Clinical Accommodations and Simulation

10

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This chapter is divided into four distinct sections. Section 1 focuses on determining accommodations, section II on accommodating different types of assessments, section III on accommodations common to various categories of disabilities, and section IV on the use of simulation labs for determining effective accommodations or modifications as well as piloting adaptive and assistive technologies.

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Section I. Determining Accommodations

Determining accommodations in health science programs is a highly nuanced process and requires an advanced understanding of health professions education, assistive technology, knowledge of safely modified procedural approaches, and a solid knowledge of the legal requirements for accommodation under the Americans with Disabilities Act. In Chap. 4, a full review of the qualifications for a disability resource professional (DRP) are outlined. This chapter will focus on [1] the process that is required under the law and how to ensure a good faith effort that is taken to investigate potential clinical accommodations, and [2] reasonable accommodations that have been vetted by health science faculty, trainees, and students and that are safely in practice nationwide. The aim of this chapter is to provide the reader with a holistic understanding of the process for determining equal access to the curriculum and the reasonable adjustments that mitigate barriers to learning, assessment, and clinical practice.

Section 504 of the Rehabilitation Act of 1973 [1] requires institutions who receive federal funds to provide reasonable accommodations to students that have disabilities. While reasonable is not outwardly defined, it is generally considered anything that is possible, within reason, that does not constitute a financial hardship for the institution nor fundamentally alter the nature of a program. To determine whether a request is reasonable, institutions appoint a representative to serve as a facilitator of the interactive process. This role is often titled the disability resource professional (DRP). This responsibility may also be relegated to a student affairs officer, many times a Dean of Students or a similar role in education oversight.

The *interactive process* is a term used to describe the interactions that occur when a student discloses a disability and either requests accommodation or expresses their need for an accommodation to mitigate a specific barrier in the environment as outlined in the Association of American Medical Colleges report on Disability (see Fig. 10.1) [2]. The institution or program reviews the student's *functional limitations* (restrictions that prevent one from fully performing an activity) and the activity that is serving as a barrier and the core competencies of the program or a specific course to identify any barriers to the curriculum or clinical experience. *Barriers* may be educational, physical, or attitudinal in nature. Finally, the program, in partnership with the student and faculty/administrators, determines *reasonable accommodations,* modifications, or adjustments that serve as mechanisms for removing or reducing the barrier.

One of the most common examples would be a student with a functional limitation of processing or reading fluency. In this case, items that have a component of time would serve as barriers to the student. In many cases, students would be afforded a percentage of additional time (as an accommodation) to mitigate the barrier caused by the functional limitation. For a person who is a wheelchair user, the functional limitation may be the inability to stand independently. This would cause a barrier in a clinical rotation that was surgical in nature and required the learner to be at standing height to observe a surgical procedure. A standing or hydraulic wheelchair, remote visual access to the operation via a monitor (for students who do

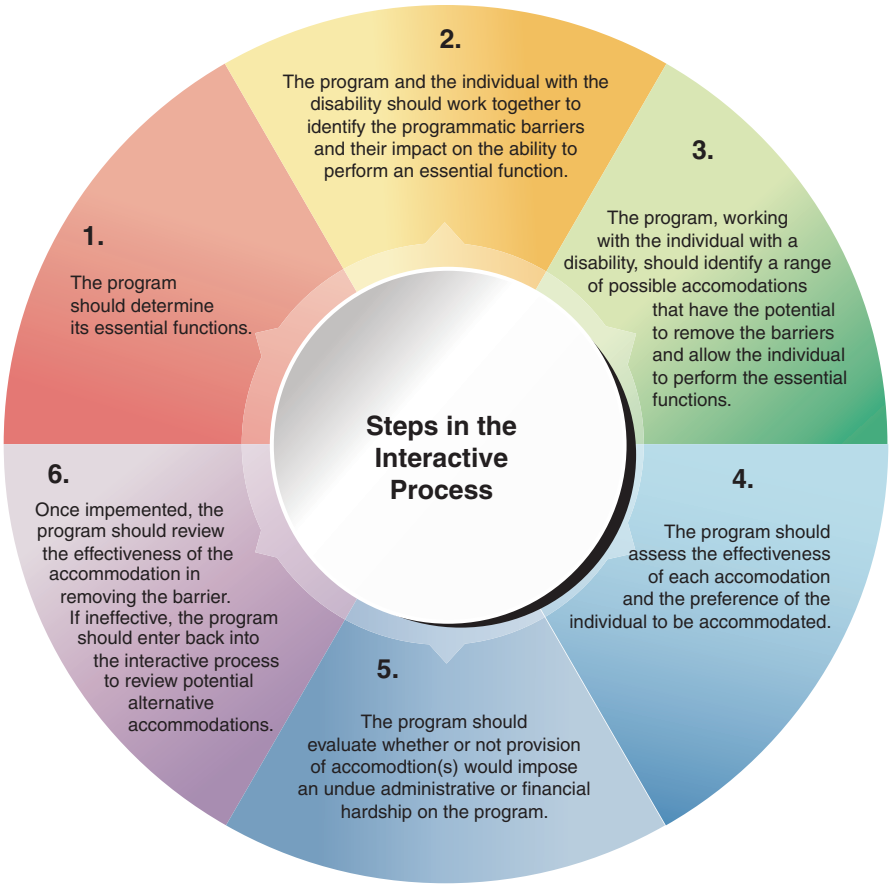


Fig. 10.1 Interactive process adapted from AAMC Report

not need to be intimately involved in the surgery), or the modification of having all parties sit during surgery (something that actually occurs in practice) [3] are all mechanisms of mitigating the barrier to the surgical learning environment. These are modifications of the original approach to the surgical experience and would be formalized through an interactive process that deems these accommodations reasonable.

In order to engage in an informed interactive process, disability resource professionals (DRPs), program administrators, and faculty must have a clear understanding of program requirements including the technical standards and clinical competencies. This requires a well-informed understanding of: the program's structure; the individual student's functional limitations as they occur in learning, clinical, and assessment settings; and current best practices regarding reasonable clinical accommodations, including an understanding of assistive and adaptive technologies [4].

Program Structure

The first step for determining accommodations in a clinical setting is to understand the program structure and requirements. Disability resource professionals (DRPs) or the appointee for disability access must have a clear understanding of the program and the clinical placement sites. DRPs can utilize the questions outlined in the clinical accommodation programmatic query (see Table 10.1) to build their programmatic knowledge.

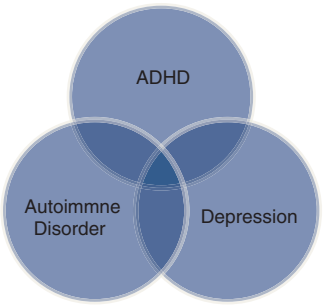
A seasoned DRP will have a good command of the program's technical standards (see Chap. 9); maintain partnerships with program directors, clinical rotation directors, and clinical coordinators; and will have visited clinical sites for firsthand knowledge of potential barriers that exist for students with each category of disability.

Students' Functional Limitations

Accommodation decisions are not made based on diagnosis, per se. Indeed, within a specific diagnosis, there are a myriad of *functional limitations* that may occur (see Fig. 10.2). That is why the second step for determining reasonable accommodations

Table 10.1 Clinical accommodations programmatic query

Program of study: _____ (i.e., medicine, dentistry, nursing)
Are there a minimum number of clinical hours required to complete the program? Of these, how many can be met using simulation?
Where are the clinical sites for each clerkship/rotation? (we recommend making a chart that depicts the availability of each clerkship for various blocks or rotations.) Is each clerkship/rotation available at each site? Are there physical barriers at specific sites? Are the clinical sites at a major medical center or community-based hospital? 1. Understand the hours of operation for each site. (critical for students requiring additional time post clinic or shift to complete notes.) 2. What electronic health record (EHR) is used at each site? (important for accessibility to the EHR and compatibility with assistive technology.) 3. What are the distances for each site, and is there a public transportation option available? (important for those who have weekly primary care close to the main school location or who have limitations on driving.)
Have students with disabilities rotated through these sites? Have there been any positive or negative experiences with students with disabilities?
Are the satellite sites part of the same hospital/educational system, or are they independently operated? Do your affiliate agreements include a statement about ensuring full access to students with disabilities? Does the program maintain a liaison at the clinical site who can facilitate or implement approved accommodations?
Do you have a copy of the technical standards (TS) for the program? (see Chap. 9 on TS for a full review of best practices.) Do the TS contain any outdated or discriminatory language? Do the TS direct students to the process for disclosing a disability and requesting reasonable accommodations? DRPs should be aware of the technical standards for all program and any changes needed.



ADHD	Autoimmune Disorder	Depression	Potential Accommodation
Difficulty with focusing	Difficulty with focusing	Difficulty with focusing	Structured setting; checklists for procedures; noise-cancelling headphones while charting
Slowed processing	Slowed Processing	Slowed processing	Additional time to chart; pre-assignment of patients for early preparation; additional time on written examinations
Need to reread material		Need to reread material	Extra time on written assessments; use of text to speech technology for easier processing
	Lethargy	Lethargy	Limited time days (8-10 hours); no overnight call or night float (day time/weekend call instead); use of mobility device for wards
	Need for weekly appointments	Need for weekly appointments	Release from clinicals for weekly appointments
Forgetfulness	Forgetfulness		Checklists

Fig. 10.2 Mapping functional limitations to reasonable accommodations

is to identify the student's functional limitations and any barriers to program access that result from these limitations.

