Minimizing workflow challenges and cognitive load during staff shortages

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The surgical technologist's role is inherently dynamic, full of nonstop multitasking, manual tasks and staff interaction, all while serving specific surgeon and patient needs. Today's staffing shortage can complicate these efforts by increasing daily demands, tangible responsibilities and intangible cognitive load (mental effort/strain). This article discusses techniques to mitigate the effects of working with new or revolving staff to help preserve operating room (OR) workflow and personal well-being.

Emerging from the pandemic, multiple industry, academic and news sources reported critical hospital staff shortages. One study showed US hospital staff shortages ranging from 19% to 52%, including a 30% vacancy rate for surgical technologists and OR nurses.[1] This was echoed by 2021 and 2022 American College of Healthcare Executives (ACHE) annual surveys which cited personnel/workforce shortages as the top concern, displacing financial concerns which topped the list since 2004.[2-3] Of roughly 300 CEOs surveyed each year, 85% and 83% (respectively, in 2021 and 2022) noted a concerning shortage in technicians, their second staffing problem behind nurses.[2-3] These OR staff shortages, in turn, have limited hospital OR capacity to serve the public.[4]

LEARNING OBJECTIVES

- View the data on how automated devices have been shown to simplify processes, enhance personal safety, reduce time and help equalize performance across users
- Examine how communication and team-building skills can lead to a more efficient team
- Evaluate how formal onboarding could be key to creating an essential OR team
- Learn about ways for STs to influence purchase-making decisions in the OR

This data reflects the ongoing need for perhaps unprecedented reliance on alternative forms of staffing, such as from external recruiting agencies, traveling practitioners and in-house temps or float pools. Alternative sources of clinical staff help provide a vital and valued resource, and their experiences at different hospitals may provide beneficial new ideas or methods worth adopting. However, the addition of any new staff can sometimes disrupt OR routines, potentially increasing intra-operative workload, workflow and cognitive load.

Leveraging automated devices and onboarding/communication techniques that take new staff needs into consideration, as well as influencing purchase decisions to secure supportive equipment, can help minimize job challenges and preserve personal well-being.

AUTOMATE MANUAL TASKS TO COMBAT BURNOUT AND TURNOVER

ACHE's 2022 survey ranked burnout as its number three workforce challenge.[3] This was echoed by a job burnout study of surgical technologists in which 65.6% rated the frequency of emotional exhaustion (overextension and work-associated fatigue) at medium to high levels.[5] Given existing technologist and nurse shortages, protecting against burnout and further staff turnover is prudent. Concerns about personal protective equipment (PPE) was found to be a significant predictor of work-related burnout.[6] Fortunately, in many instances personal protection can be controlled or modified. For example, automated devices with integrated safety features can enhance personal protection by reducing or eliminating clinician exposure to sharps, biohazards or other personal safety risks, instinctively reducing cognitive load.

Additionally, devices that automate traditionally manual tasks can help reduce physical injury, fatigue and workload as well as standardize and simplify tasks. This standardization can mitigate human factors across clinicians from various staffing sources and experience levels, facilitating more consistent performance and predictable workflow. A study on sterile surgical unit workflow also showed that streamlining and automating the work process can reduce instrument processing time and OR surgical supply replenishment times.[7]

The personal protection and workflow benefits of automated devices are reflected in increasing adoption of OR equipment such as automated fluid waste management systems, RFID sponge trackers/counters and electrosurgical pens with on-tip smoke evacuation.

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AUTOMATED TISSUE REMOVAL AND BONE MILLING

Of particular relevance to surgical techs (STs) who prepare autologous bone are devices for automated tissue removal and bone milling. Use of autologous bone remains the gold standard. But manual tissue removal and bone milling has been found to be dependent on individual scrub tech skill and efficiency,[8,9] a variance that can be more prevalent with today's reliance on alternative or rotating staff members.

Manual bone processing can also be an arduous, time-consuming task involving multiple tools and physically repetitive motions which, along with sharps, can cause hand fatigue and injury. And the time and physical effort associated with manual bone processing can intensify in cases such as multilevel spinal fusions, which may also add stress to keep pace with the surgeon. Studies have shown the OR environment to be the highest area of sharps risk in a hospital and that fatigue and rushing are among the most common causes for sharps injuries.[10,11]

Use of a reusable power base (Bone Mill+) that drives automated tissue removal (Prep+ disposable cartridge) and automated milling (Bone Mill+ fine, medium or large disposable blade cartridge) can convert a manual task into an automated one from start to finish. Prep+ mechanically removes soft tissue from extracted bone within a closed, see-through cartridge on a 10-minute run cycle. Cleaned bone is then placed directly into Bone Mill+, which mills bone in an 8.4-second single pass into the surgeon's specified particulate size.[8]

A study of 16 experienced STs showed that, compared to

manual bone processing, automated bone stripping and milling resulted in significantly faster time to readiness (Table 1), consistently higher-quality soft tissue removal (Figure 1), greater bone yield (Table 2) and enhanced personal safety via reduced hand fatigue and sharps punctures[8] (Table 3).

