Chapter 47
The Consistent Operating Room Team

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Objectives

1. What are the measurable impacts of team consistency?
2. What are the pros and cons of team consistency vs cross-trained teams?

Introduction

A team is defined as a group of people who perform interdependent tasks to achieve a common objective. In healthcare, there are many types of teams. For example, they can vary from teams whose members work together often and are highly specialized, such as a team in a cardiac catheterization suite, to teams who sporadically come together for temporary measures, such as the stroke or trauma team. In the operating room, a typical team includes anesthesiologists and/or nurse anesthetists, surgeons, residents, nurses, physician assistants, and technicians.

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Several studies have shown that team training in the operating room can improve efficiency and improve the culture of patient safety [1]. It is evident in this era of healthcare that teams need to be optimized to deliver the best performance in accomplishing care. To achieve optimization, emphasis has been placed on teamwork through effective communication between those team members and a culture of safety. Teams are structured within this paradigm and objectives can be met utilizing different formats. In this chapter, the importance and impact of team training and team interaction in the operating room environment will be reviewed. Methodologies to achieve these goals will also be discussed.

Types of Teams

Cross-Trained Team

One emerging team structure is the cross-trained team. There are several definitions for what a cross-trained team is—one of which is some or every team member has been trained to perform other job functions than their primary designated function. For example, a scrub technician may help transport the patient, or a post-anesthesia care unit (PACU) nurse may rotate into the operating room and assist the circulating nurse. Another definition, which will be the primary focus of this chapter, is that team members are trained to perform their respective duties in a wide variety of procedures and circumstances. In essence, each team member becomes a "Jack of all trades, master of none." An example of this is a scrub technician or a physician assistant who has been trained for a wide variety of specialty cases, such as a member of the orthopedic team assisting in a bariatric case.

Cross-trained teams are not a new phenomenon but rather something that has been advocated by other industries as well as sports and the military. For example, in sports, by mixing different exercises for players, coaches can prevent

overuse injuries, balance development, and avoid monotony. In the military, operational success is dependent on each team member's understanding of each other's roles and tasks. This is primarily to ensure that if one member is unable to continue, others can replace them and accomplish the mission at hand. In industry, cross-trained teams of employees help increase productivity and mitigate risk and inefficiency.

Team members involved in cross-training programs become proficient at tasks outside the usual limitations of their job. Hence, they can anticipate and help with the needs of other team members. For their employers, this also provides more flexibility. It makes it easier for employers to seamlessly fill in certain employees for a variety of tasks. By ensuring that team members are trained for multiple roles, it is easier to respond to and troubleshoot problems and mitigate disasters.

By providing scheduling flexibility, cross-trained team members are better suited to meeting varied operating room demands. For example, in Geisinger Health System in Pennsylvania, two centers with different team paradigms were set up to deal with thrombectomies for stroke patients. Center A utilized a cross-trained team that was trained in both operating and neuroendovascular procedures, while Center B maintained a dedicated on-call neuroendovascular team. When comparing the effectiveness of both teams, successful reperfusion was achieved in 98% and 97% of cases in Centers A and B, respectively ($p = 0.79$), but door-to-puncture time differed significantly between 50 minutes in center A compared to 121 minutes in center B (58% reduction, $p < 0.02$) [2]. This is due to Center A relying on in-house staff members that are trained to fit in different roles whenever it is asked of them. Center B relied on a highly trained specialty-specific team. These teams are more experienced in their specific specialties but logistically require more time to mobilize.

Cross-trained teams can be more economical as members of the staff can fill different functions. Larger institutions with

more financial resources are more adept at having multiple specialty-specific teams. The smaller surgical department, however, may only have a limited number of staff members. Thus, cross-training those few staff members becomes imperative to handle the wide variety of procedures that need to be performed.

Consistent Teams

On the other end of the spectrum of team models is a paradigm of consistency in team members and their functions, i.e., each member is tasked with certain functions that do not change. This type of team has been espoused by other fields as well. In sports, it is equivalent to special teams on an NFL professional team or the special tactical unit in the police force or military. For these teams, there are clear expectations for each team member's functions, responsibilities, and accountabilities. This helps to optimize the team's efficiency toward a concentrated goal. In the setting of an operating room, these teams are typically trained toward a particular surgery or set of surgeries and spend the majority of their time performing these procedures. Members of the team would function in their primary designated function but would work as such in a dedicated subspecialty.

