

Teaching, Mentorship, and Coaching in Surgical Education



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KEYWORDS

• Teaching • Surgical coaching • Mentorship

KEY POINTS

- Challenges from changes in residency training, financial constraints, rapidly increasing knowledge, and limited faculty time due to increasing clinical, academic, and research demands require that new approaches are developed, including simulation, competency-based assessment, online courses and resources, and systems that reward teaching and mentorship.
- Successful mentoring is critical to the professional and personal development of students, residents, and faculty and requires significant commitment from both the mentor and the mentee.
- Coaching offers a structured approach encouraging self-reflection using facilitated feedback, analysis, and debriefing and can be individualized to each surgeon's needs and goals benefitting surgeons at all levels.
- Choosing an appropriate coach is critical, and the individual must have the knowledge and expertise to be credible coaches, strong interpersonal skills, and flexibility to adapt to each learner's different styles and needs.
- Identifying and addressing potential obstacles to coaching, including limited time, concerns about reputation, and loss of control, is important to increase "buy-in" from the learner to participate in their own performance improvement.

INTRODUCTION

Teaching and mentorship have a long history in medical education with Sir William Osler advocating for the value of learning from patients around the beginning of the twentieth century. Dr William Halsted joined Osler at Johns Hopkins and established the Halsted model for surgical training with repetitive opportunities to care for surgical patients under the supervision of a skilled surgeon, an understanding of the scientific basis of surgical diseases, and the acquisition of patient management and surgical skills with graded responsibility with each advancing year.¹ Although many surgeons have trained under this model, it

is becoming increasingly clear with a national focus on patient safety, quality improvement, and continuous professional development that the current training system is inadequate. The goal of this article is to outline the specific roles and relationships that teachers, mentors, and coaches have within surgical education for the spectrum of trainees from medical students and residents through practicing surgeons (**Table 1**).

Teachers have a role in teaching a specific area of knowledge or skill and then assessing competence of their students. Teaching is generally performed over a defined period, such as a medical school rotation or residency, at the end of which students are awarded a diploma or certification.

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Table 1
Teachers, coaches, and mentors in thoracic surgery

	Medical Student	Resident	Fellow	Junior Faculty
Teaching	Knot tying, subcuticular suture, history and physical examinations, and patient presentations	Patient management and technical skills	Complex patient management and advanced technical skills	New techniques (robotics, minimally invasive mitral valve repair), complex patient management
Mentoring	Career paths (residency, M4 rotations), networking, scholarships, meetings to attend, research projects	Career paths, networking, research grants, meetings to attend, research projects, job openings	Career paths, networking, meetings to attend, research projects, job openings	Career paths, networking, research grants, potential collaborators, local and national committees
Coaching	Providing constructive feedback, encouragement, opportunities for practice in the operating room (OR)	Surgical techniques in OR, clinical scenarios (patient code), simulation center, mock oral examination	Surgical techniques in OR, clinical scenarios (patient code), simulation center, mock oral examination	Surgical techniques in OR, patient management, teaching techniques

Mentors can also play a role in teaching, and although teachers can also serve as mentors, mentorship tends to occur over a longer timeframe and can include guidance in areas outside of medical knowledge or surgical skills, such as career advice, networking, and work-life balance. Although teaching, mentoring, and coaching have overlapping characteristics, coaching is focused on actively identifying areas for improvement through reflecting on one's performance, making adjustments, and evaluating the impact of these changes.² Coaching has been widely applied and even expected in disciplines like business, music, and athletics, even for elite athletes and CEOs, but remains relatively rare in surgical education. However, with changes in surgical training with duty-hour restrictions and a greater focus on patient safety and quality improvement, changes in traditional surgical education are needed.

TEACHING

Teachers focus on specific lessons, which are usually cognitive in nature. In surgery, teaching can encompass technical skills or knowledge-based content. Lessons require instruction and formal assessment for evaluation. Because of the duration and depth of the relationship, the

teacher-student relationship may not be as close as the relationship between mentors and mentees. Medical student teaching was traditionally performed during the preclinical years through lectures and frequent quizzes and examinations with rote memorization. There has been a shift toward small group sessions and increasing use of case studies, virtual and standardized patients, and suturing sessions in the simulation laboratory that are more relevant to clinical care.^{3,4} With changes in medical school curricula, there has also been a push toward increasing the clinical years to give students greater clinical exposure, shifting more medical student teaching to the bedside. Changes in the curriculum are also allowing students more time for innovative electives, longitudinal patient experiences, independent study, and research, giving teachers a wider variety of opportunities to teach and mentor but also requiring more effort on the part of the student for self-directed learning. At the University of Michigan, a novel Minute Feedback System has been implemented, allowing teachers to provide timely feedback to students using a Web-based form immediately after clinic or an operative case.⁵ Boot camp courses have also been developed to help medical students transition to surgical residency by practicing chest tube placement, central line placement, and tracheostomy in cadavers.⁶

Chan and colleagues⁷ reported that residents felt increased confidence in transitioning to cardiothoracic residency after completing a medical student simulation course.

