, learning style, and hands-on training complexity. Navigating all these professional hurdles can be a challenge, and residents may struggle with various aspects of these throughout their training, which can lead to the need for remediation. Remediation in graduate medical education is more prevalent than many assume. In a multi-institutional study of 348 general surgery residents, 31% required remediation at some point during their training [1]. The most common areas were medical knowledge (74%), interpersonal and communication skills (24%), patient care (22%), professionalism (18%), systems-based practice (14%), and practice-based learning (8%). Remediation strategies varied and included faculty meetings, reading assignments, therapy, required conferences, and repeating clinical rotations.

The two primary components of remediation in a residency program are technical and non-technical skill competencies. Ensuring that surgical residents develop essential technical and non-technical competencies is crucial for patient safety and surgical success. A study by Bynum et al. found that deficiencies in skills like suturing, dissection, and laparoscopy led to longer operative times, increased complications, and greater intraoperative assistance [2]. Residents with low Objective Structured Assessment of Technical Skills (OSATS) scores had a 30% higher risk of complications such as wound infections and organ damage. Equally important are non-technical skills such as communication, teamwork, decision-making, and leadership. Deficits in these areas can disrupt performance, particularly in high-stakes settings [3]. Residency programs must identify and address both technical and non-technical deficiencies through targeted remediation.

ROLE OF THE PROGRAM DIRECTOR

The program director plays an essential role in guiding and facilitating the remediation process for residents, however, they frequently struggle with the support and resources needed. In a national survey of General Surgery program directors on preparedness to support struggling residents, 65.9% of program directors did not feel their program had 'completely adequate' resources to address these remediation needs [4]. Evidence suggests that effective remediation requires a personalized, structured approach that addresses the root causes of underperformance, which can be challenging with all the other aspects of a residency program that a program director must manage [5]. Program directors are not only responsible for identifying struggling residents through regular performance evaluations but also for creating performance improvement plans. While not specifically looking at general surgery residency programs, one study found that faculty spend an average of 20 hours of additional time explaining and implementing interventions to address trainee deficiencies [6]. This time estimate does not include the time required to gather information about the deficiency, analysis of trainee performance over time, and the planning and preparation of the specific interventions provided to the trainee [6].

Remediation plans can vary widely, depending on the needs to be addressed. These may involve additional hands-on training, mentorship, feedback loops, and targeted workshops that address specific areas of weakness, be it in technical skills, professionalism, or communication. Moreover, research highlights that timely and clear communication between program directors and residents is pivotal in fostering a productive learning environment [7]. A well-organized remediation plan, implemented with clear expectations and frequent feedback, allows residents to enhance both their technical and non-technical competencies, ultimately improving their readiness for independent practice. Program directors should aim to build a performance improvement program that is comprehensive and allows for prevention through early identification and intervention of at-risk residents. It is also critical to the role of the program director to document these plans clearly with accountability on progress for both residents and leadership alike. With the integration of entrustable professional activities (EPAs), Montgomery et al.

suppose there is a future state in which EPAs could "increase real-time assessment of residents to track progress and identify struggling trainees" [8]. While the exact approach to trainee remediation may vary across programs and across residents, this paper aims to highlight tools and resources that programs can use to structure technical and non-technical skills performance improvement plans for their residents.

PREVENTION OF REMEDIATION

Preventing remediation in surgery residency training is an intricate process that requires deliberate planning, consistent oversight, and a deeply ingrained culture of support, all of which hinge on the program director. Prevention begins even before the residency match, as program directors play a crucial role in selecting candidates whose qualifications, skills, and personal attributes align with the demands of surgical training and their specific program. This involves thorough evaluation of applicants' academic record, technical competencies, problem-solving abilities, and interpersonal skills, alongside assessments of resilience, adaptability, and commitment—traits critical for navigating the rigors of surgical training [1]. Key components of remediation prevention include establishing a clear framework for success, creating a supportive learning environment, individualized attention, and fostering a culture of resilience and adaptability.

One aspect to potentially prevent resident remediation is that program directors should establish a clear framework for success. This includes setting transparent expectations for performance, providing comprehensive orientation, and designing curricula that balance clinical exposure, technical training, and academic development. Early and ongoing assessments are central to prevention, as they allow program directors to monitor progress, identify areas for improvement, and intervene promptly. Utilizing tools such as milestone-based evaluations, simulation training feedback, and multi-source reviews, program directors can detect subtle signs of underperformance or stress before they evolve into major challenges. Emphasizing consistent, actionable feedback fosters a growth mindset, enabling residents to continuously refine their skills and address gaps [2, 3].