As you can see, many diagnoses share symptoms that lead to similar functional limitations and accommodations; however, barriers, and the accompanying accommodations, are often dependent on the distinct portion of the curriculum (e.g., didactic, clinical, simulation). For example, a student with ADHD whose symptoms result in the functional limitations of slowed processing and inattention may experience several barriers on timed exams in the didactic setting. While this is easily mitigated with extended time on examinations and a reduced distraction location, those same limitations in a clinical setting or simulation lab will not be mitigated

through the same accommodations. That is not to say that extra time is always inappropriate in a clinical setting – it is not – but rather, it is less likely that extra time will be the primary accommodation in such cases. In a clinical setting, where a student is responsible for patient care, it is more likely that assistive technology and structural accommodations will be most effective and safe.

Determining Accommodations

After the DRP or appointee understands the program and identifies the functional limitations, it is time to determine reasonable accommodations. This section will review the process (see Fig. 10.3 flow chart), review widely utilized accommodations for specific functional limitations, offer options for assistive technology, and offer resources for gathering additional information.

As outlined by Laird-Metke and colleagues, the process for determining nonstandard reasonable accommodations in a clinical setting involves asking four questions (see Box 10.1) [5].

If the request for a specific accommodation does not challenge any of the questions, then it is likely a reasonable request. Some accommodations have been in use at the educational level for over a decade, for example, daytime-weekend call in lieu of overnight call or night float. As well, release from clinic once weekly (for medically necessary care) is a vetted accommodation at many health science campuses; some even proactively set up a system whereby any student can seek care weekly without the need to register their disability with an office [6]. Importantly, accrediting bodies like the Liaison Committee for Medical Education require programs to adhere to a set of elements relevant to these issues. For example, element 12.4 (Student Access to Health Care Services) mandates that "a medical school provides its students with timely access to needed diagnostic, preventive, and therapeutic health services at sites in reasonable proximity to the locations of their required educational experiences and has policies and procedures in place that *permit students to be excused from these experiences to seek needed care*" [7] (emphasis ours; see Chap. 5 for detailed information on psychological disabilities). For a full review of the determination process, we recommend reading Laird-Metke and colleagues' full chapter on the topic [5].

Box 10.1 Four Questions as Proposed by Laird-Metke and Colleagues

- Would the proposed accommodation result in a failure to meet the program's technical standards?
- Would the accommodation legitimately jeopardize patient safety?
- Would the proposed accommodation fundamentally alter the program?
- Would the proposed accommodation pose an undue hardship on the institution? (using institutional vs. programmatic budgets).

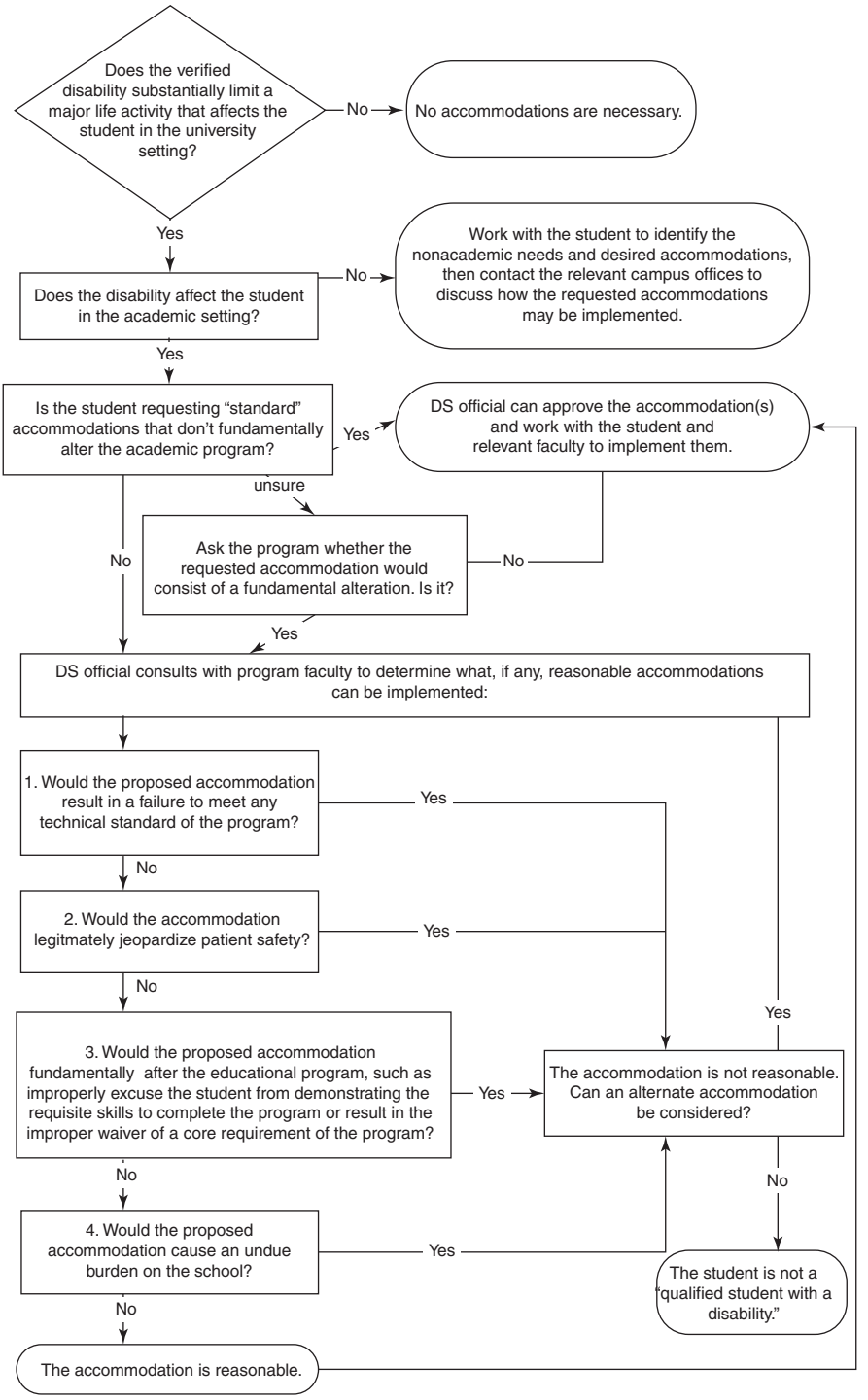


Fig. 10.3 Clinical accommodations flow chart with permission from Meeks/Jain

Table 10.2 Ten initial questions for guiding the student intake

1. How does your disability impact you in daily life (e.g., socially, academically, with work, and with self-care)?
2. How do you mitigate the impact independently and how have you mitigated this impact in an educational setting?
3. What, if anything, exacerbates or worsens your disability?
4. Do you have a history of needing to receive treatment, or do you anticipate needing to receive treatment such that you may need to "step out" of the curriculum at some point to attend to disability-related needs?
5. Have you ever worked in a clinical setting, or do you anticipate additional barriers during the clinical portion of your education? (may need to prompt with example competencies)
6. Have you reviewed the technical standards of the program and the competencies for each rotation? If not, we can do this together to identify any potential barriers.
7. Have you ever used assistive technology to mitigate the impact of your disability on a task (e.g., writing, reading)?
8. Have you ever used adaptive equipment? If the student has never been in a clinical setting it may be helpful to ask how they interact with everyday items (depending on the disability), like listening to music, using the phone, or cooking. This can prompt a discussion about how one might navigate the clinic, for example, a deaf or hard of hearing student using a pager system or a student with mobility disabilities navigating clinical spaces with multiple medical tools or devices
9. Do you take any medication that impacts (positively or negatively) your ability to function (e.g., medication that causes drowsiness or that allows a student to focus for a sustained about of time)?
10. What are your biggest concerns about entering this program?

While the questions in Table 10.2 will not address every need or inquiry regarding a student's disability-related needs, it provides the DRP with a starting point. Remember, most students will lack considerable experience in the clinical setting and will not truly understand all of the potential barriers of this environment. It is incumbent upon the DRP to have an appreciable knowledge of the program, the clinical rotations, and all skills and competencies required for graduation, including any high-stakes examinations.

Section II. Accommodating Assessments

Accommodations are designed to ensure accessibility of the curriculum, including assessments. Health science programs utilize several forms of assessments and all must be considered for accommodation. In most cases, using the flow chart for determining reasonable accommodations (see Fig. 10.2) will result in a well-informed decision about when to accommodate assessments.

Formative and Summative Assessments

Formative assessments are often thought of as having little impact on a student's overall performance and as such may be overlooked in the accommodation process.

On the contrary, formative assessments must be accessible to students and must be appropriately accommodated.

Formative assessments measure clinical skills and knowledge and provide important feedback for students, giving them critical data about their performance and deficits in knowledge or skill. When these assessments are inaccessible, students may not be able to accurately assess their level of competency and will be ill-equipped to refine their skills [8].