There have been substantial changes in cardiothoracic resident education over the last decade, and novel training approaches are needed.⁸ Duty-hour restrictions have decreased the total number of hours at the bedside. Programs have adjusted by adding midlevel providers to do more routine tasks and paperwork to make those hours more educational. Residents have less continuity with their patients, and Connors and colleagues⁹ found a decrease in cardiac cases logged by cardiothoracic surgery residents after duty-hour restrictions. Duty-hour restrictions have also resulted in limited exposure of general surgery trainees to cardiothoracic surgery with the elimination or fewer opportunities to rotate on the cardiac and thoracic services. There are also increasing demands on the time of teachers with increasing focus on research, clinical outcomes, and clinical revenue. With less opportunity to see complicated, less common cases, the increasing amount of medical knowledge needed, rapid advancements in technology like transcatheter techniques and robotic surgery, and less autonomy with increasing scrutiny on clinical outcomes, the simulation laboratory can be used to give residents experience managing potential intraoperative disasters, such as a massive air embolus during cardiopulmonary bypass, or opportunities to use simulators developed to train residents on various aspects of cardiac and thoracic surgery, including aortic cannulation, cardiopulmonary bypass, and robotic surgery. In addition, there are opportunities to attend an annual resident boot camp organized by the Thoracic Surgical Directors Association using high-fidelity simulators.^{10,11} The American Board of Thoracic Surgery has also mandated that residents have at least 20 hours of simulation training during residency.

Technical excellence as a surgeon does not necessarily translate into excellence as a teacher. There has been an increased focus on resident education and developing more effective teachers through an Educate the Educator course for cardiothoracic surgeons.¹² Novel teaching resources, including Web-based articles, textbooks, cases, and questions curated by an editorial board of cardiothoracic surgeons, are available at learnctsurgery.sts.org to residents and surgical faculty to use for didactic sessions corresponding to the American Board of Thoracic Surgery Curriculum with a larger library of online resources at sts.webbrain.com. Although traditional textbooks are

often outdated at the time of publication, electronic resources can be continuously updated and even tailored to the local curriculum. Learning management systems can also be used to track a learner's progress. An online tracheal course developed by the Joint Council on Thoracic Surgery Education was favorably received by residents, who were particularly attracted to the self-assessment quiz questions.¹³

There has been increasing recognition of adult learning theory and that adults learn better by being actively involved in their learning.¹⁴ Knowles¹⁴ suggested 4 principles that apply to adult learning, including the need to be involved in the planning of their instruction, experience provides the basis for learning activities, adults are most interested in subjects that are immediately relevant to their job or personal life, and adult learning is problem centered. Efforts to enable adult learners to be active participants include flipping the classroom by having residents teach interactive didactic sessions using a case-based format with a faculty moderator as opposed to a traditional lecture format. Mokeddam and colleagues¹⁵ found that flipping the classroom stimulated resident participation with residents completing both curricular readings (82%) and reviewing case presentations (79%) performing significantly better on quizzes. Similar to the Minute Feedback System, app-based feedback (Zwisch Me) has been used to provide brief, immediate written feedback to residents on their operative performance, which was most useful in addressing surgical technique and error prevention.¹⁶ Assessment of residents is also shifting to a competency-based Milestone system rather than one based purely on time or case volume. With the expanding volume of medical knowledge and variable exposure to more complex and increasingly less common cases, competency-based assessment is needed to ensure the quality of graduating residents. The Milestones are based on specialty-specific competencies within 6 core competencies (patient care, medical knowledge, practice-based learning and improvement, professionalism, interpersonal communication skills, and systems-based practice).

To encourage teaching in the current challenging environment, new models need to be developed to recognize and reward teaching and to stimulate scholarly activity in education. Some institutions have also implemented educator tracks and education portfolios for faculty promotion. However, the requirements to advance based on these tracks vary between institutions.

