PRACTICE BRIEF
Accommodating Deaf and Hard of Hearing Students in Operating Room Environments: A Case Study

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Abstract

Increasing numbers of deaf students in the health professions require accommodations in the clinical setting to ensure effective learning and accurate communication. Although classroom learning barriers have long been identified and addressed, barriers to clinical education have been far less analyzed. Operating room clerkships, which include many competing auditory and visual stimuli, pose unique obstacles to deaf students. Disability Services worked collaboratively with other campus offices to accommodate a fourth-year medical student with almost complete hearing loss in an anesthesia clerkship who had limited knowledge of any manual language such as ASL. Accommodations implemented for the student are reviewed within the context of their successes and challenges, with the goal of providing a roadmap for future deaf graduate health sciences students in the operating room environment.

Keywords: Operating Room, accommodations, ADA, anesthesia, medical students

Hearing loss affects over 1.2 million individuals between the ages of 20-29 years in the United States (Lin, Niparko, & Ferrucci, 2011). Yet only 5.8% of all deaf[1] individuals are employed in health care occupations, compared to 9.7% of all hearing individuals (McKee, Smith, Barnett, & Pearson, 2013). This underrepresentation is a problem not only for deaf individuals who wish to enter the health professions, but also for deaf patients. Ineffective communication is a contributing obstacle to deaf patients receiving preventive care (McKee, Barnett, Block, & Pearson, 2011), which likely contributes to an already significant health disparity between people with and without disabilities (Centers for Disease Control and Prevention, 2006; Drainoni et al., 2006). Research also suggests that deaf physicians are more likely to serve the deaf population and enter the primary care field, increasing access to appropriate health care for deaf individuals (McKee et al., 2011). Training deaf students to become doctors is therefore essential, but such training requires the implementation of effective accommodations, which can be complex, particularly in clinical settings. This article describes how disability accommodations for a deaf medical student in a clinical setting were created and implemented, and suggests that these accommodations have benefits far outside the deaf student's immediate communication needs.

1 For purposes of this article, we are including all degrees of hearing loss and cultural identification when we refer to deaf individuals.

Summary of the Relevant Literature

This article responds to recent calls for the publication of case studies describing how accommodations for medical students with disabilities in health sciences education are determined (Ouellette, 2013) and for further data regarding assistive devices and their use by deaf students in medical education (McKee, et al., 2013). Little data regarding clinical accommodations for deaf students currently exists. Although several articles identify the general need to accommodate medi-

cal students with disabilities (Helms & Helms, 1994; Moore-West & Health, 1982; Sack et al., 2008), none contain practical advice regarding how to design accommodations for individuals with hearing disabilities in the clinical education environment. Those studies that focus on deaf issues often do so in the context of medical school admissions, an important hurdle for deaf students, but this leaves an important gap in our understanding of comprehensive approaches to post-admission accommodation support (DeLisa & Thomas, 2005; Schwartz, 2012; VanMatre, Nampiaparampil, Curry & Kirschner, 2004).

The most relevant study regarding deaf health sciences students reported the results of a recent survey of practicing physicians, residents, and medical students with hearing loss. This article tallied the types of disability accommodations used by deaf physicians in practice and training, resulting in list of standard accommodations used (Moreland, Latimore, Sen, Arato, & Zazove, 2013). However, this survey lacked detailed information regarding how the accommodations were determined or implemented. Furthermore, most physicians surveyed practice in non-surgical specialties, so the accommodations used by these physicians offer limited guidance in operating room environments.

Depiction of the Problem

Medical clerkships with surgical components, both core (e.g., anesthesia, obstetrics/gynecology and surgery) and elective (e.g., critical care, neurosurgery, orthopedics, otolaryngology, urology), pose unique obstacles to the deaf learner. For example, the use of standard masks in the operating room (OR) prevents lip reading. Further, clinicians are expected to receive instruction from clinical supervisors regarding the current plan of action while simultaneously monitoring the patient and checking the relevant monitors; a deaf student must attend to all of this information using only visual channels. Accommodations are needed that allow the deaf clinician to smoothly engage in all aspects of learning while successfully providing competent surgical care to the patient.

Participant Demographics and Institutional Partners/Resources

This case study took place at a public university that offers solely graduate-level education in the medical sciences. The deaf student involved was a fourth-year student, completing a visiting student elective anesthesia clerkship, requiring the student to be a member of a surgical team in an OR. In order to determine the most effective accommodations for the setting, a team consisting of Disability Services (DS), Educational Technology Services (ETS), the Anesthesia Clerkship Director, additional anesthesia clinical faculty and trainees, and the deaf student convened. Guidance was also sought from a sister institution, which had successfully utilized a similar method of accommodation with a deaf medical student several years before.