Practical Exams (Anatomy Labs)

Health science educators may falsely believe that accommodations are not possible in practical labs. In cases where a student requires extra time, a faculty member may raise concern about scheduling and modified approaches to a practical exam or simulation and/or may raise questions about a fundamental alteration.

Lab practical exams are often administered in groups, whereby the group size is equal to the number of stations. Each student stands at a station and rotates to a new station in a prescribed amount of time, making the addition of extra time complex. Meeks and Jain (2017) noted two distinct approaches to accommodating students in practical exams where extra time was the approved accommodation (see Box 10.2) [9].

Standardized Patient Exams

Objective Structured Clinical Exams (OSCEs) are clinical encounters utilizing standardized patients (trained actors) to measure a student's clinical and communication skills (e.g., taking a history and physical, developing a differential diagnosis) as

Box 10.2 Approaches to Accommodating Lab Examinations [9]

Example: A student who receives time and one half with lab stations that allow 5 minutes per station.

Option 1. Students with disabilities requiring extended time rotate through the final testing group of the day with classmates who do not require extended time. At the end of the standard time, all students are dismissed and students requiring extended time receive a 5-minute bathroom break. This break allows all students to exit the lab together, reducing the possible identification of students receiving accommodations. Students with extended time return to the lab after the break and rotate through all stations again to receive their allotted extended time (e.g., 2.5 additional minutes per station).

Option 2. Students with disabilities requiring extended time rotate through the exam as the final group of the day, with all stations timed on the 1.5x schedule (e.g., 7.5 min/station). For students receiving additional extended time (e.g., double time), the procedures in option 1 can be followed to allow the additional 2.5 minutes.

they progress in the program. Programs assert that, because this exercise is meant to mimic a clinical encounter, no accommodations can be provided. Some have even stated, in policy, that students are not accommodated on OSCE exams or in clinical environments. This statement is not in keeping with legal requirements. Programs must engage in an interactive process to determine the reasonable nature of an accommodation. Despite a program's or individual's belief about the reasonableness of an accommodation in any portion of the curriculum, there must be a robust discussion on the matter. As for OSCEs, programs around the country have determined, after careful consideration, that OSCEs should be accommodated when appropriate [10].

For any assessment, the DRP must understand what is being measured in order to determine if an accommodation fundamentally alters the program. In the case of OSCEs, which are timed, a program must determine whether or not time is a variable being assessed. In their article on the topic, Meeks and Jain outline the items a DRP must understand in order to determine reasonable accommodations in a clinical setting (see Box 10.3).

Most OSCEs are broken down into discrete parts, all measuring different aspects of a clinical encounter. For example, most students, regardless of program, begin by reading some general information about the standardized patient before entering the room. These might be referred to as door notes, as they were historically the notes in the patient's file that was placed in the door, ready for the provider to enter the room. This task requires reading and processing. What is being measured, if anything, is the ability to take the chief complaint of the patient and any test results and use this information to aid in developing a differential diagnosis. For a student with a disability, the act of reading and processing the information may require accommodation to fully access the materials. In an outpatient clinic setting, this activity may take a provider 2 minutes, or up to 5 minutes, depending on the complexity of the case. This portion of an OSCE is almost always amenable to reasonable accommodation.

The second part of any OSCE is the patient encounter. In this section, the student performs a history and physical on the patient, develops a differential

Box 10.3 Considerations to Determine Appropriate Nature of Accommodations

1. *What will the student be required to do?*
2. *Does it consist of several discrete tasks?*
3. *Is the exam timed, and if so, how much time is given for each part of the exam?*
4. *What is the exam designed to assess, and how is performance measured?*
5. *How important is timing to the purpose of the assessment? Is the goal to assess a student's performance in assessing the patient or the quality of her clinical skills within a specific time?*

diagnosis and treatment or follow-up plan, and communicates this to the patient. Technical skills, patient interviewing technique, and communication are being assessed during this portion of the OSCE. Accommodations on this section might be reasonable and necessary for students with specific disabilities including (but not limited to) physical disabilities and chronic health disabilities and the need for specialized equipment; sensory disabilities and the need for an interpreter; a communication disability (e.g., stuttering, expressive language disorder) and the need for additional time or a checklist of the steps for patient interaction as a prompt; and a student with a visual disability who utilizes assistive technology or a scribe.

The final portion of an OSCE usually involves a written assessment of the interaction, called SOAP (Subjective Objective Assessment Plan) notes. This section may also have an oral presentation of the patient. This portion does not have a patient interaction and instead draws on the student's ability to crystallize and organize their thoughts in writing or orally. For a student with a disability that causes functional limitations in the ability to write (or type) or to communicate using spoken language, this section may require accommodation.

Each portion of the OSCE should be evaluated independently for accommodation. Not all disability types will require accommodation on all portions of the exam. Take for example, a student with dyslexia, whose functional limitation includes slowed reading speed and comprehension (see Example 10.1).

In this scenario we might gather that Chris has more flexibility with time on the wards and in outpatient clinics. This 2–3 minute of additional time allow Chris to fully comprehend the patient's history and presenting issues. In a time-restricted setting, Chris is missing critical portions of the patient information. Let's do an analysis of Chris's disability, the functional limitations, the barrier to the OSCE, and what is being measured in that portion of the OSCE (see Box 10.4).

Now let's take a step back. Does Chris's disability and the associated functional limitations lead to any additional barriers for the two remaining portions of the OSCE, the patient interaction and the reporting out of the patient, orally or in SOAP

Example 10.1 Student with Dyslexia and OSCE Accommodations
Chris is a student with dyslexia. His clinical skills are outstanding and his patients really enjoy working with him. His "bedside manner" has been highly scored on educators' evaluations. Chris consistently performs well in the clinic and on the wards; however, when taking a high-stakes OSCE, Chris gets anxious as he knows there is limited time to read the door notes. Rushing to read the door notes keeps Chris from truly absorbing the patient history, which has cost valuable points in his OSCE assessments. The faculty cannot figure out why Chris performs so well in the clinical setting, while underperforming on the OSCEs.

Box 10.4 Analysis of Disability, Limitation, and Barrier to OSCE
Disability: Dyslexia.

Functional limitation: Reduced reading fluency and difficulty with comprehension (the need to reread material for comprehension).

Barrier: Time to read and process the door notes.

What is being measured: Ability to synthesize material and begin formulating a differential diagnosis.

Appropriate and reasonable accommodation: Extra time on door notes portion of exam.

notes? It is likely that Chris does not experience barriers in the remaining two portions of the OSCE. If additional time is a vetted accommodation for door notes, when appropriate and necessary for full access, then Chris would receive some measure of extended time on this portion only. The time extended is usually a function of the degree of impairment. Let's say Chris's reading fluency is in the 5th percentile when compared to his peers. That level of impairment is quite significant and would likely warrant double time on this portion of the OSCE. In real numbers, the door notes portion of an OSCE runs between 2 and 5 minutes. Therefore, Chris would be provided between 4 and 10 minutes for the door notes. As you can see in this example, Chris is receiving accommodations on the OSCE but only for one distinct portion as this is only a portion that is a barrier to him.

Planning for the OSCEs

When communicating approved accommodations, DRPs should communicate each portion of the exam and the accommodations within that discrete portion (see Example 10.2).

For the OSCEs, the DRP should meet with the faculty lead for these activities, along with important stakeholders, including the dean of assessment and the director of simulation. Once they have answered the questions in Box 10.3, the group, in consultation with the DRP, can determine if there are accommodations that are worthy of vetting for all future use. The OSCEs are often scheduled a year in advance. As part of the required preplanning, programs should assume students with disabilities will be in their courses and that at least one student will require accommodation on the OSCE exam. Costs associated with alternative OSCE administration, additional standardized patient (SP) costs, and time for faculty/staff are considered costs associated with accommodation and should therefore be covered by the disability office or centralized funding structure (see Chap. 4 for a full discussion of funding structure).

Example 10.2 OSCE Letter of Accommodation

Dear [insert faculty member name].

I am writing with regard to [insert student name] who is a student in the School of Medicine and is registered with [insert office name]. Based on a thorough review of this student's disability needs and supporting documentation, [name of office] recommends the following reasonable accommodations for the OSCE EXAMS:

- During the Patient Encounter: [insert approved accommodation] on the student/patient encounter inside the clinical examination room with the patient.
- After the Patient Encounter: [insert approved accommodation] on the written clinical reasoning exercises or written clinical note-writing exercises outside of the clinical examination room.
- After the Patient Encounter: [insert approved accommodation] on the oral case presentations to faculty or peers inside or outside of the clinical examination room.

These accommodations are recommended after thoughtful analysis of the student's disability-related needs, the University's programs and curricula, and the University's legal obligations under the Americans with Disabilities Act, as amended (ADA AA), and Section 504 of the Rehabilitation Act.

The intent of all reasonable accommodations is to provide students with disabilities equal opportunity, not to lessen or undermine academic standards or course requirements.

It is the responsibility of the student to request academic accommodations as needed in a reasonable and timely manner. The coordination of in-class accommodations is a shared responsibility between the instructor and the student. [Name of office] suggests that all details (e.g., exam length, start times, format changes, locations) be decided on as early as possible and recorded in writing.

After discussing with the student, please do not hesitate to contact me at [insert contact information] for further questions. I look forward to collaborating with you to ensure at students with disabilities have equal access to our program.