MENTORING

Mentors may also be teachers, but mentoring is often more abstract and not focused on specific skill acquisition or short-term performance. According to John C. Crosby, “Mentoring is a brain to pick, an ear to listen, and a push in the right direction.” Mentoring is focused on broader personal development and defining long-term goals. Mentors are often role models the mentee looks up to. Although mentorship may be a more informal process, formal mentorship programs are increasingly being used. Mentoring students and residents involves sharing advice on broader topics like career paths, networking, and work-life balance but can also provide more specific advice on selecting residency programs, research topics, or which national meetings to attend (see [Table 1](#)).

Mentoring styles differ but may be categorized as a Challenger, someone who pushes the mentee, asks hard questions, and helps him or her stay focused on the end goal; Cheerleader, someone who stays positive and focuses on growth; Educator, someone who takes a teaching style approach with assessments to understand the mentee’s needs and then addresses any deficiencies; Ideator, someone who focuses on thinking and planning; and last, Connector, someone who helps their mentees network within their field.¹⁷ Mentors may take on different aspects of each style, depending on the mentor’s strengths and the relationship and overall goals of the mentee. A truly great mentor has the dexterity to switch between the different styles when appropriate.

Mentorship is a deeper relationship and is generally longer in duration than teaching or

coaching. Whereas coaching is a more formal relationship, mentorship can be more organic and is cultivated over a longer period of time. Mentors can guide mentees in many aspects of life that are not just career related and often have similar interests or experiences as the mentee. Successful mentor-mentee relationships take commitments from both sides and can be increasingly difficult because of growing clinical, administrative, and research demands on faculty time. A study by Kibbe and colleagues¹⁸ found that only half of departments of surgery in the United States have established mentorship programs and that most are informal and unstructured. With the importance of mentorship to career satisfaction and faculty retention, there is increasing recognition that key stakeholders need to be involved, including the department and institution. In a study by Stephens and colleagues,¹⁹ cardiothoracic trainees’ responses to questions on mentorship given with the 2017 In-Training Examination showed that although 84% had mentors, which impacted their choice of specialty in 80% of residents, and 91% viewed mentorship as critical to their success, important gaps remain, including guidance on their career path, assistance in finding a job, and advice on work-life balance.

Characteristics of a good mentor include the ability to generate enthusiasm in the mentee, the ability to inspire confidence and security, and the ability to evaluate their own effectiveness as a mentor ([Table 2](#)). Mentees must also fulfill their part in the relationship, including defining their goals, responsibility, follow-through, willingness to learn and improve, and timeliness. A mentoring relationship can benefit both the mentee and the mentor. Mentors not only have the satisfaction of

Table 2
Characteristics of effective teachers, mentors, and coaches

Teachers	Mentors	Coaches
Knowledgeable	Knowledgeable	Knowledgeable
Expert communication skills	Sincere	Strong interpersonal skills
Approachable	Available	Cultivates mutual trust
Passion for their subject area	Stimulates enthusiasm	Facilitates learner-directed development
Good technical skills	Trustworthy	Highly respected
Adapts to different learning styles	Flexible	Adapts approach to individual learner’s goals and needs
Good listening skills	Good listening skills	Active listener
Sets clear objectives	Challenges the mentee	Recognizes the learner’s abilities and experience
Strong rapport with learners	Evaluates their own effectiveness	Nonjudgmental
Organized	Track record with other mentees	

seeing the mentee succeed but also may be recognized for their efforts. Finding the right mentor can be crucial to success in any field. Physicians with successful mentorship are more likely to secure research funding, achieve promotion, have greater career satisfaction, and provide mentorship to others.^{20,21} Seeking out several mentors who complement each other and different aspects of the mentee's career may also be useful with the multiple roles surgery faculty are expected to play. It is also important to recognize when a mentor is a poor match due to personality issues, lack of interest or time, or conflicts of interest and not to be afraid to change mentors.

COACHING

Although coaching includes aspects of teaching and mentoring, coaching focuses on improving and refining existing skills. There is an opportunity for coaching at all levels, and this approach can be useful throughout one's surgical career. Coaching styles can be broken down into 2 broad categories of "autonomy" and "controlling." The controlling style is the traditional, paternalistic, top-down approach to improving performance, whereas the autonomy style works to address the psychological needs of the trainee and to help develop greater self-motivation in the future.