Creating a supportive learning environment is equally critical. Program directors must actively cultivate a culture where residents feel empowered to seek help and share struggles without fear of stigma. Establishing mentorship programs connects residents with experienced surgeons who can provide guidance, encouragement, and perspective. Regularly scheduled check-ins and open-door policies further reinforce the message that seeking assistance is a sign of professionalism and self-awareness rather than weakness. Recognizing that wellness plays a vital role in performance, directors should implement robust systems to monitor and support mental health, offering access to counseling services, wellness workshops, and structured work-life balance initiatives [4].

Individualized attention is another hallmark of effective prevention strategies. Program directors must acknowledge that residents learn and progress at different rates, tailoring training plans to accommodate these variations. For residents who struggle with specific technical skills, simulation labs or additional operative opportunities can help bridge the gap. For those facing challenges with decision-making or communication, focused coaching, role-playing scenarios, or interdisciplinary team exercises can build confidence and competence. By providing these tailored interventions early, program directors help residents avoid falling behind and reduce the likelihood of needing remediation.

Prevention also extends to fostering a culture of resilience and adaptability. Surgical training is inherently demanding, and setbacks are inevitable. Program directors must model and teach strategies for handling stress, learning from errors, and maintaining composure under pressure. This can include formal training in coping mechanisms, mindfulness, and stress management, as well as informal reinforcement through day-to-day interactions. Residents who feel supported in their development are more likely to embrace challenges and persist through difficulties.

Ultimately, program directors are the linchpins of a residency's success. Their vigilance, empathy, and commitment to fostering growth can significantly mitigate the risk of remediation or failure. By embedding prevention into the very fabric of the training program—through careful selection,

structured assessment, supportive mentorship, wellness initiatives, and individualized attention—they not only ensure the success of their residents but also contribute to the broader goal of producing highly skilled, compassionate, and resilient surgeons who can meet the demands of a complex healthcare landscape [5].

TECHNICAL SKILLS REMEDIATION

Program Design

What is traditionally thought of as technical skills deficiency in fact may encompass both technical and non-technical skills alike. As such, when remediating trainees for poor performance in the operating room, it is important to thoroughly assess the root of the deficiencies. For example, a trainee may have limitations in situational awareness, poor self-direction, forward planning, or judgment when it comes to patient safety. These limitations may manifest as an inability to move an operation forward, lack of professionalism, inability to lead an operating room team, or poor intraoperative decision-making, for example. These attributes are distinct from an inability to execute specific technical skills, however, and are remediated in different ways [9]. Published literature on technical skills remediation is sparse, with few studies documenting clearly reported outcomes or incorporating educational theories of adult learning and frameworks that bring structure to the complexity of technical skills remediation. Existing studies agree that these programs are resource-intensive and utilize multimodal strategies [10].

Every technical skills remediation program should begin with thoughtfully and thoroughly identifying skills in need of improvement, followed by designing a program with tangible and achievable goals, and ending with assessing longitudinal progress and revision as needed. Obvious sources of information that can aid in identifying specific skills to target include rotation evaluations, the Clinical Competency Committee, and Entrustable Professional Activities (EPAs). The quality of this feedback may vary and is dependent on faculty voluntarily completing evaluations with meaningful and actionable and/or residents or faculty initiating EPAs. In the case where these are lacking, soliciting opinions from

faculty directly is helpful. Additionally, soliciting opinions from the trainee is crucial, not only in building the content of a technical skills remediation program, but also in assessing the residents' insight and ability for self-reflection. When available, operative video is a useful adjunct [11]. Additionally, simulation labs can be used to establish a baseline for technical skills. These labs may take the form of procedure-specific assessments or skills "Olympics," incorporating competition and gamification while allowing the assessment of multiple residents in a short amount of time [12].