Section III. Standard Reasonable Accommodations for Health Science Programs

While the following section offers accommodations by disability type, this is for the ease of the reader. As mentioned previously, diagnosis alone does not fully dictate the range of accommodations that might be appropriate for a student. Additionally,

students' needs should be individually evaluated to determine reasonable, appropriate, and effective accommodations within the context of the specific program. The following are offered as some examples of accommodations put into place in clinical settings. This is *not an exhaustive list,* and the absence of an accommodation in this section does not suggest that it is unreasonable or unsafe.

Attention Deficit Hyperactivity Disorder (ADHD)

Students with ADHD may find it difficult to compensate for the large volume of information that must be reviewed and retained in health science programs. Those with a hyperactive clinical feature may, unintentionally, struggle with professionalism expectations in these new, high-stakes settings. For these students, accommodations offer a removal of barriers in the clinical settings. In addition to accommodations, students can employ strategies that mitigate the impact of their ADHD on functioning in a clinical setting.

Accommodations for ADHD include written, specific objectives, or clinical expectations for a rotation, broken down by the week, with weekly feedback on progress. Feedback is best when it is delivered orally and in writing and presented as objectives met and objectives unmet with specific instruction on the steps needed in order to meet a learning objective or clinical competency [11]. Depending on the level of the student, checklists may be appropriate as a means of developmental scaffolding, while the student learns a new skill or process. Developing relationships with new teams and learning new systems or expectations, especially if these are only implied, are difficult for students with ADHD. Therefore, minimizing change, when possible and appropriate, can help the student develop structure and allow time for the development of relationships and adjustment to both written and unwritten curriculum. For example, a student may, as an accommodation, be placed at the same hospital for multiple clerkships or rotations to avoid the added cognitive work of learning a new system (e.g., electronic medical system, protocol for students, culture). In one successful case of a resident physician with ADHD, the team utilized many of the aforementioned accommodations and added a written task list to be generated by the resident in the operating room, a checklist for managing logistics of the daily case load, typed preoperative evaluations to assist with presentation of patient, and time allowance by faculty for the resident's personal healthcare appointments [12].

Autism Spectrum Disorder

Students with autism spectrum disorder (ASD) generally find the didactic portion of a clinical program unchallenging. The high intelligence, acumen for memorization, and, for many, the interest in science synergize toward high academic achievement in this domain. However, the social deficits inherent in ASD can make it challenging on the wards, when working with teams, and providing patient care. The need for

professional and clear communication is heightened in a clinical setting and is a measured competency of the curriculum, making communication a high-stakes skill. In addition to the social skills needed on the wards, the wards also present challenges for overstimulation. Bright lights, alarms, multiple people talking, and the general bustle of a hospital ward can prove detrimental to the sensory system of a student with ASD. Even the most general, yet unwritten, task like determining how to take a bathroom break (e.g., How do I communicate this need explicitly to the team?) or how to address a senior on the wards when different teams have different expectations and levels of formality (e.g., Is it ok to address them by their first name, or do I use titles?) can seem monumental for someone with ASD trying to navigate this new environment. A misstep or two in communication may damage relationships with team members or lead to a student developing a poor reputation with the team. Finally, the many changes of environments, teams, protocols, and electronic health records (EHRs) between rotations can drain an already taxed executive functioning system. Given the probable landmines of the clinical setting for students with ASD, DRPs should work proactively to remove barriers and provide adequate structure that assist in removing barriers for the student [13]. These may include, where appropriate, rotating the student through the same health system, or even the same hospital, to minimize multiple transitions; pre-rotating through each ward, with time allotted to discuss the expectations of the rotation, how a student will be evaluated, to orient the student to the EHR and to clearly spell out some of the items of the unwritten curriculum; or allowing the student to use noise-cancelling headphones during non-patient contact events like charting or reading to reduce overall stimulation. Rotating a student through a less intense environment is always a reasonable accommodation, if the student agrees and when an alternative is available. For example, if an emergency department rotation can occur at a Level 1 trauma hospital or a rural community hospital, it is likely less chaotic and overstimulating to rotate at the community hospital. Decompressing clinical rotations, in the beginning of the clinical year, may also help the student acclimate to the clinical environment in a slower, more systematic manner, similar to systematic desensitization.

Assigning a mentor, especially at the beginning of the clinical year, may improve the transition for students with ASD. A mentor can provide in vivo feedback to the student helping the student learn to self-correct, and breaking down social exchanges or protocol to help the student understand interactions in the clinical setting [14].

Chronic Health Disabilities

Many students come to health science education due to their own personal experiences with health concerns. Their experiences inform the work and add to their understanding of what it means to be a patient. For these students, the barriers encountered are often related to physical functional limitations, joint and/or chronic pain, fatigue, or gastrointestinal disruption [15]. For many students with chronic health disabilities, the intermittent and uncertain expression of the symptoms makes

accommodation difficult. Therefore, the most effective means of accommodation are often proactive accommodations (e.g., standardized schedule, avoidance of triggering activities or events, decompression of clinical rotations) that are designed to avoid a flare of symptoms (i.e., an abrupt occurrence) coupled with planned options for reactive accommodations (e.g., leave of absence, makeup exam, additional absences) should a flare of symptoms occur. Additionally, providing ample time for medical appointments and appropriate self-care is an additional necessity for those who have chronic conditions. At times, a student may need to attend physical, occupational, or other therapy weekly; this should be discussed in advance with the DRP and the program administration to find a reasonable adjustment that balances the student's need to attend to their personal health needs with the least amount of disruption to the learning environment. Meeks and Jain (2018) recommend the following considerations for working with students with chronic health disabilities [2]. When appropriate, build in a hard stop time for clinical rotations and maintain a consistent schedule (e.g., no night float or 24-hour call). In some cases, students will need to work weekends to ensure clinical hour requirements are met. This is fine as long as the schedule is consistent, allowing the student to arrange and maintain adequate sleep and other medical needs. Minimize commute time. For students with chronic health issues, long commutes can place additional wear and tear on systems and for those commuting by public transportation, weakened immune systems can be further exposed to the elements and infectious sources. Placements should also be close to any treatment site or healthcare provider. Being sensitive to the rotation schedule serves as a proactive deterrent to flares. When possible, arrange the rotation schedule such that highly physical and demanding rotations are spaced out. If this is not possible, decompressing the curriculum (in programs that are not lockstep) is very helpful and allows the student to complete a year of clinical work over 18–24 months. Students should take time to adjust their own schedules outside of any accommodation by avoiding flares in their off time and, when in a flare, adjusting their schedule to allow for an on-time arrival in the clinic. For some, this will require an hour or more at home for self-care in the morning, necessitating an earlier wake up time [15].

Proactive measures are very helpful in minimizing flares and avoiding a compounding of symptoms or impact on overall health; however, they will not address all the barriers. As noted above, some accommodations are reactive, meaning they occur in the event of a flare. This might include an alternative assessment in the simulation lab, if the original assessment occurred during a flare and a student was unable to perform the competency at that time. When a student is experiencing pain or an exacerbation of symptoms that reduce mobility and dexterity, DRPs can work with programs to utilize the simulation lab and adaptive equipment. Retail outlets like Amazon offer multiple options to fit the exact needs of the student and program. Compression gloves can also be helpful and reduce pain associated with joint swelling, allowing a student to perform tasks that require the use of hands.

Reasonable accommodations, including assistive technology, will need to be put into place when barriers to the curriculum or clinical environment exist. The use of

Fig. 10.4 CellScope

technology, already in use by clinicians, like a CellScope™ or PanOptic™ by Welch Allyn (see Figs. 10.4 and 10.5, respectively), afford the student a wider grip, putting less continuous pressure on the joints. These devices also afford those with physical or visual disabilities a larger view that can be realized at a distance.

Students with ongoing joint pain may also require speech-to-text technology for charting or recording a patient history. Multiple devices exists to assist with this need, the most popular being Dragon Medical by Nuance™ (https://www.nuance.com/healthcare/provider-solutions/speech-recognition.html). When evaluating a student's needs, it may be helpful to tap into your campus's expertise. For example, if you have an occupational therapy program, this is an excellent opportunity to partner with them on modifications for the work environment. Occupational therapists have the latest information about adapt environments to allow individuals to continue work and activities of daily living.

Fig. 10.5 PanOptic Welch Allyn

Some students with chronic conditions will have difficulty ambulating (e.g., Ehlers-Danlos syndrome, postural orthostatic tachycardia syndrome – POTS). For these students, and for students who can ambulate but tire easily, mobility devices may be necessary. It is best if the DRP discusses the potential need for this mobility aid in the beginning of a program to prepare the student for the eventual need on the wards. Given the tight space of clinical environments, smaller/compact scooters are a good choice. This allows the student to continue with the pace and demands of a busy ward. More information about mobility disability can be found in the section on *physical disabilities.*

Deaf and Hard of Hearing

This section will focus on the range of accommodations available for deaf and hard of hearing (DHH) students and resident physicians in health professional education. First, stakeholders should recognize that members of the DHH community vary widely in their communication preferences and modalities, using any combination of spoken, signed, visual, and auditory means of communicating. Selecting and implementing effective accommodations should begin with identifying one's existing communication preferences and experiences; the DHH person and accommodation team should also consider future educational experiences which may not have a parallel in the DHH person's past background (e.g., working in the operating room). We also note that the accommodations below are not an exhaustive list nor is any single accommodation necessarily used singly throughout one's training and career; in one study, only 15 of 56 respondents reported using only one accommodation over time [16]. As noted in Fig. 10.6, each accommodation tends to be used in a variety of situations. Table 10.3 identifies a number of potential accommodations, their common situational applications, and commonly recognized certifications or qualifications for each, if applicable.