There is significant literature on athletic coaching research to support the autonomy style in helping athletes achieve greater success compared with the controlling style. Control-style coaches provide feedback, but it is usually negative. They provide no information to their trainees on decisions and may use "punishments" to try to improve performance. The autonomy style is in direct contrast to this, and coaches learn their trainees' perspectives and understand their feelings. They provide their athletes with the information and opportunities to make their own decisions within a set of rules or limits. These coaches are approachable and avoid controlling behaviors. Athletes (and likely surgeons) who learn from autonomy-style coaches tend to develop greater intrinsic motivation and greater performance.

In medical school and residency, coaching is often done in person with a debriefing after an operative case or an event like a patient code. Debriefing involves facilitated reflection and is instrumental in the coaching process. Feedback is also crucial and emphasizes positive, good performance as well as points out areas of deficiencies and often follows debriefing as 1 fluid process. Coaching incorporates the idea of deliberate practice by actively identifying areas for

improvement by reflecting on performance, making adjustments, and evaluating the impact of these changes.² There is increasing interest in the use of video recordings to observe technical skills and to give feedback. Videos have been used to assess and critique medical students in standardized patient interactions for many years.

In a study by Singh and colleagues,²² medical students were randomized to receiving video-based coaching in performing laparoscopic cholecystectomy in virtual reality simulators and in the pig laboratory. Students receiving coaching outperformed control students. Bonrath and colleagues²³ reported on a randomized controlled trial comparing coaching with standard surgical training using minimally invasive Roux-en-Y gastric bypass as the index procedure. Residents in the coaching arm showed significant improvement in their technical skills and error scores. There was also improvement in self-assessment with a strong correlation between blinded video scoring and resident self-assessment in the coaching but not in the control arm with improvement in self-directed learning, skills that can benefit trainees throughout their career.

COACHING FOR SURGEONS IN PRACTICE

Although coaching has been widely applied and even expected in disciplines like business, music, and athletics, even for elite athletes and CEOs, it remains relatively rare after surgeons enter surgical practice. Surgical residency training occurs over a finite time period at the end of which surgeons are expected to be competent, and most surgeons are never observed by another surgeon after completing residency. Although surgeons often think of mastering and achieving a new skill set like transcatheter techniques or robotic surgery, they do not always consider the importance of refining that skill set with continued learning and improvement that are cornerstones of other disciplines that use coaching. Watling and colleagues²⁴ described a difference in learning cultures. Although surgeons emphasize mastery and competence, sports and music emphasize performance improvement. Similar to a professional athlete who can benefit from continuous feedback and refinement of their serve or golf stroke, a surgeon, who uses repetitive, technical skills, is well suited to benefit from coaching. A coach can provide an outside viewpoint that the learner cannot or does not want to see. A coach can help a surgeon change unconscious deficiencies to conscious deficiencies then to conscious abilities, and finally, to unconscious abilities.

Although it is common to think of coaching as a remedial or punitive approach, coaching should be seen as an opportunity to get constructive feedback and maximize a surgeon's potential. Coaching sessions should be nonthreatening and nonjudgmental. Finding appropriate coaches as one transitions to surgical practice is critical as well as finding lifelong mentors and coaches that help one to maintain and develop new skills after finishing traditional residency training. Coaching can be a useful approach to quality improvement, increasing a surgeon's self-awareness by identifying areas for improvement, making adjustments, and then evaluating the impact of these changes.

A structured approach using established coaching frameworks, such as PRACTICE (Problem identification, Realistic/relevant goals, Alternative solutions, Consideration of consequences, Target most feasible solutions, Implementation of Chosen solutions, and Evaluation) and GROW (Goals, Reality, Options, and Wrap-up), for laparoscopic cases can provide a systematic process that can then be personalized for individual learners based on their needs and goals.^{22,25}

The Wisconsin Surgical Coaching Framework is shown in Fig. 1.²⁶ To develop a surgical coaching program, decisions should be made on whether the coaching will be live versus video based and whether this will involve expert versus peer coaching. Coaches should be identified based on their expertise and interpersonal skills. Coaches should be matched to the individual's goals and practice

type and should not be direct competitors. The focus of coaching (technical, cognitive, interpersonal, and stress management) and the coaching activities (goal setting, inquiry, constructive feedback, and action planning) should also be defined.