Description of Practice

To begin determining accommodations for the OR setting, the DS office conducted an intake with the student to determine the level of hearing loss, previous successful accommodations and proficiency with ASL. The student had extensive hearing loss, previously mitigated by the use of bilateral cochlear implants, but had experienced a "soft failure" of the implants two weeks prior to the start of the clerkship, resulting in almost complete hearing loss. The student's normal course of accommodation included the use of an FM system in the classroom and a personal amplification device to increase sound in clinic. The student relied on lipreading to supplement her hearing, a method of communication not available in the OR due to the use of opaque surgical masks. The student had limited experience with sign language interpreters and CART, as the cochlear implants provided considerable assistance with functional hearing.

To assess the disability-related needs, the medical school's Department of Anesthesia, DS, and ETS examined two clinical sites to better understand the space, culture, requirements and nuances of each environment. Together we identified general operating room auditory, physical space, and technology needs through a series of questions (see Table 1).

The general operating room needs included: spoken communication (especially instructions and feedback from supervisors and other team members), auditory signals, and alarms emitted by the equipment that monitors patient stats. The barrier in this case was inability to access auditory-based instruction and feedback.

Next, the team worked to identify all potential accommodations that might provide access to this auditory information. Ideas included use of transparent surgical masks, so that lipreading would be possible for the student; interpreters; use of Computer Assisted Realtime Translation (CART) to allow the student to read the spoken communication in the room; and handwritten notes.

Once all of the options were identified, the team analyzed each accommodation's feasibility. Handwrit-

Table 1

Assessing the Operating Room Environment for Students Who are DHOH

Size of the OR

Is there ample space to house two sign language interpreters in the planned surgical environment?

- If not: consider CART or move to a larger OR.

Essential sounds

Does the student require access to all voices in the room? Or, is the surgeon and anesthesia attending sufficient for direction and feedback?

- If student needs all voices: Consider infrared system with area microphone, which captures all voices but contains transmission to the specific room thus maintaining HIPPA compliance. Such a device may be used to collect the sound to be transmitted via an internet connection to a CART provider.
- If attending and surgeon are sufficient: Consider placing a small lavalier mic on the inside of their masks, connecting them to CART provider or an amplifier for the student's personal use.

What are the essential instruments or monitors that use alarms for alerting care team to a need and monitoring patient vitals?

- Consider: A vibrating alarm attached to a beeper or other small device to alert DHOH students to an alarm.

Viewing captions

What are the potential devices for displaying visual output?

- Consider: Proximity and ease of viewing. Possible solutions: iPad, overhead monitor, large television screen

Previewing key vocabulary and terms

Does student have the ability to review the case one-on-one with a member of the surgical team before going into surgery?

- This process assists students with familiarizing themselves with the procedure, vocabulary, anticipated outcome, potential concerns, and the technique being used.

IT

If using CART, infrared transmitter or other technological device: Is there an IT specialist available to troubleshoot technological issues?

- Can someone be "on-call" during the surgery to ensure a fast response time?
- If using CART: Is the internet connection in the OR strong and consistent?

Culture and Education

Is the culture supportive of having a DHOH student/resident in the OR?

- If not: What education is needed for the surgical team before the student begins the clerkship?
- In all cases: A brief reminder about etiquette and communication tips when working with DHOH individuals should be circulated to the surgical team.

ten notes, though effective in some settings, were not practical in the OR environment where speed can be critical. And although transparent surgical masks could offer a significant benefit to facilitate lipreading, clear surgical masks could not be obtained as they are not yet in production.

The elimination of lipreading due to the use of conventional surgical masks made providing access to the spoken communication in the OR an even greater need. Although the student did not use a signed language, oral interpreters could mouth words to the student that may not have been visible to her when uttered by the speaker and alert the student to auditory signals from OR equipment.

Even in the best of circumstances lipreading can never be completely reliable. Consequently, and despite the decision to include oral interpreters, CART was also determined to be a necessary accommodation for providing accurate access to spoken communication. It was clear, though, that modifications to the traditional CART set-up would be necessary to adapt it to this unique setting. Due to the space limitations, having the CART transcriptionist present in the OR was not practical, so it was determined that the CART provider would be in a remote location receiving an audio feed from the OR via an internet connection. Further, the CART provider would deliver captions to the student via an online host platform, GoToMeeting, a secure forum that meets federal patient privacy regulations. The attending anesthesiologist was fitted with a wireless Revolab lapel microphone, chosen because of the clarity of sound delivered by their products, to transmit sound to the CART provider. Although the team considered the possibility of projecting the captions onto the wall for all present to view, captions were ultimately delivered to the student via an iPad, which provided the flexibility she needed to move around the room while allowing her to easily view the text. The oral interpreters were able to correct and clarify inevitable errors due to the "real time" nature of CART. Because the OR contains multiple parties, an area microphone was tested in an effort to deliver captions from the remainder of the surgical team. This was not successful due to background noise in the environment. In addition, a laminated chart listing the top 20 drugs used in anesthesia was created so that the interpreters could point to it where needed. This was a useful time saving clarification device, as lipreading can confound similar-sounding words.