Consistent teams affect multiple factors when it comes to the operating room. Communication, for example, is more effective in teams that have worked together longer and have familiarity with each other. This, in turn, causes increased efficiencies, as demonstrated by one study, in which there was an average of 5.1% time gain per similar case performed within the same day with the same team. This consistency builds trust among team members; thus, individual team members can rely on dependable working conditions, knowing the reliability and acumen of each team member through experience and consistent feedback [3]. The effects of this consistency can outlast just same-day similar surgeries. In another study, which examined 754 cases of bilateral reduction

mammoplasty procedures over 12 years, there was a reduction of 16 minutes of operative time as the team members became familiarized with one another [4].

As surgical departments try to rein in spending and cut costs, they must find the optimal level of efficiency to take advantage of their infrastructure, equipment, and team setup. In one study, it was demonstrated that it is possible to increase operating room efficiency by changing the patient flow from patients linearly moving through their operative day to one of parallel processing. In this model, the team members are effectively able to work on two patients simultaneously. To achieve this, each member had a well-defined role, and the team acted as a unit. Therefore, by mandating consistent teams, there was a reduction of overall costs per case [5]. To achieve this model, additional personnel may be needed. However, cost-effectiveness analysis suggests that the additional costs incurred by higher staffing ratios are likely to be offset by increases in throughput [6]. To increase efficiency utilizing this team model, it is important to have a high volume of surgery. The more surgeries performed, the more opportunity teams have to work together and thus contribute to the team's overall effectiveness.

Factors Affected by Team Format

Communication

The concept of a culture of safety has been featured prominently in the literature on quality and outcomes. At the heart of the culture for safety is effective communication between team members. Operating room safety does not just happen organically, but rather it is largely a result of the behaviors and attitudes of the involved individuals and how well they communicate [7]. In the operating room, communicative events were found to be clustered around certain phases: patient preparation, the start of the procedure, moments

where surgery is difficult, the conclusion of the procedure, and patient hand-off [8].

Team dynamics play a large role in how effective communication is. Team members' familiarity with one another and comfort level in addressing each other play a significant role in how effective the team is in maintaining the appropriate culture and addressing common concerns that arise in the operating room (Table 47.1). The consistent team members are aware of the equipment needed for the procedure and how to prepare the patient. They can get the patient on the table and have the room appropriately ready faster than their counterparts on cross-trained teams [9]. Thus, at least in the phases of communicative clusters, at the beginning and end of cases, it is more optimal to have a consistent team. The authors also made this observation when looking at the importance of team consistency in their own experience. They also noted that with consistent teams, the setup time and time after surgery out of the operating room were shorter with a consistent team [16].

Additionally, team members of a consistent team are more likely to know the goal of the operation and the procedure steps as compared to members of a cross-trained team [10]. This will give them more confidence in speaking up on safety issues as well as bring up concerns regarding steps in the procedure as they become more familiarized with the procedure [11].

Table 47.1 Common concerns in the operating room

Coordinating patient preparedness (room readiness, cancellation)
Resources (locating correct equipment, troubleshooting equipment)
Staffing (assign particular staff to cases, coordinating coverage during breaks)
Safety (timeout, operating room fire, instrument counts)

Error Reduction

In the operating room, situations can arise in which the team has to act quickly and decisively in response to changing conditions. This has to be achieved without necessarily being able to halt surgery to discuss the best plan of action. To be successful in the operating room, teams need to intuitively know what to do and how to do it together efficiently. To do this, they need a good shared mental model. A shared mental model is a "knowledge structure held by each member of a team that enables them to form accurate explanations and expectations…and in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members" [12].

A shared mental model is the notion of being on the "same page." Team members who are part of consistent teams will, over time, develop a shared mental model through repetition of the procedure. This, in turn, allows for error reduction and the ability to meet challenges as they arise. This can be attributed to team members identifying errors or potential errors due to previous encounters of similar problems or due to knowing the capabilities and shortcomings of the team members at hand [13].

In one study, questionnaires were given to surgical teams performing video-assisted thoracoscopic surgery to assess their shared mental model [14]. The questions addressed three overall topics, namely, (1) risk assessment of the procedure, (2) familiarity with team members/perception of those team members' skills, and (3) recognition of challenges arising during the operation for different team members. As noted in Fig. 47.1, the team member who was most familiar with the team and who team members, in turn, felt most familiar with was the surgeon. This has important ramifications regarding leadership and guidance of the procedure to a resolution safely. More importantly though were the final results of the questionnaire: it noted that only one-third of perceived problems were identified by other team members, as outlined in Table 47.2.