Real-Time Captioning

Real-time captioning, sometimes referred to as computer-assisted real-time transliteration (CART), is a technique in which a trained captionist listens to speakers and transmits the spoken word in text form to be read by the receiver(s), usually on a tablet or laptop's screen. The text can be displayed on a large screen for a larger audience. Captioners utilize specialized equipment (akin to court reporting stenographer machines) and software including specialized terminology dictionaries, as well as specialized training in court reporting methods to carry out this task. Depending on location and the task, captioners can function on-site in the same room, or remotely, working via Internet- or telephone-enabled microphone and audio transmission.

Transcripts often can be provided to the student in electronic or hard copy format.

Situations in which 56 Respondents Reported Using Current Accommodations in a Survey of U.S. Deaf and Hard-of-Hearing Trainees and Physicians, 2011

Accommodation*	Lectures	Small-group discussion	Clinic-based patient care	Hospital-based patient care	Other clinical tasks (e.g., phone calls, rounds)	Teaching	Research	Administration
Real-time captioning	11	6	1	0	0	0	0	0
Signed interpretation	7	8	5	6	4	3	1	3
Oral interpretation	2	4	4	3	4	1	0	0
Note-taking services	9	2	0	0	0	0	0	0
Modified surgical mask	0	0	2	1	0	0	0	0
Amplified or modified stethoscope	3	3	36	28	8	5	0	0
Auditory, nonclinical equipment	14	6	2	3	3	2	1	1
Total	46	29	50	41	19	11	2	4

* This table reports responses for the accommodation options provided by the authors on the survey instrument. Participants could also include free-text responses in an "Other" category (data not shown). Free-text responses included video relay service, e-mail, cell phone text messaging, amplified telephone, and hearing aids.

Fig. 10.6 Situations in which deaf and hard of hearing physicians and medical students have used certain accommodations

Table 10.3 Common accommodations for deaf and hard of hearing healthcare students and trainees; education settings in which they are often used; and formal certifications or qualifications that may be held by providers of each accommodation

Accommodation	Education setting in which it is often used	Commonly recognized certifications or qualifications
Computer-assisted real-time transcription (CART)	Lectures, didactic sessions, small-group meetings. Has been used in the operating room	Certification through the National Court Reporters Association (NCRA), which can include certified Realtime Reporter (CRR), certified Realtime Captioner (CRC)
Note-taking services	Didactic	None
Signed language and/or oral interpretation services	Wide range: Can include large-group lectures and one-on-one interactions	Certifications exist at national (e.g., registry of interpreters for the deaf – RID) and state levels (e.g., Board for the Evaluation of interpreters – BEI)
Cued English transliterator services	Wide range: Can include large-group lectures and one-on-one interactions	Certification is provided by the testing, evaluation, and certification unit (TECUnit)
Transparent surgical masks	Clinical settings requiring droplet or respiratory isolation, or sterile precautions for procedures	Food and Drug Administration approval may be supportive

Note-Taking Services

Due to the speed of information in classically unidirectional education settings (e.g., lectures), DHH students may experience challenges in taking notes while simultaneously absorbing visual information. Note-taking services allow for another person to take notes so that the DHH student can focus on the interpreter and the visual items in the course.

Telephone Adaptations

Telephones are ubiquitous throughout the healthcare system, with long-standing reliance on handset telephones and alphanumeric pagers, which are still in use. Some adaptations for DHH individuals focus on modifying the telephone itself (e.g., phones with amplification capabilities, connecting phones to headsets by cord or Bluetooth), while DHH healthcare providers utilize pagers with amplification or vibration options. Relatively new communications like text messaging benefit DHH healthcare providers and facilitate communication with the team, although HIPAA compliance remains an important parameter. Finally, video relay services (VRS) or video remote interpreting (VRI) offers DHH clinicians the option of a communicating via a remote/video signed language platform while the receiver is able to utilize a telephone. Interpreters assist the provider. They may or may not vocalize for the DHH provider, while also providing sign language to interpretation for the DHH clinician via video feed.

Auditory, Nonclinical Equipment

Healthcare students and trainees who are DHH use a broad variety of adaptive technology to support communication. Assistive listening devices (ALDs), such as hearing aids or bone or cochlear implant processors, can be programmed to adapt to a

variety of inputs, with some allowing modifications to switch from noisy to quiet rooms, or even adjusting for varying needs in frequency. Directional microphones can be small, even in the unassuming shape of a pen, able to be pointed at a single speaker to provide direct auditory input to a person's ALD. Omnidirectional microphones may be more effective when participating in group discussions, since they capture sound from a 360-degree range. Lapel microphones can also be worn by people who will be the sole speakers, or speaking the majority of the time; examples would include lecturers or attending surgeons in the operating room. The transmission of sound to one's ALD can be by direct line of sight (e.g., via laser), by Bluetooth connection, or even via directly wired connection. As with other technologies, information security must be assessed, since some wireless technologies' signals may be captured by those other than the intended recipient.

While ALDs can provide excellent amplification, it is critical to note that amplification alone may not benefit many DHH people. Thus, assistive listening devices may provide situation-specific benefits for some people, while others may benefit more broadly from them. DHH students and trainees in healthcare who use ALDs often benefit from working closely with an audiologist to adapt their ALD programs to particular clinical situations and even to stethoscope use. Readers should also note that many DHH people do not use ALDs for a variety of reason and rely more fully on sight and other senses.

Stethoscopes and Ultrasound

Traditional stethoscopes and their alternatives are a big topic of inquiry for DHH students seeking to enter the healthcare professions. Early electronic versions focused on amplification, followed by adaptive connections to hearing aids and cochlear implants. Amplification alone, however, does not benefit many DHH people who use auditory stethoscopes, since they need auditory clarity as well. New versions present visual options as well, innovative methodologies that have benefited healthcare professionals with and without hearing loss. Figure 10.7 shows some examples of these stethoscopes. We also note that the rapid advent of ultrasound as an important and increasingly evidence-based diagnostic and procedural imaging modality can benefit all patients and clinicians, whether or not the student or clinician is DHH.

Specialized Clinical Considerations

Operating Rooms

Participants, in collaboration with the CART captioner, will need to assess the OR to determine optimal placement to ensure the DHH person can see the surgical team, patient, and text without violating sterility. Options have included transmitting text to a screen in a transparent sterile sleeve or to a large mounted monitor. The transmitting microphone must be placed with consideration; one solution has been to ask the primary surgeon (or other designated educator) to wear the microphone under their sterile gown.

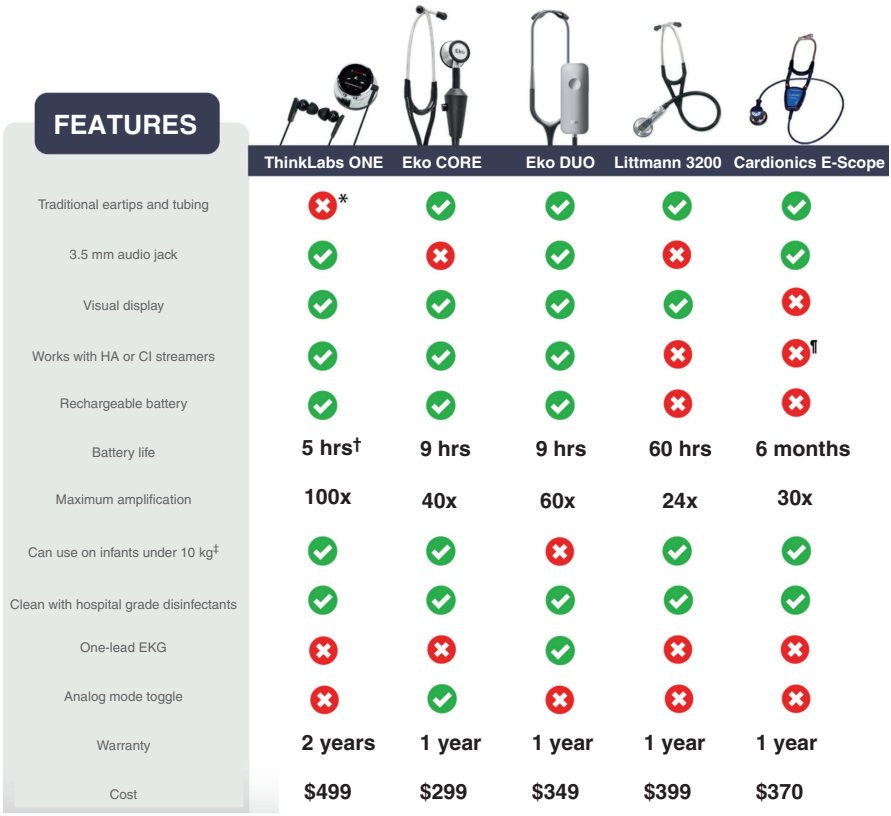


Fig. 10.7 Examples of electronic stethoscopes with amplification and/or visual representation capabilities. (Copied with permission from https://www.amphl.org/comparison-table)

Interpretation

While most people imagine interpreting as occurring with signed languages, some may be surprised by the variety of interpreting structures.