Of particular note in this study was a significant drop in total bone processing time from 41 (+23) minutes for manual processing to 10.14 (+0.06) minutes for automated processing. This means, depending on the ST's manual processing speed, they could redeploy up to 40 minutes of time to more strategic or desirable OR endeavors. Additionally, when asked to estimate total manual bone processing time, 50% of STs underestimated their time spent by ~14 minutes, indicating an opportunity to realize and recoup true time lost.

Table 1. Compared to 16 STs (avg. 12 yrs experience) who manually processed 25g porcine bone, automated processing resulted in significantly faster bone cleaning, milling and total bone processing time. Automated processing showed repeatable predictable time to readiness across OR staff users.[8]

Figure 1
Manual versus automated bone cleanliness quality

Figure 1. Independent STs who were blinded to manual or automated bone cleaning procedures rated the cleanliness quality of tissue stripping on a scale of 10, with 10 being highest quality. The automated examples rated 15% higher than bone processed manually. Manually cleaned samples - 33% - scored <4.8 (A) Randomly Selected Automated Example (B) Randomly Selected Manual Example.

Table 2. During 10-minute processing times, automated bone processing resulted in 64% greater bone yield than manual and generated consistent volume across all samples.[8]

TABLE 1: MANUAL VERSUS AUTOMATED BONE PROCESSING TIME

Method	Avg time (mins) plus standard deviation (mins)	Total processing time (time to readiness)
Manual bone cleaning	27 ±14	41 ±23
Manual bone milling	14 ±9	
Prep+ bone cleaning	10 ±0	10.14 ±0.06 p<0.0001
Bone Mill+ bone milling	0.14 ±0.01	

TABLE 2: MANUAL VERSUS AUTOMATED BONE YIELD DURING TISSUE REMOVAL/BONE CLEANING

	Manual cleaning	Automated cleaning
Bone yield measured after 10 minutes (the time of Prep+ run cycle)	Average 4g of bone *(68% of scrub techs cleaned 32% of the total 25g)*	25g of bone *(for all samples)* Avg 64% more bone yield than manual cleaning p<0.0001
Additional manual tissue removal time needed to finish cleaning 25g of porcine bone	50% of participants required 20 minutes more	0 mins

TABLE 3: PERSONAL SAFETY ASSESSMENT		
Experience of nitrile glove puncture during study[8]		
	Manual cleaning	**Automated cleaning**
Glove puncture	50%	0
Past experiences during self-reported survey[8]		
Hand fatigue		
Ever experienced hand fatigue while manual bone cleaning	100%	
Ever experienced hand fatigue while manual bone grinding	75%	
Glove puncture		
Ever experienced holes in gloves while manually cleaning bone	31%	
Ever experienced holes in gloves while manually grinding bone	13%	
Injury		
Ever experienced injury while manual bone cleaning	31%	
Ever experienced injury while manual bone grinding	19%	

Leveraging automated devices and onboarding/communication techniques that take new staff needs into consideration, as well as influencing purchase decisions to secure supportive equipment, can help minimize job challenges and preserve personal well-being.

Table 3. Manual bone processing is associated with a variety of personal safety risks such as hand fatigue, glove puncture and injury.[8]

AUTOMATED BONE DUST COLLECTION

Bone dust collection (Bone Vac, Figure 2) is another automated means of collecting and processing autologous bone intraoperatively in cases where bone regeneration or fusion is desired. Similar to the automated tissue removal and bone milling device, the bone dust collector can help standardize workflow while minimizing the need for sharps and manual handling. Patient centric, it may also reduce the need for, or extent of, iliac crest (or other bone) harvesting because its 13cc capacity filter can be used multiple times during the case to optimize autologous bone capture.

It functions via attachment to the surgeon's existing drill and standard surgical suction tubing to capture drilled bone dust during routine procedural bone drilling. When the collection filter is full, one push of the integrated plunger cleanly ejects all bone dust. The putty-like bone plug can then be quickly shaped and reimplanted by the surgeon.