Once the most appropriate and feasible accommodations were established, all equipment and technology were tested in an empty OR and again during a surgery for a "sound check." Arrangements were made for interpreters to be incorporated into the OR team, which required fingerprinting (per hospital requirements) and an orientation to the OR. Interpreters had to "scrub in" to surgeries, were instructed not to touch anything in the "sterile field" and were given a specific place to stand in the room. The sister institution staff were critical in advising members of the team regarding technique, technical products and the use of CART in an OR setting. ETS provided expertise with identifying appropriate technology and technical platforms, and in setting up and testing equipment.

It was critical to inform the entire OR team in advance about the process, the student's needs, and the assigned accommodations, to prevent surprises in the OR. The clerkship director (i.e., the head faculty member in the clerkship block) contacted the "need to know staff" – the attending surgeon (i.e., the head doctor in the surgery), the clerkship coordinator, and the charge nurse (i.e., the head nurse in the surgery) – by email and phone to advise them that the deaf student would be rotating through the clerkship, explain the communication arrangements that would be in place, and address any concerns that arose. See Table 2 for a list of questions that were used to exchange this information.

Evaluation of Observed Outcomes

The combination of accommodations provided allowed the student to receive the necessary information in real time and respond to communications from clinical supervisors in the surgical environment. The student commended the willingness of faculty to engage in a trial and error process for determining accommodations, which contributed to inclusivity and led to a positive experience for the student. The faculty and staff who participated in creating the accommodations in this clerkship reported that working through the process of identifying appropriate accommodations as part of a consultative and interactive process helped them to learn more about DS and the disability accommodation process. They expressed surprise and satisfaction about what could be achieved with creative accommodation strategies and a collaborative team. Their newly-acquired knowledge about working with and teaching deaf individuals resulted in an increased comfort and better ability to educate future deaf learners. As one surgeon said, "I would never have believed this was possible until I saw it come together."

Table 2

Concerns Expressed About DHOH Students in the OR

1. What happens if the student fails to hear all the instructions?
2. Many anesthesia medications sound alike. How can we be sure the correct medication is understood?
3. The addition of sign language interpreters to the OR increases the risk of infection. Can the interpreters remain outside of the sterile environment and still communicate effectively with the student?
4. Who is responsible for setting up the equipment needed to utilize CART?

Implications and Portability

Although this case study focused on a medical student in the medical school OR environment, similar challenges exist for deaf learners in other health professions and during clinical simulation trainings. This stage of training plays a large role in professional health science education and credentialing. Challenges also exist in the pre- and post-operative environment, as clinicians attempt to conduct patient interviews, deal with patients' family members, and coordinate care with essential team members. The accommodations described here could largely be incorporated into those settings as well, providing access to deaf students before, during, and after the surgical arena. Further research and practice is needed to confirm the most effective accommodations in these environments.

Despite the success with accommodating the student, there were inherent logistical challenges to overcome. First, although the CART provider was remotely based, the use of CART still required the set up and tear down of equipment (e.g., laptop, iPad, receiver for microphone) in the OR for each procedure and during pre-op interviews with patients. This added approximately 10 minutes to each procedure and required the student to transport the devices from OR to OR. Further, while the iPad's size and portability were benefits, finding a secure and stable location within the OR for easy visual reference proved challenging. Additionally, the workspace in the OR for the anesthesiologist – the role the deaf student had during this clerkship – is often small, leaving little to no room for additional devices. One remedy would be to purchase a portable iPad stand with a wheeled base, similar to an IV pole. This would likely be a more effective means of adjusting display height and would allow quicker mobility while using minimal space.

A communication challenge that the accommodations did not fully address relates to teaching clinical skills that require ongoing feedback to the student from clinical faculty. The deaf student's visual attention often needed to focus directly on the surgical field while simultaneously receiving feedback from the attending surgeon via the interpreter or CART. This difficulty with attending to two separate visual fields at once was particularly apparent when dealing with unexpected situations in the OR, where rapid two-way communication was essential. The use of Google Glass is a possible solution that should be explored. Delivery of CART via Google Glass could provide an effective, seamless conduit to allow students to view the transcript through the Google Glass lens while viewing the surgical field, preventing the need to split attention between multiple locations within the OR to read the real-time transcript, as well as eliminate the need for an iPad with its attendant logistical difficulties.

The accommodations created in the OR setting will often benefit not only the deaf student. The use of CART as a matter of standard practice in operating rooms would provide a visual confirmation of spoken information for all OR participants. As our existing pool of physicians ages, CART would provide a visual confirmation of auditory information. The CART transcript can also be saved for later use as a written record that proper procedures were followed, an educational tool for students who have not yet participated in a surgery, or as a record of events that transpired in the OR in the case of a medical error. It is our hope that this article helps to elucidate what is possible in the OR environment and expands on the existing repertoire of effective disability accommodations. Creative accommodations will allow an increasing number of deaf students to succeed in medical school and go on to fill the great need for culturally competent physicians serving the deaf community.

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