Video-based coaching is one of the most effective methods and has been shown to be more effective than verbal feedback alone in helping to maintain behavioral changes over time.^{27,28} Video allows surgeons to have a third-person view of themselves, to benchmark against other surgeons, and decreases the inaccuracy of surgeon self-assessment.^{29,30} Video recording is now widely available and does not require sophisticated equipment. Videos can be reproduced and reviewed by multiple coaches. Video-based coaching also decreases many of the logistical issues and risks inherent in intraoperative teaching, including distractions from coaching that may affect concurrent patient care and ethical and medicolegal issues for coaches. Video can be fast-forwarded, making sessions more efficient and saving 50% to 80% of time without affecting the ability to assess the learner.^{29,31,32} On the other hand, some operating room staff may be uncomfortable being filmed with concerns about discoverability. A gastroenterology study showed that the quality of colonoscopies improved once gastroenterologists knew they were being video recorded even if the video was not reviewed.³³ However, verbal expert review of the video is more effective than self-assessed feedback,

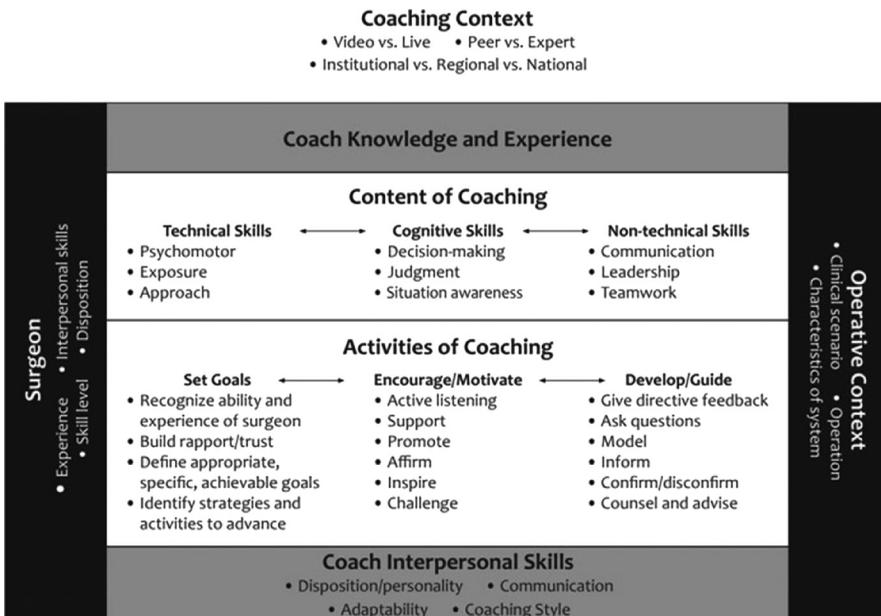


Fig. 1. Wisconsin surgical coaching framework. (From Greenberg CC, Ghouseini HN, Pavuluri Quamme SR, et al. Surgical coaching for individual performance improvement. *Ann Surg* 2015;261(1):33; with permission.)

demonstrating the added value of coaching.³⁴ A coaching relationship provides expertise to help identify a surgeon's gaps in knowledge or skill and to develop strategies to overcome them.^{35,36}

EXPERT COACHING

There are 2 types of coaches, expert coaches and peer coaches. Expert coaching, also known as instructional coaching, involves an experienced consultant who helps a learner change their practice through self-assessment and constructive feedback. Expert coaches are especially useful when developing a new skill or procedure. Expert coaches can also provide exemplar video samples to provide good and poor examples, which can be used to help with behavior modeling of the learner. Context should be provided to the coach with a brief summary of the patient's history and presentation along with relevant radiology imaging to help put the coach in the surgeon's position. An overhead camera may also be useful to provide a complete view of the operative field with the surgeon's gross and fine movements. One example of expert coaching is the Assuring and Defining Outcomes through Procedural Training program, which uses expert coaching to teach total extraperitoneal laparoscopic hernia repair. The program included didactics, simulation training, and intraoperative training at both the coach's and the surgeon's institutions with video-based coaching for the first independent cases.³⁷

PEER SURGICAL COACHING

Performance improvement for surgeons in practice, especially more senior surgeons, may be best facilitated by a peer coach. Peer coaching tends to be more bidirectional with surgeons with a similar level of experience learning from each other but can range from instructional to reciprocal approaches and should be a nonjudgmental partnership. Not all coaches are equally effective. Identifying appropriate coaches is critical, and the individuals must have the appropriate knowledge and expertise to be credible coaches (see [Table 2](#)). Coaches should be adaptable to each learner's different style and needs, and many of the skills needed to be an effective coach can be obtained through training. Regardless of the type of coaching, longitudinal sessions over time may help surgeons incorporate feedback into changing their performance and achieving continuous professional development.