Pre-clinical studies have shown that bone dust generated by high-speed drills can contain viable bone-forming cells and expression markers reflecting the osteogenic, osteoinductive and osteoconductive potential – three fundamentals of bone growth and fusion.[12-17] (See Table 4, Figures 3–6)

Figure 2

Figure 2. Bone dust collectors are designed to automate autologous bone capture while limiting manual processing. Device shown operates independent of orientation and replaces traditional basket collectors (which require inversion and scrapping out loose dust) with a plunger method of action.

TABLE 4: VIABLE BONE-BUILDING CELLS WITHIN DRILLED BONE DUST
Osteoblasts
Osteoclasts
Osteocytes
Osteoprogenitor/mesenchymal stem cells
Osteoblast expression markers

Table 4. Six independent studies using various drills, drill techniques and collection methods identified viable bone-forming cells within the collected bone dust with the potential to generate and form new bone.[12-17]

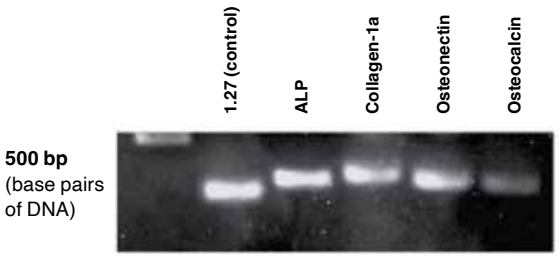


Figure 3. Osteoblast-related genes from adherent cells from bone pate fragments.[13]

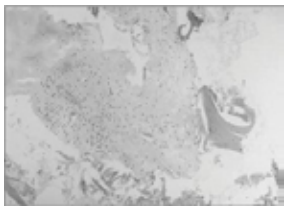


Figure 4. Photomicrograph of local autograft demonstrating the presence of viable osteocytes.[15]

Figure 5. Bone dust has demonstrated the ability to spur a range of bone-growth activities typically associated with osteogenesis, osteoinduction and osteoconduction.[14]

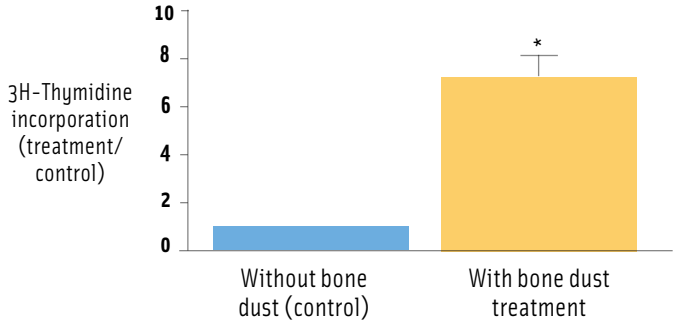


Figure 6. Primary human osteoblast proliferation increased seven-fold in response to bone dust ($p<0.05$).[12]

INTEGRATION OF ALTERNATIVE STAFFING FOR IN SYNC WORKFLOW

Rotating or alternative sources of OR staff can have benefits aside from filling a role. Experienced agency, traveling or per diem clinicians may have served a range of patient populations, creating a multipurpose skill set. Their exposure to and technical proficiency across devices and equipment may also be broad. And, after working across healthcare systems, they're often accustomed to quickly adjusting to new hospitals and OR teams.

But, naturally, differing clinical practices and team unfamiliarity at any experience level has potential to disrupt OR routines, communication and interpersonal dynamics. And with novice, inexperienced staff the hurdles and acclimation needs can be greater.

Many techniques, including those that follow, can help leverage the strengths of new or rotating staff while mitigating undesirable or unintended effects on intra-op workload, workflow and cognitive load.

Impaired psychological safety can stunt one's ability to speak and act quickly and confidently, attributes essential to safe patient care in a fast-paced, high-demand OR.[20]

COMMUNICATION AND TEAMBUILDING

The Association of Surgical Technologists (AST) views collaborative teamwork as an essential part of the surgical environment and views communication skills as necessary to achieving exceptional team and patient outcomes.[18] This view is supported by an OR study (including STs) by Lin et al., which identified communication and team dynamics as two of six top factors influencing psychological safety in the OR.[19] Impaired psychological safety can stunt one's ability to speak and act quickly and confidently, attributes essential to safe patient care in a fast-paced, high-demand OR.[20]

Lin et al's study reveals insights and constructive solutions valuable to any OR team, including those dealing with new or changing team members. Shared are key findings, and it is recommended to read the full article for additional helpful learnings.[19] The study identified team familiarity as a contributor to psychological safety; consistent teams were found to facilitate trust, camaraderie and openness,[19,21] whereas new or rotating staff can inadvertently add complexity simply because their clinical expertise, personality and communication style is unknown or less known. For example, psychological safety was affected by level of trust in team members' expertise, which can cause an inability to focus completely on responsibilities if they felt unsure of a team member's abilities.