Oral Interpreters

Oral interpreters replicate through their own voiceless mouth movements what others say, so that the DHH person can focus on one source – the interpreter – without scanning the room to identify who in a group is speaking and thus losing critical visual information in the process. In this mode, oral interpreters may paraphrase or substitute certain words in order to visually articulate terms more clearly or to maintain pace with the group, without changing the message itself. They often will use gestures to support the oral message, such as identifying who is speaking.

There are fewer certifications available to identify those who have demonstrated qualifications via testing. Formerly, the Registry of Interpreters for the Deaf (RID) provided such testing, and the Texas Board for Evaluation of Interpreters (BEI)

maintains a current test and certification [17–18]. Formal training programs focused on oral interpreters are rare.

Signed Language Interpreters

Signed language interpreters convey messages from a spoken language (e.g., English) to a signed language (e.g., American Sign Language – ASL), and the reverse; we note that many DHH people choose to speak English, while many others do not. Those interpreters may also use a modified sign system, such as signed English which more closely follows the grammatical structure of spoken English while using signs from ASL.

Multiple state- and national-level certifications exist for generalist signed language interpreters [17–19]. Training programs for general interpreting range from 2-year to 4-year degree programs. Only in the last few years have certifications been developed specifically for signed language interpreters who specialize in the healthcare environment [18–19]. Most medical interpreting training still occurs in the form of discrete workshops or targeted conference formats.

Cued English Transliterators

The process of using a combination of handshapes, positions around the face and neck, and mouth movements to represent the phonological sounds produced in English (or any spoken language). National certification is offered by the Testing, Evaluation, and Certification Unit (TECUnit) [20].

Specialized Clinical Settings

Operating Room

The OR team should consider where interpreters can be best positioned so that they can hear conversations while being seen clearly by the DHH person. Where should interpreters stand? They might stand behind the primary surgeon so that the DHH person can easily shift gaze from the surgeon to the interpreter, or they might rotate around the room while remaining mindful of sterile spaces. Interpreters have at times scrubbed in with the operating team, including the DHH student, so that they could stand at the operating table; this maximizes the student's sightline as well as the interpreter's ability to hear the operating team's conversations.

Traditional surgical masks block visible mouth movements, blocking a DHH individual that lip reads from fully accessing communication. To address this barrier, the interpreters for one resident physician in a surgical specialty used Stryker orthopedic hood masks, which have a clear face shield so that people can view the mouth movements and expressions of the clinical team and interpreters [21]. While effective, a Stryker hood mask is cumbersome. Thankfully, new clear-window surgical masks have been developed that can provide a means of eliminating this barrier. Masks can be used along with other accommodations or techniques to reduce barriers in the OR. A successful case study for one DHH medical student utilized a combination of accommodations including oral interpreters using

transparent-window surgical masks, a lapel microphone worn by the attending surgeon to facilitate CART that was then transmitted via an online platform to an iPad visible to the student, and a reference chart of the most common drugs used in anesthesia for confirmation of the pharmacological name, given that many drug names sound alike and/or use similar mouth movements.[1]

Sensitive Physical Examinations

During sensitive examinations, interpreters can position themselves in ways that are respectful to patient privacy, such as behind a curtain or by turning their backs, so that the DHH person can see the interpreter while the interpreter cannot see the patient.

Critical Care Situations

In clinically emergent situations (e.g., a "code blue"), healthcare professionals collaborate and communicate rapidly to provide swift clinical interventions for the decompensating patient. While these situations are often intimidating to the student or trainee, they can be even more so to the untrained student who is DHH or the interpreter working with that student. Reassuringly, multiple DHH healthcare professionals and interpreters have learned to collaborate effectively in such situations, with their communicative and physical adaptations revolving around the DHH person's role [22]. Whether that role is checking a pulse, delivering chest compressions, or leading the code team, interpreters have identified ways to maintain clear sightlines and manage the flood of input and allow the DHH student, trainee, or professional to conduct their role within that situation. As with any student, new interpreters should be allowed opportunities to observe critical care situations, participate in simulated encounters, and debrief as needed with the rest of the team to develop their familiarity with such situations.

Functional Considerations

In certain situations, interpreters may need to work in pairs so that they can switch off regularly. This is because of the physical and cognitive fatigue associated with the physical signing as well as the equally, if not more, strenuous cognitive process of converting from one language and modality (e.g., spoken English) to another (e.g., signed language). This challenge is frequently compounded within healthcare training environments loaded with complex terminology, rapid speakers resulting in lack of clarity, and a wide variety of English accents. Those situations may include rounding on the wards, lectures, small-group discussions, or multiple one-on-one interactions over several hours (such as in clinic).

Designated Interpreters

As more DHH people enter healthcare professional school the demand for interpretation services will increase. With that demand, some DHH people and naturally choose to establish and maintain long-standing professional relationships, in which

[1] Safe N Clear Communicator Mask. https://www.safenclear.com/

the interpreter works primarily with that healthcare professional or student in their current role, such as working with a deaf student throughout nursing or medical school. An interpreter serving in this longitudinal role can be considered a designated interpreter (DI), a concept first introduced in 2008 [21]. Since then, others have explored the role and training required for DIs in healthcare settings, with ongoing training and safety precautions similar to those in other healthcare professional positions.

Preparing Interpreters

Interpreters provide the best service when they are able to prepare in advance and when they are a welcomed and valued member of the team. Supervisors may have questions about how the interpreter will engage with the team and may have questions about patient privacy. Introducing the interpreter to the team early allows for the exchange of information and can allow time for the interpreter to educate the program about etiquette for working with a DHH student. In addition to facilitating relationships and comfort, some specialties contain vocabulary that does not have a formal or even a common parallel term in sign language. Therefore, it is critical for the interpreter and provider to develop a common language for use in the clinical setting. To help prepare the interpreter and identify language that may need to be developed into sign language, programs should provide access to all curricular items including presentation slides, handouts, the names of speakers or team members, clinical orientation materials, syllabi, and textbooks. The terminology and concepts from those materials can enhance providers' abilities to convey language accurately and efficiently, whether interpreting or captioning.

Modified Surgical Masks

For those who rely on speechreading and/or other facial cues, surgical masks can disrupt effective communication. Over the past two decades, various forms of surgical masks with transparent windows have been developed, with at least one having obtained US Food and Drug Administration (FDA) approval for use and another undergoing FDA review.[1-2] While studies are in process to evaluate their impact on communication, anecdotal feedback from DHH students suggests that they have positive impact for both DHH and hearing users.

Learning Disabilities

Learning disabilities are discussed in great deal in Chap. 7 and are considered fairly easy to accommodate in the didactic setting. In the clinical setting; however, DRPs and faculty may mistakenly believe that there are no reasonable options to consider accommodation when direct patient care is part of the experience.

For students with specific learning disabilities, there exist potential functional limitations that will impact their ability to perform in the clinical setting. Building on Table 10.4 (drawn from Chap. 7), we offer some of the most common and reasonable accommodations in use across a myriad of health science programs.

[2] The Clear Mask. https://www.theclearmask.com/product

Table 10.4 Specific learning disorders and potential accommodations (adapted from Chap. 7)

Specific learning disorder	Possible barriers to learning	Potential functional limitations	Potential accommodations in clinical setting
With impairment in reading (dyslexia)	Comprehension, phonetic decoding, word recognition, and reading fluency	Slower reading rate Deficits in comprehension and retention Deficits in spelling Deficits in discerning main ideas Slower written expression	Pre-assignment of patients to allow for focused preparation/ reading Use of word for spell check prior to entering notes in the electronic health record Use of speech-to-text technology
With impairment in math (dyscalculia)	Understanding mathematical concepts and using math skills to solve problems	Slower reading/ processing Deficits in understanding symbols and alignment of numbers Deficits in understanding spatial concepts and math reasoning	Use of words/terms/ symbols legend when using symbols as primary source of information. Use of calculator or automated conversion tool when calculating doses of medication
With impairment in written expression (dysgraphia)	Letter formation, spacing, organization of the page, or speed of putting written information on paper; writing is laborious and messy	Deficits in motor coordination Barriers to effective note-taking, essay composition, and in-class writing	Use of speech-to-text technology to dictate notes Use of livescribe smart pen or apple smart watch to record and dictate provider/patient interactions [24, 26]

Clerkship Placements

When working with students with learning disabilities, a few of the barriers may be related to the type of EHR utilized at the clinical site. For those who require text-to-speech or speech-to-text technology, it is necessary to ensure that those technologies are EHR-compatible. When a particular EHR is vetted and a student becomes comfortable with the system, it can be helpful to try and rotate the student through sites that utilize the same EHR. The barrier to the site, for an EHR that is incompatible with the reading or dictation software, is palpably present and must not be ignored.