When designing a technical skills remediation program, it is important to include both independent and proctored practice as well as realistic goals. Faculty should be present at select intervals to provide structure and feedback. Faculty may be in-person or remote, feedback can be given synchronously or asynchronously, and the feedback itself may be summative or formative [13-15]. Video-based coaching can be incorporated as part of this feedback model. Additionally, residents should have mandatory independent practice, with protected time and materials to do so. These materials may take the form of portable laparoscopic trainer boxes for home use or suturing and knot-tying kits, for example. The residency program should ensure the simulation lab is open during hours accessible for a general surgery resident and close to places they would frequent in the hospital. Finally, technical skills remediation programs should have longitudinal goals. These may take the form of time benchmarks or validated assessment scales.

Resources for the design and implementation of skills practice vary from society-sponsored curriculum to homegrown practice programs. The American College of Surgeons (ACS) in collaboration with the Association of Program Directors in Surgery (APDS) provides a Surgery Resident Skills Curriculum complete with modules detailing task setup, materials list, and benchmarks for assessment. The Fundamentals of Laparoscopic Surgery (FLS) and Advanced Training in Laparoscopic Suturing curriculum (ATLAS) similarly do so for laparoscopic fundamentals and advanced suturing, respectively. The Surgical Council on Resident Education (SCORE) General Surgery Resident curriculum includes an online platform that contains a vast video library. And finally, social media, including surgery influencers, may have creative practice tasks and innovative setups for inspiration.

Once practice models and resources have been identified and a remediation framework has been established, multiple assessments have been designed to help determine and improve technical competency during residency. Some examples of these assessments are Objective Assessment of Skills in Surgery (ACS OASIS) and Objective Structured Assessment of Technical Skills (OSATS) [16, 17]. EPAs are an excellent tool for assessing core tasks that residents must be able to perform independently to determine residents' readiness for clinical practice, intraoperative autonomy, and technical decision-making. The EPAs for procedures, if done regularly and appropriately, can help evaluate the progress of the residents during their training, starting from observation only, going through direct supervision with guidance, indirect supervision, and supervision on request to independent practice [18].

Video-based assessments

Given the development of new technology and multiple platforms for recording videos, video-based assessment is an invaluable tool for evaluating resident progress. Plenty of literature shows a correlation between video technical skill assessment and patient outcomes. OSATS has been used for video analysis to assess technical skills objectively. There was a pilot study by Pryor et al. sponsored by the American Board of Surgery on video assessment of surgeon technical performance in surgery, showing positive feedback from surgeons; these assessments have the possibility of detecting technical gaps that can be addressed immediately with proctoring. Implementing these assessments as early as possible during residency are a natural pathway to obtain objective data on our trainees and facilitate early interventions. Video assessment has mainly been developed in laparoscopic and robotic surgery, and new modalities for image capture will be required, mainly for open procedures [19].

SAGES has championed this effort with the creation of a Video Based Assessment Task Force. Through the work of this task force, high reliability tools have been developed that can be used to make competency decisions for residents in technical skills remediation. The initial tool developed was for laparoscopic fundoplication, evaluating competence using a rubric framework measuring quality, risk and

skill for each step [20]. Cholecystectomy and colectomy are additional SAGES video-based assessment initiatives that are in progress and can be incorporated into future resident remediation programs.

The most critical component of these tools is to promote formative assessment. These tools also can be used multiple times to assess progress. Assessing the progress of a resident in a remediation plan for technical reasons is complex and will vary depending on the level of training and the deficiencies encountered. It will require the combination of the above-mentioned tools. Additionally, the level of resident and types of technical deficiencies must be considered to tailor the remediation plan. For example, if you have a junior resident with clearly limited laparoscopic skills, a simulation tissue lab using objective assessment scales to pinpoint areas of deficiency would be a starting point. Improvement in technical skills and translation into the operating room can then be tracked with EPAs that incorporate specific feedback on these skills. For senior residents with more advanced deficiencies, such as progressing the case, identifying planes of dissection, and efficiency during the operation, simulation is important, but direct coaching, video assessments, and EPAs will be more critical in evaluating and assessing progress in these domains.

It is crucial to keep technical skills remediation plans professional and formative; they should not be punitive for the residents. All assessments should be as objective and specific as possible and detail what needs to be done to improve the resident's technical deficits. Regular updates on their performance status are necessary, and all data collected should be transparent and shared with the resident.