Lin et al also found the ability to recognize different communication styles, including the ability to interpret nonverbal cues, affected psychological safety. This was deemed particularly important in OR scenarios with persons working irregular shifts with an unfamiliar team. Rotating staff and ad hoc teams reported lower psychological safety in part from communication problems, which can be exacerbated by lack of team identity, familiarity and trust.[19,22]

To facilitate integration of new or changing staff and to build strong OR teams, the Lin study and AST offer a number of helpful tactics (Table 5),[18,19] as did a survey of OR managers and directors (Figure 7).[23]

TABLE 5: SOLUTIONS TO ASSIMILATE OR STAFF AND BUILD STRONG TEAMS

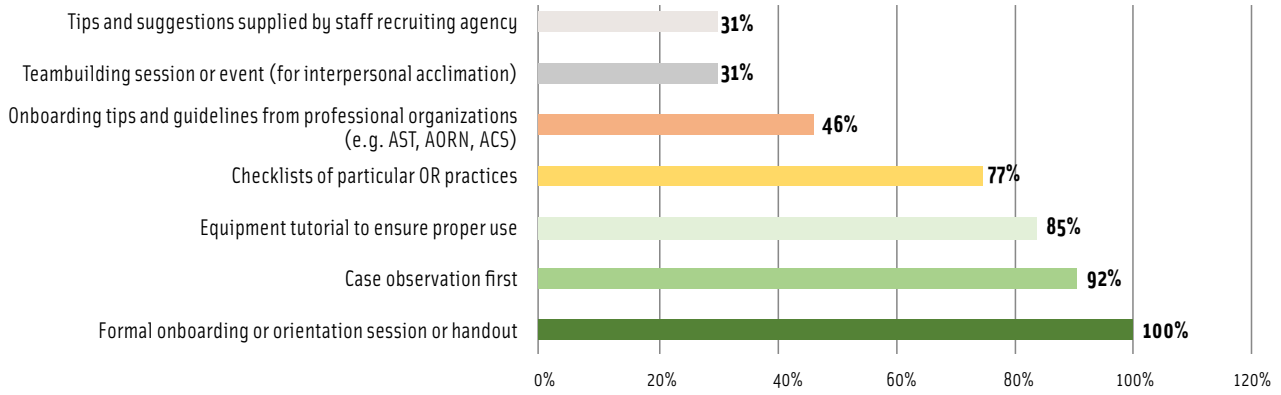
In-services on the following: • **Civil communication style; giving and receiving constructive feedback** • **Conflict negotiation/resolution and consensual decision-making** • **Understanding role perspectives, aligning on team goals and sharing responsibility for outcomes**
Rapport and teambuilding exercises or events
SBAR technique and training; a standardized process for efficiently and predictably sharing information (situation–background–assessment–recommendation
Facility policies; review and develop policies that empower and protect team members who suggest quality improvements; make policies, including incident reporting, easy to find and use
Leader training (e.g., surgeon, anesthesiologist): exercising authority without reliance on power or hierarchy; normalizing team discussion about failures, error-reducing strategies, and converting human fallibility into a positive change agent

Table 5. Equal to communication and teambuilding skills are facility policies and OR leadership that align team goals and create a culture of safety for sharing concerns and suggesting improvements.

Figure 7. Top onboarding methods identified by OR manager and directors

- 100% - Formal onboarding or orientation session or handout
- 92% - Case observation first
- 85% - Equipment tutorial to ensure proper use
- 77% - Checklists of particular OR practices
- 46% - Onboarding tips and guidelines from professional organizations (eg, AST, AORN, ACS)
- 31% - Teambuilding session or event (for interpersonal acclimation)
- 31% - Tips and suggestions supplied by staff recruiting agency

Figure 7 **Top Onboarding Methods Identified by OR Manager and Directors**



SECURE A VOICE IN PURCHASING EQUIPMENT IN YOUR BEST INTEREST

As presented, automated equipment is one way to help reduce OR team workload and cognitive load. Surgeons often hold inherent power and influence over the equipment purchased. A survey of STs was conducted to determine what methods have proven successful in giving the ST a voice in the decision- and purchase-making process. Figure 8 shows methods STs have used to secure equipment that was beneficial to their personal well-being and work-related needs.[24]

Figure 8
ST tools to influence equipment purchase

- 73% - Interpersonal dynamics, friendship and trust
- 73% - Bringing convincing data or marketing materials to OR manager
- 55% - Bringing convincing data or peer review articles to surgeon
- 27% - Participating on hospital value analysis committee

Figure 8. Results show that STs leveraged interpersonal dynamics as much, or more than, clinical data to help secure desired equipment.