The data suggests that despite some level of familiarity, perceptions of other team members' challenges may not be recognized by other team members. This study also suggests that as teams become more familiar, they demonstrate a greater degree of concordance for each other's perceived skill levels as well as recognizing other member's challenges. Furthermore, this mutual understanding also improves adaptive coordination within teams which is essential for overall performance. As teams became more consistent, there was an improvement in recognizing challenges. For cross-trained teams, it is important to have explicit coordination strategies to obtain shared mental models that can help compensate for lack of familiarity [15].

It is also important to note that consistent teams may also have limitations. Team members who have the same mental
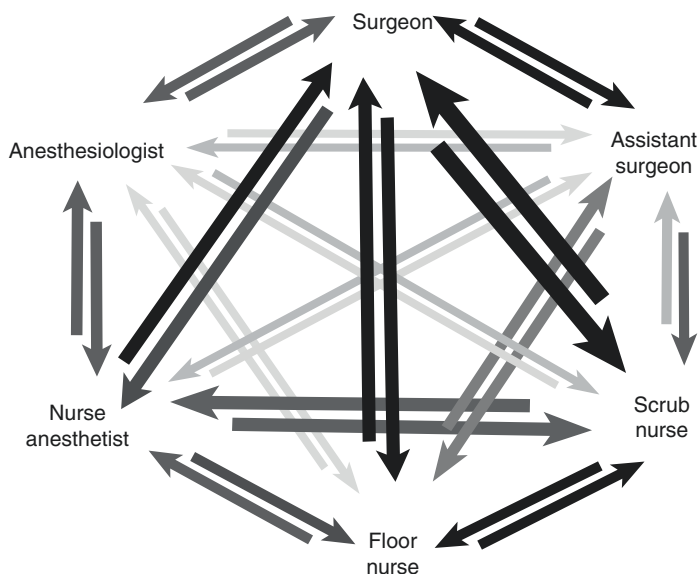

FIGURE 47.1 Familiarity within the team. Each arrow represents the mean familiarity of one team member toward another team member; darker and thicker arrows represent higher familiarity. (Reproduced from Gjeraa et al. [14])

TABLE 47.2 Team members' awareness of other team members' challenges or problems, as percentage of self-identified problems and challenges

Awareness of challenges/ problems	Problems of						Team member's awareness (average)
	Surgeon	AS	SN	FN	Anesth	NA	
Surgeon	…	44	22	27	65	60	44
Assistant surgeon	48	…	0	27	58	50	37
Scrub nurse	27	47	…	27	49	35	37
Floor nurse	24	44	25	…	17	15	25
Anesthesiologist	35	31	33	40	…	32	34
Nurse anesthetist	27	31	22	30	47	…	32
Rest of team (average)	32	39	21	30	47	38	35

Reproduced from Gjeraa et al. [14]

Anesth anesthesiologist, *AS* assistant surgeon, *FN* floor nurse, *NA* nurse anesthetist, *SN* scrub nurse

model may also hinder the goal of the team through "group think." This term refers to a situation in which team members all have a consensus of a mental model, but the mental model is incorrect. Also, familiar teams are less innovative when faced with new problems. This is an area where cross-trained team members may be more advantageous. They can provide a different lens by which the challenge can be met and can bring experience from other specialties to use in dealing with the procedure at hand.

Team members possessing a common understanding of the case at hand, including its major steps and points at which challenges are most likely to be encountered, do better than teams that do not. However, one way to mitigate this is through creating specialty-specific preoperative briefings [16]. This will help decrease surgical flow disruptions as well as improve patient safety [17].

OR Efficiency

The operating room is a complex dynamic work environment. It requires multiple professionals to interact with each other as well as with complicated technologies seamlessly. This must be done with safe and effective patient care as the primary goal, but it is also important for it to be efficient. As discussed earlier, in large hospital settings, it is common that during the day, personnel are utilized across many different ORs and different types of surgeries. Although the staff members may be adequately prepared for some of these surgeries through prior experience, it is possible that some members will not be familiar with the procedures or surgeon at all. For staff who have been part of the team during previous surgeries, it is also possible for them to require a period of familiarization time at the beginning of the surgical procedure or during it. This can form an obstacle for smooth workflow and reduce efficiency.