Learning disabilities, and the impact on the student, vary significantly depending on the demands of the program and a student's compensatory skills and self-accommodation through the use of assistive technology. For some students, the use of a text-to-speech program for reading articles or books will suffice in ensuring that have equal access to the program, while for others, a decompression of clinical

rotations will be necessary (if possible per program structure) to afford enough time to read, study, and execute new skills in a clinical setting. This can be accomplished in a few ways, in approaches similar to those for other disability categories described earlier in Chap. 10. First, the student can complete clinical rotations in double the time, for example, taking 2 years to finish 1 year of clinical rotations for medical school, (this is not possible in lockstep programs, so it would not apply to most nursing students) with clinical rotations spread over more weeks (e.g., an 8-week rotation becomes a 16-week rotation). Multiple iterations of this decompression are possible depending on the structure of the program. Alternatively, a student in a flexible curriculum can complete one rotation then take the next one off to prepare, read, and study for the following rotation and accompanying examinations. As always, the specific schedule must be individualized to the program and to the student.

Low Vision

Students with low vision successfully complete clinical programs through a myriad of self and school-based accommodations. The most common accommodations are the use of assistive technology (e.g., screen reader, zoom text,[3] CCTV). A CCTV (closed-circuit television) is a free-standing magnification device that provides magnification and high-definition color and contrast. The user can place any material under the magnification lens to magnify the item. Contrast can also be changed to black with white lettering and newer CCTVs have built-in text-to-speech capabilities.

For some individuals with low vision, a simple and portable magnification device will suffice and can easily be transported to the anatomy lab, skills lab, and other locations for optimal use.

Other portable magnification devices are also helpful and can be more readily affixed to a table (anatomy lab) when needed.

Finally, personal, handheld magnification devices can be folded and contained in a student's white coat or pocket and used as needed in outpatient and inpatient settings.

Most computer systems maintain a zoom feature and will allow the user to enlarge font to a size that is legible. When the size of the font, using the zoom feature, is insufficient, an easy way to address this is through the use of a larger monitor. Monitors are relatively inexpensive and with newer privacy screens can be used in a busy clinic setting without the fear of exposing sensitive patient health information. Larger screens can be located in a student or clinician lounge area and identified as an accessible workstation and reserved for the student when they are on rotation. A larger monitor also has value that does not require any significant IT intervention. It is portable and can be moved from one rotation to the next.

While most of the aforementioned items can be used in inpatient and outpatient clinical settings, some other devices are more optimal for sterile environments.

[3] https://www.zoomtext.com

Surgeons have been using surgical loupes for ages to help magnify small structures. Students with low vision can also use this tool to enhance their vision in the operating room or during surgical skills lab or surgery. These look like regular glasses with tiny microscopes on each lens and come in multiple levels of magnification.

For some students with visual disabilities, notating the patient interaction while reading the monitors and EHR quickly will be difficult. For these students, a text-to-speech technology that reads out a patient's history is critical. In the absence of this, a scribe system may be the most effective accommodation? Scribes, frequently utilized in environments like emergency rooms, are very beneficial for students with low vision. Scribes do not perform the duties of a student or physician; they serve as facilitators, gathering and documenting information for the student.

Working with an individual with low vision requires that the DRP be very creative in their approach to accommodations. One student, classified as legally blind, could not see the almost clear suture materials in the surgical rotation. Creatively, they used the blood of the patient as a stain to enable the student to see the material and to keep everything in the sterile field. Thinking outside the box and using existing materials, perhaps in a different way than originally planned, can often solve what may seem like complex barriers. DRPs should talk to the students about how they navigate their everyday life and work with the student to develop creative and reasonable solutions to access.

Mobility and Physical Disabilities

This section will cover accommodations for people with mobility-related physical disabilities, including those who use wheelchairs, scooters, crutches, or other mobility aid devices. This section is structured by first addressing accommodations generalizable to many locations, followed by discussion of situation-specific accommodations, including the classroom, outpatient clinics, the inpatient ward, emergency departments, and operating rooms. We also describe some specific adaptive equipment.

Accommodations Generalizable to Multiple Environments

Computer Workstations

Computer workstations should be available with clearance for wheelchairs or other mobility devices. The workstation's location should be consistent with those of other students or trainees and not be isolated from other members of the team, so as to facilitate collaborative clinical education and team integration. Ergonomic keyboards and trackballs or trackpad mice should be provided as options for students with limited hand or arm function. Dictation software, including microphones, should also be available for students with limited typing ability. Importantly, students and trainees must receive proper training on the relevant assistive software. In some cases, scribes may be an appropriate accommodation for trainees and

students with limited hand function. In these cases, the scribe would work in the same manner in which they work with clinicians without disabilities, providing the relevant noting and documenting of patient information without any clinical input.

Clinical Supplies

Standard supplies like tongue depressors, gauze, and tape should be kept in drawers or cabinets that are accessible from a seated position and can be opened using handles that do not require significant dexterity. If this type of storage is not available, necessary supplies should be stored on countertops for easier access. It is worth discussing whether it is worth adjusting all exam rooms for access. Those without physical disabilities will still be able to locate and easily utilize the equipment, making the experience accessible for all.

Building Access

Entrance to the building must be accessible. This means that the building contains a zero entry (a single-level entrance without stairs), a ramp, or an elevator to the entrance. Power doors must be available for building entry. Buildings that have accessible entrances only in the rear of the building are discouraged. Having a student or trainee enter from the rear of a building or a loading dock sends a very clear message about the value of persons who use assistive devices. Any medical building should be accessible to patients and providers with disabilities. If a hospital or outpatient clinic is physically inaccessible or requires a learner to utilize alternative entryways, the program should address upgrades on the inaccessible building while locating an alternative placement for the student.

Environment-Specific Accommodations

Classroom and Small-Group Settings

Many students with disabilities will have had extensive experience learning in the classroom setting before entering health professional school, given the common didactic and/or small-group organization of preclinical undergraduate education. As a result, students can often speak knowledgeably about necessary accommodations, although those who have recently acquired a disability may be less aware of available accommodations, emphasizing the need for informed DRPs (as noted in earlier sections).

Classroom Access for Wheelchairs

Classrooms should be on the ground floor or accessible by ramp or elevator. Doors to classrooms should have lever or "U"-shaped handles for easier access, as opposed to spherical doorknobs which can be more challenging to grasp. Classes should only be held on floors that maintain accessible restrooms.

Box 10.5. Proper Height and Width for Wheelchair Access
Tables or desks should be height adjustable and must be 27 inches or higher to accommodate wheelchair users. Further, 30 inches of clearance is required between the legs of the table.

Classroom Space for Wheelchairs or Other Mobility Devices

Classroom workspaces should be accessible to wheelchairs and other mobility devices. Group work tables should have appropriate clearance from the floor and between table legs to accommodate mobility devices (see Box 10.5[4]).

Lab benches should have a roll-under area with a table top at a seated height so as to be accessible to a manual wheelchair user. To allow for full participation, lecture halls should have space for students using mobility devices at both the front and back of the lecture hall. Again, lecture halls that only allow for entry via the alternative route should be amended so that all members of a class can enter and exit in the same manner. Tabletops in cadaver labs should also have adjustable height tables.

Writing Surface Access

When a student has to sit in a nonstandard seat, in a lecture hall for example, they may not have a writing surface. In these cases, programs should provide a table with appropriate clearance for the student.

Restrooms

Accessible restrooms need to be available in the building where classes are held within reasonable distance from classrooms. Restrooms should have at least one wheelchair accessible stall with grab bars. A single-occupancy restroom may be preferable for some students who require more privacy for their personal needs. Programs should be careful to ensure that the accessible restroom is located on the same floor as the classroom. For students who are wheelchair users, the need to exit the classroom, which in itself may take considerable navigation, only to have to wait for an elevator to go to another floor and repeat in reverse could take considerable time away from the learning experience.

Breaks

Students with limited mobility should be provided breaks that include appropriate time for travel to and from various buildings or classrooms and for using the restroom. Consideration should also be given to the challenges presented when large lecture halls empty at once and bathrooms are filled. Students may need access to a separate bathroom or extra time allotted during breaks. Some people may also require breaks for changes in positioning for pressure relief.

[4] These guidelines are in line with the Americans With Disabilities guidelines for small businesses http://www.ada.gov/smbustxt.htm and may not apply to international regulations.

Outpatient Clinics

One aspect of clinical education that is challenging for all students is rapid cycling among widely varying teams and physical environments. This change in setting poses additional challenges for students with disabilities. Placing students in clinics well-equipped to meet their needs can further optimize the educational experiences of students with disabilities as well as their capacity to contribute to teams' patient care flow with less distraction and greater ease.

Clinics' Physical Access

Outpatient clinics should have accessible parking available to students and proximity to accessible public transit. Clinic entrances should be zero entry and have ramp and elevator access.

Patient Rooms

Students must be able to access their patients; therefore, doors to patient rooms must be able to close even if the patient and student both use mobility devices. There may be additional personnel also present, making the room crowded. Removing unnecessary furniture (e.g., chairs and stools) from patient rooms can increase the amount of available space and the ease with which students and patients with mobility devices can navigate the room.

Bed Controls

Controls used to adjust the height and angle of the patient examination table must be accessible to students with limited mobility including students who are not able to use foot pedals. Bed controls should be sensitive enough to operate without extensive force or dexterity.

Hand Hygiene

Sinks and paper towels should be accessible from a mobility device and should not be controlled exclusively by foot pedals. Hand sanitizer should be kept in a location that can be reached from a seated position. If needed, place an additional hand sanitizer directly below the original at a height aligned with a seated position.