KEY TAKEAWAYS

In a landscape of ongoing staff shortages, increasing role demands and job burnout, examining approaches to simplify workflow while decreasing work and cognitive load are warranted.

Automated devices have been shown to simplify processes, enhance personal safety, reduce time and – importantly during today's changing staff – help equalize performance across users. The predictable quality and time to readiness resulting from such devices can add a new layer of security and confidence to the OR team.

Effective integration of new or revolving staff can help reap the benefits of their contributions while mitigating inadvertent disruption that can come with new team members. Thorough onboarding – including goal alignment, communication, team building and supportive leadership/policies – can help achieve strong, cohesive teams.

Collectively, these approaches can help minimize workflow challenges and cognitive load during staff shortages. This, in turn, can help foster well-being and job satisfaction to help turn the tide against further burnout and turnover.

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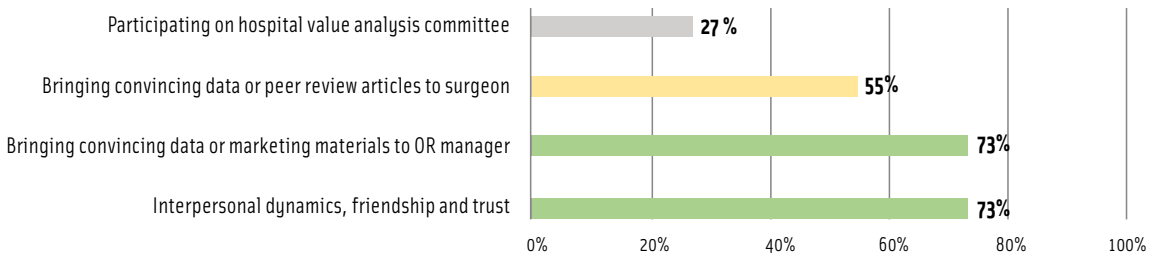
FIGURE 8 **ST Tools to Influence Equipment Purchase**



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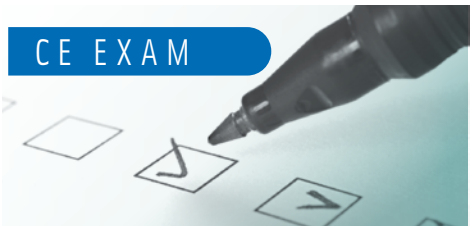

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Minimizing workflow challenges and cognitive load during staff shortages

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1. **Staffers from external/alternative sources may bring:**
a. A versatile skill set
b. Knowledge across patient populations
c. Proficiency on a range of equipment
d. All of the above

2. **Automated devices for autologous bone processing can:**
a. Mitigate human performance variances
b. Improve quality of bone cleanliness
c. Reduce sharps injuries and simplify workflow
d. All of the above

3. **Surgical techs underestimated their manual bone cleaning time by:**
a. Nearly 5 minutes
b. Nearly 10minutes
c. Nearly 15 minutes
d. Nearly 20 minutes

4. **Automated bone processing versus manual resulted in a significant reduction in:**
a. Bone cleaning time
b. Bone milling time
c. Total bone processing time
d. All of the above

5. **In 10 minutes, automated bone cleaning generated __% greater bone yield than manual:**
a. 23%
b. 37%
c. 52%
d. 64%

6. **The bone dust collection device in this article:**
a. Connects to existing drill and standard surgical suction
b. Has a collection filter that's reusable during case
c. Operates independent of device orientation
d. All of the above

7. **In response to bone dust, human osteoblast proliferation increased by:**
a. 3 times
b. 5 times
c. 7 times
d. 9 times

8. **Studies here found which of these to be vital to team function?**
a. Team dynamics
b. Humor
c. Communication
d. Shared interests outside work

9. **Unfamiliar staff can inadvertently cause complexity until understanding each other's:**
a. Clinical experience level
b. Communication style
c. Personality
d. All of the above

10. **In-services or attention to the following can foster teamwork and trust:**
a. Facility policies and leader support
b. Aligned goals
c. Communication skills building
d. All of the above

MINIMIZING WORKFLOW CHALLENGES AND COGNITIVE LOAD DURING STAFF SHORTAGES #485 MARCH 2024 1.5 CE CREDITS $9

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