In one study in the Netherlands, scheduling similar consecutive cases and performing them with a consistent team resulted in faster case time and lower turnover and preparation time. The study focused on two procedures: an open inguinal hernia repair and a laparoscopic cholecystectomy. The procedure time of the inguinal hernia repair decreased significantly and had practical scheduling implications. Surgeons were able to increase the number of cases they perform per day due to an increase in efficiency. For the more complex operation, laparoscopic cholecystectomy, there was no significant effect on procedure time, but there was a decrease in turnover time [18].

In our institution, we observed similar results. Operating room data was obtained for 180 cases of laparoscopic Roux-en-Y bypasses performed at two hospitals. One hospital had a highly consistent operating room team (eight circulating and scrub nurses, four anesthetists, three anesthesiologists), and the other had much greater variability of staff (39 circulating nurses, 57 scrub nurses/technicians, 59 anesthetists or anesthesia residents, 24 anesthesiologists).

There was no statistical difference between the total mean OR time. However, the preparation and turnover time for cases were shorter in the hospital with a consistent operating room team [19].

Training

Multiple modalities exist for training, including on-the-job training, apprenticeship, as well as simulation models. On-the-job training is an explicit type of training where team members are instructed via targeted information and observed as they perform their duties. This is followed up by feedback based on observed performance. An example of this is when a new surgical assistant is placed with the surgeon, and instructions with feedback are continuously given throughout the operation. In an apprenticeship model, new team members are paired with coworkers who have more experience. The older team members mentor and advise on how to succeed in that particular team role. The newer team members observe, learn, and assimilate the different responsibilities of their role. For example, a new scrub technician may shadow a more experienced scrub technician to learn the steps and responsibilities of a particular surgery before attempting them on their own. In the simulation model, the goal is to replace real experiences with guided and immersive replicas. Team members are immersed in surgical settings that evoke or replicate what they may encounter during surgery.

The goal of any training should be to ensure patient safety while providing an optimal training environment. Another goal is to increase productivity and efficiency. Simulation-based training can be the answer to foster those goals regardless of the team configuration. Simulations can be used to expose the team members to the steps and conditions of the surgery. It allows for knowledge sharing and feedback to be done in a setting without the possibility of patient harm. This gives team members access to valuable information not just on the steps needed to get the job done but also on the

skills and capabilities of other team members. The feedback on potential errors, which might otherwise be missed during the usual clinical setting, can be exposed during the simulation and prevented [20]. A simulated environment allows the team members to grow, learn, and be challenged. Additionally, simulation scenarios can be created from basic common experiences or atypical experiences that the team may encounter, thus preparing the team for a myriad of possibilities. This can be particularly effective when preparing to perform a new procedure for the first time in the operating room.

Team members with proper training have improved efficiency and productivity. There is less wasting of time and resources. Training also improves morale as team members are more likely to feel confident if they feel more prepared for the surgeries. This causes less team turnover. Most importantly, fewer mistakes occur if team members do not lack the knowledge and skills required for the job. The more proficient each team member becomes, the less likely an error will occur.

Conclusion

The reality of most operating room teams is perhaps a hybrid between the consistent team and the cross-trained team models. Operating rooms utilize nurses, technicians, anesthesiologists, and physician assistants in their functional capacity but in an ever-shuffling mix as per the demands of the operating schedule as well as logistical and staffing issues. Additionally, as to be expected in emergency surgery, most operating room teams form ad hoc for the procedure. Thus, it is commonplace for the surgeon to have a team consisting of different members for different procedures throughout the operative day. This is most evident as the institutions become larger as they can employ dozens to hundreds of operating room staff.

Ultimately, having a large operating room staff that is not organized into teams results in team members working

loosely together and never developing the same cohesiveness as a pure, consistent team should. It is for this reason that team training in surgery is paramount to having a safe and efficient operating room that communicates effectively with mutual respect among all members of the team. The surgeon, regardless of the team format, must first be a team player but also a leader. They must establish a clear vision for the case, provide the knowledge and method by which that goal can be achieved, and coordinate/balance the conflicting interests of all team members—avoiding the hierarchical model and realizing that every member in the operating room is equally important in achieving the best patient care results in a better "team" environment. As leaders, they must demonstrate that leadership by taking all concerns into account in a safe manner and providing an environment whereby team members are encouraged to speak about their concerns and feel that their concerns matter to everyone on the team, all in the name of patient safety.

Through team training, improvements in operating room efficiency, quality of care, operating time, turnover time, and overall team morale can all be improved and optimized.

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