Challenges

Implementing and executing a technical skills remediation program presents multiple challenges, including the amount of time needed for administration, the complexity of resources, and the high cost. Ultimately, faculty engagement and participation is imperative, a crucial component to facilitate the implementation and surveillance of the residents' progress under a remediation plan. However, given the

importance of faculty engagement, time and availability are critical barriers. Remediation sessions should occur, when possible, during protected curriculum time to avoid significant disruption in the residents' and faculty's daily workflow. Faculty members participating in remediation plans and coaching residents should receive incentives, whether that be recognition of their teaching efforts through the residency program and Department chair, or monetary based on the structure of the Department incentives.

Cost is another barrier for implementation of a technical skills remediation program. These costs include simulation models, video-based assessment resources, and proctoring. Some strategies that can be used to save costs are shared simulation resources, equipment repurposing, donation programs, use of expired supplies, partnering with vendors for donations, and donations from hospital foundations [21]. And finally, resident accountability is another challenge of technical skills remediation programs. Residents must be tasked with practicing independently, logging their practice sessions, and holding themselves accountable for their own progress. This can be challenging depending on the intrinsic motivation of the resident, and their own insight into their technical skill deficiencies.

NON-TECHNICAL SKILLS REMEDIATION

Non-technical skills are essential to the delivery of high-quality surgical care and are increasingly recognized as an integral part of resident competence and professional development [22]. These skills encompass cognitive, social, and organizational domains, and are often manifested as professionalism, interpersonal skills and communication. They support decision-making, communication, and the effective execution of clinical duties. Deficiencies in non-technical performance have been linked to adverse outcomes, even among technically proficient and medically knowledgeable trainees. Consequently, structured remediation of non-technical skills has emerged as a critical component of graduate medical education in surgery. Remediation efforts must be deliberate, incorporating direct observation, evidence-based frameworks, individualized coaching, and simulation to foster sustained behavioral change. The following section outlines strategies and best practices for remediating common non-technical skills.

Following a standardized process is critical in the remediation of non-technical skills. The clinical competency committee should partner with the program director in the holistic evaluation of the underperforming trainee's performance. Deficiencies should be linked to the Accreditation Committee for Graduate Medical Education (ACGME) Core Competencies, and milestones-based evaluations should provide an objective framework for assessing problematic behaviors that may be otherwise elusive [23]. Incorporating 360-degree evaluations allows for multisource feedback from attending physicians, peers, and nursing staff, offering insight into a resident's collaborative functioning. An individualized, targeted remediation plan with clear parameters for passing/failing should be created [10]. An adequate timeline for demonstrating a change in performance should be offered. Stakeholders including graduate medical education (GME) leadership, the department chair, and supervising faculty should be involved in the process early to ensure alignment of goals between all parties. Any critical meetings between the program director and trainee undergoing remediation should include a witness such as another faculty member program coordinator. Key points discussed should be documented and can be sent as an e-mail summary after such meetings.

Non-technical skills are often multi-faceted and supporting residents with deficits in these skills may require resources that are not readily available for most surgical training programs. Remediation inherently causes additional stress for an already underperforming resident who is deviating from a normal training trajectory, particularly when the cause for remediation is less objective than a deficiency in medical knowledge or technical skill. Feelings of shame, guilt, and anxiety are common [24] and can obstruct progress. Providing adequate psychosocial support can facilitate a more effective remediation. This can be done through multiple avenues, such as mental health support, which may be available through employee assistance or the graduate medical education office. In addition to counseling, screening for underlying neurocognitive disorders [25] can have a substantial positive impact if the appropriate support and treatment can be provided.

Mentorship and coaching are also effective tools in fostering support for the remediating resident and accelerating the development of non-technical skills. Mentorship encourages development of a longitudinal relationship with a faculty member or more senior resident and provides a broad focus on aspects of personal or professional development [26]. Mentorship typically involves a degree of hierarchy and can provide effective role modeling and real-time feedback when professional behaviors are in question. Coaching is typically a more formal, short-term relationship with a narrow focus on a particular skill set. An active listening style in coaching encourages reflection and self-directed learning. While coaching is often used to provide operative feedback, it is also useful for working on interpersonal skills and communication. Depending on the skill in question, a coach does not need to be another surgeon or another medical provider necessarily. However, depending on the program's resources and specific training required for coaches, mentors may be more readily available.