Shubeck and colleagues³⁸ evaluated whether surgeons could transition to becoming a colearner for effective peer coaching. They found that participating surgeons frequently alternated

between coaching and coachee roles and that the exchange of ideas was bidirectional with both surgeons offering their expertise when appropriate. One program developed in Wisconsin identified coaches using nominations through the state surgical society. Coaches underwent training sessions, and a call with participating surgeons before the coaching session was used to define goals and develop an action plan. Both coaches and participating surgeons found the coaching to be valuable.³⁹ According to Beasley and colleagues,⁴⁰ the framework for building effective peer coaching relationships includes aligning roles and process expectations, establishing rapport, and cultivating mutual trust.

OBSTACLES

Setting aside time for teaching, mentoring, and coaching is becoming increasingly difficult because of growing clinical, administrative, and research demands. Incorporating lessons learned through self-assessment and increased self-awareness may actually increase efficiency both inside and outside of the operating room. However, there are also other obstacles unique to coaching, including concerns about reputation and loss of control ([Table 3](#)). Mutabdzic and colleagues⁴¹ performed a survey of attending surgeons evaluating perceptions of surgical coaching as a technique for performance improvement. They found that surgeons highly valued their image of competence and autonomy. Many felt threatened by surgical coaching with significant concerns about how their reputation could be affected and that even the presence of a coach could make them appear incompetent. There was also concern about feedback being given in front of colleagues.

Table 3
Barriers to surgical coaching

Concern	Approach
Limited time	Incorporating lessons learned through self-assessment and increased self-awareness may increase efficiency
Concerns about reputation	Coaching should be performed in private. Approach should be nonthreatening with the goal of improvement and not punishment
Loss of control	Individualized goals increase "buy-in" and develop self-directed learning

Surgical culture can pressure surgeons to behave a certain way to maintain an image of control and competence that makes them less likely to ask for help.⁴² For coaching to be successful, it must be accepted by the surgeons involved. The learner must “buy-in” and accept the coaching process. Coaching should be performed in a private setting and can be done away from patients and colleagues using a video-based approach.³¹ However, the need to maintain one’s image must be balanced with the value of receiving immediate feedback before the teaching points are forgotten. These issues may need to be negotiated to establish trust between the coach and the learner, and feedback should be tailored to each surgeon’s learning styles and needs. The approach should be nonthreatening with the goal of improvement and not punishment.

Many surgeons do not feel the need for coaching and fear the loss of control. However, there are several studies showing that physician self-assessment is inaccurate and that surgeons would benefit from external coaching.^{43–45} Creating individualized goals, defined by the learner, helps to increase “buy-in” and to develop self-directed learning, which can improve the surgeon’s sense of control over their own performance improvement. The coaching relationship is a partnership, and the coach is helping the learner help themselves.

FUTURE

As technology continues to improve, remote video review and coaching by teleconference may become more common, improving efficiency and even anonymity, which remains an obstacle for some seeking out coaching opportunities. Video conferencing may be particularly useful for surgeons practicing in remote areas or in solo practice, where there is a lack of experienced partners and access to traditional learning opportunities. Technology is also being developed for surgical telementoring with important criteria, including safety, reliability, transmission quality, ease of use, and cost.⁴⁶

As coaching becomes more common, it will be important to create training opportunities for coaches to both learn and share a wide range of coaching techniques and strategies. Regional and national surgical societies and quality collaboratives can play an important role in identifying expert and peer coaches, training programs, and networks to distribute ideas and resources. More research will also need to be done to confirm that coaching results in better patient outcomes.

SUMMARY

Teaching, mentoring, and coaching all play critical roles in success at all levels from medical students to cardiothoracic residents and faculty. However, challenges due to changes in residency training, regulatory and financial constraints, rapidly increasing knowledge and technology, and limited faculty time due to increasing clinical, academic, and research demands require that new approaches are developed using simulation, competency-based assessment, online courses and resources, and the development of systems that reward teaching and mentorship and encourage scholarly activity in education. Although coaching has been used effectively in other disciplines, including athletics, business, and music, surgical coaching remains relatively uncommon. However, there is growing interest due to an increasing focus on safety and quality improvement and the realization that current continuing medical education is limited. Coaching offers a structured approach encouraging self-reflection using facilitated feedback, analysis, and debriefing and can be individualized to each surgeon’s needs and goals and can benefit surgeons at all levels.

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