Simulation is another tool that is more frequently used with technical skills but can also be beneficial for non-technical skills. Teamwork is an example of a foundational skill in surgery that encompasses multiple core competencies including patient care, professionalism, and interpersonal skills and communication. When residents exhibit deficiencies in teamwork, structured remediation should begin with direct observation using validated tools, such as the Non-Technical Skills for Surgeons (NOTSS) framework, developed in the United Kingdom and endorsed by the Royal College of Surgeons of Edinburgh [27]. Targeted simulation exercises, including crisis resource management scenarios, provide opportunities for residents to practice closed-loop communication, task delegation, and conflict resolution in a controlled environment. These sessions should be paired with structured debriefings that reinforce positive behaviors and identify opportunities for improvement.

Program directors report greater difficulty with remediation of non-technical skills as opposed to deficits in medical knowledge or other domains in patient care [28]. Following a standardized approach to remediation and relying on tools for competency-based assessment can make the process easier from the program administration perspective. Ensuring that trainees have adequate psychosocial support and

resources can ensure remediation is most effective and can prevent attrition in the struggling trainee. Mentorship, coaching, and simulation are examples of some tools that can be used to remediate non-technical skills.

FUTURE TOOLS AND RESOURCES FOR RESIDENT REMEDIATION

Although many strategies to address aspects of technical and non-technical skills remediation for residents have been identified, there are many potential future tools and resources on the horizon. Artificial Intelligence (AI) offers a unique opportunity to significantly enhance the education of surgical residents. These advancements can be seen across various areas, such as structured feedback, technique analysis, and the identification of specific deficiencies that can be targeted for remediation and improvement [29].

The potential applications of AI in surgical education are rapidly expanding. One promising development, still in progress, is the creation of intelligent tutoring systems (ITS), as discussed by Julian et al (30). These systems are designed to extract critical data from recordings of surgical tasks, which can then be analyzed to provide automated feedback based on predefined proficiency standards. Such systems could be used to identify precise areas of weakness in a resident's operative performance, allowing for targeted remediation and skill enhancement [30].

Artificial intelligence and augmented reality hold significant promise in enhancing real-time feedback and telemonitoring in surgical education. Currently, telemonitoring relies on human intervention from both ends; however, advances in communication technology have enabled its application in remote locations [29]. Overall, the integration of AI into surgical education models could bring substantial improvements. In a randomized controlled study, senior orthopedic surgery residents were trained to perform reverse shoulder arthroplasty using either an instructional video or a VR platform that provided real-time guidance [31]. The residents who received VR-based training not only completed the procedures more quickly but also achieved higher OSATS scores [31]. The future of AI applications in surgical

education is still emerging but the promise of using these resources for performance improvement plan development with automated tracking as well as for predictive modeling and early identification is not far ahead. A recent study by Yost and colleagues developed a predictive neural network to identify traits that may be a predictor of ABSITE and QE performance to help guide earlier preparation [32]. These new applications of AI may reduce the burden of work and accuracy of early identification of residents for performance improvement and automate tracking of data measures demonstrating their successful improvement.

CONCLUSIONS

Resident remediation is a complex yet essential responsibility for surgical training programs. It requires structured strategies tailored to both technical and non-technical skills, grounded in timely identification and consistent support. Effective remediation begins with early recognition of deficits and the development of clear, personalized improvement plans. These plans must outline specific goals, measurable outcomes, and mechanisms for progress assessment.

Resident success depends on the engagement of faculty, mentors, and the residents themselves. Open communication, non-punitive feedback, and accountability at every step are critical for fostering growth and improvement. By building robust remediation frameworks—integrating traditional methods with tools like simulation, video analysis, and artificial intelligence—training programs can better support struggling residents and ultimately improve surgical education outcomes.

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TABLES

Table 1. Key components and resources for remediation prevention, technical skills and non-technical skills

	Key components	Resources
Prevention of remediation	- Clear framework of success - Supportive learning environment - Individualized attention - Culture of resilience and adaptability	- Milestone-based evaluations - Simulation training feedback - Wellness support - Coaching - Formal training in coping and mindfulness
Technical skills remediation	- Clear identification of skill deficits - Tangible and achievable goals - Assessment of progress	- Rotation evaluations - Entrustable professional activity assessments - Video-based coaching and assessments - Models available for independent practice
Non-technical skills remediation	- Holistic evaluation of underperformance - Individualized - Clear expectations and timeline for progress and change	- 360-degree evaluations - Mental health support - Mentorship and coaching - Scenario simulation