Communicating Needs to Team Members

Other members of the care team can be instrumental in providing an accessible work environment for students with limited mobility. With the support of educational and clinic leadership, students with disabilities should make team members aware of their needs so that rooms and workstations are maintained in the configuration that is most accessible for the student with a disability and not rearranged. Identified work stations with adaptive or assistive technology should be kept clear and available for the student. Team members may also assist students with limited hand function in preparing equipment for office-based procedures by opening packages for supplies like lubricant, speculum examination, or wound care, and placing

them in a sterile location accessible to the student. Communicating how this equipment is made most accessible to the student will be helpful in ensuring the student's and patient's needs are met.

Inpatient Setting

Most healthcare students will spend a majority of their training working in an inpatient (hospital) setting. Access to inpatient floors is not typically an issue for students with limited mobility, as floors are often designed to provide easy access for patients' needs, such as beds and supply carts. One particular concern for students with limited mobility can arise when hospitals have various sections of the hospital built at different times, with different designs. For example, some older hospitals may have stairs connecting two adjacent buildings. In these cases, people may need to take alternative routes, adding considerable transit time to their navigation between the buildings.

Team Rooms

Team rooms can often be cramped with enough furniture and tables to accommodate a large number of students and resident physicians. Supervisors must ensure that there is adequate space for those who use a mobility device to move around the room, including enough space near the doors for entry and exit and access to any refrigerators, or beverage machines.

Patient Rooms

Similar to the outpatient setting, patient rooms may not have enough space for the student to easily move around the room and perform an exam. Patient rooms should be arranged such that the students with disability is able to fully access the patient and the equipment in the room. This may require moving bedside tables, chairs, and other objects that are in the path of providing care.

Team Rounds

Students with limited mobility should be given a position within the team on rounds to allow them to see and hear during team discussions. Rounding should also proceed using accessible means of transit between one area and another. Teams should avoid using stairs and other inaccessible routes to ensure students with limited mobility are included in the full experience. It is important to remember that not every mobility disability is visible. It may be helpful to survey the team members to see if all members of the team are able to navigate stairs, even if it appears that no one has limitations.

Call Rooms

Call rooms should be accessible to students who use mobility devices. This requires some call rooms to have a bed (not a bunkbed) at a lower height accessible to a wheelchair user. Students that require a special mattress for pressure relief or who

require assistance to get in and out of bed may find that the planning required to use call rooms is particularly difficult. In these instances, it may be reasonable to allow an equivalent number of hours worked during the day to be substituted for a night shift, or other equivalent shift modifications.

Inpatient Medical Emergencies ("Code Blue")

In the hospital, a medical emergency in which a patient requires immediate intervention is often referred to as a code blue in professional jargon. For providers with limited mobility who have the responsibility of carrying the code pager (the means by which specific people are notified of inpatient medical emergencies), the speed of arriving to a code on a different floor may be limited by the elevator. For this reason, redundancy should be built into the response to codes so that if a provider with limited mobility is delayed in responding to the code by circumstances outside their control, another individual qualified to run the code has already arrived on site in the interim. Many hospitals provide layers of relative redundancy in code blue roles, such as with Rapid Response Teams or by engaging emergency department personnel in code blue situations. Some hospitals additionally have special keys or badge encodings that allow members of a code team to obtain priority access to elevators during a code. This access should be afforded to all providers with limited mobility. Trainees with disabilities should consider ahead of time what their role(s) would be in a code (e.g., code team leader, timer/recorder, drawing up medications, airway management), depending on their level of function.

Emergency Departments

The Emergency Department (ED) is a hectic environment that presents a unique challenge to students with limited mobility. Despite this there are several ED physicians who are wheelchair users and navigating the space can be quite easy with attention to access and preplanning.

Patient Rooms

Patient rooms may be large with adequate space for both a patient and provider using mobility equipment; however in, some facilities and during busier times, patients may be on a stretcher in a hallway or separated from the patient next to them by a curtain and a very small amount of space that is prohibitive for assistive equipment.

Trauma Management

Students with limited mobility should identify themselves to the team and discuss any needs with team members before or at the start of a shift, helping to ensure the students full engagement and active contribution to the team. To develop familiarity with trauma procedures, many hospitals and medical schools have simulation labs which can be a good place for students to determine their needs. They can also visit

the trauma bays when a trauma is not actively underway to identify locations of equipment, sinks, protective gear, and other necessary items. Some required items may be wall-mounted, creating a difficult reach by a team member who is a wheelchair user necessitating assistance from others. Because trauma bay equipment cannot always be controlled (e.g., patients arriving via ambulance with equipment from outside the hospital), this presents a unique challenge. Preplanning can help anticipate these challenges.

Examination Rooms

The approach with here is similar to rounding on inpatient wards, unnecessary chairs, equipment, and gurneys should be removed to allow enough space for the student to examine the patient. Patients who are on a stretcher in the hallway should be moved to a standard exam room to allow for a complete examination that is respectful of patient privacy, while allowing the examiner the necessary space and equipment for their success.

Sinks/Hand Hygiene

Sinks should be at an accessible height and hand sanitizer should be available at the height of a seated position and be readily accessible. It is important to remember that not all pathogens are destroyed by sanitizers (e.g., *Clostridium difficile* and other spore-based organisms). Therefore, an accessible sink must be within a reasonable distance from all examination areas. Some students with mobility disabilities will utilize standing or hydraulic lift wheelchairs that allow them to access sinks. In the absence of this, program leadership should work with the hospital to ensure an accessible sink and process for remaining sanitary.

Operating Rooms

Administrators and educators often express concern about accommodating students with disabilities in surgical rotations. Students with mobility disabilities can be easily accommodated on surgical rotations, in fact there are multiple successful practicing surgeons who utilize wheelchairs [23–24]. Below, we discuss methods for fully incorporating students with mobility disabilities in the operating room (OR), including how to maintain sterile precautions.

Preparing for the OR

It is essential to work with necessary OR and surgical staff prior to the student's first trip to an active operating room to ensure a smooth entry into the rotation. ORs are supervised by an OR charge nurse, and we advise a pre-rotation meeting to review the accommodation and modification details and to discuss how department faculty work together to provide an accessible experience.

During this initial meeting, we recommend discussing expectations and the details of the student's functional limitations and mechanisms for a meaningful

educational experience; we do not recommend simply having the student observe and/or waiving requirements. There is sufficient anecdotal evidence to suggest that a student with a mobility disability can reasonably engage in surgical rotations for a meaningful educational experience; therefore, we encourage programs to be creative in their approaches to equal access and think broadly about how to ensure inclusion.

To facilitate creative thinking, we recommend scheduling a time (as early in advance as possible) to visit an empty operating room or simulation center OR with a team that includes a clinical preceptor, an OR nurse and/or scrub tech and the simulation center director to practice the modified approach to procedures and skills (e.g., scrubbing in) without the pressures and complexity of an ongoing surgical procedure. This dry run will ensure that the student the student has full access and a set protocol for scrubbing in and addressing required surgical skills competencies. As well, this preplanning and review reduces concerns that might otherwise be expressed by the OR team. When the procedures have been tested and reviewed in a simulated or practice setting, supervisory staff can attest to the student's ability to achieve and maintain sterility. OR management should be sure to notify relevant senior OR staff, techs, and nurses of the results of this dry run, so that the student will be able to start immediately on the first day and experience a full and accessible rotation.

Before each surgical case, students should have the opportunity to enter the OR and communicate with the circulator and scrub technician, regarding any items needed for gowning (e.g., differently sized gowns, drapes, gloves, sheets) and the student's scrubbing process (if it is the first time working with that particular team). This approach allows the student to introduce themselves to the OR staff and avoid unexpected questions about approved nonstandard procedures. A printed overview of the steps for scrubbing and any modified equipment may be helpful, or a memo circulated with OR management signatures can go a long way in reducing any unnecessary concern or exclusion of the student. This form or memo can reside at the main OR desk, and another copy can be placed into the rooms when needed for easy access. This nonstandard procedural review is also helpful when new team members arrive. They can quickly review the process and aid in scrub-in or gowning when needed.

The Sterile Field

Maintaining the sterile field for surgical procedures is critical to avoiding infectious complications for surgical procedures. This is one of the common concerns of those unfamiliar with surgeons and students who use mobility devices. Mobility equipment (e.g., wheelchairs) can be brought into the operating room and sterilized as outlined below. The sterile field ranges from the chest to the waist on the front of clinicians' and students' bodies only; their backs are not sterile. Thus, the device's wheels contacting the floor do not break the sterile field. The chair itself can be protected with sterile covers used for other equipment like x-ray machines and CT

scanners so that the armrests and joystick are sterile while being used. In Boxes 10.6A, 10.6B, and 10.6C, we describe several approaches to sterilizing wheelchairs, as well as scrubbing into operations safely.

Scrubbing for the OR

Products, such as Avagard, are designed as a dry scrub. These are approved by the FDA as a sterile scrub, even for the first case of the day. We recommend that, for the first scrub, students with mobility disabilities get assistance with a nail curette to remove all dirt underneath the nails, followed by a wet scrub to remove any particles or dirt that may be on the hands. This is particularly important for manual wheelchair users who may accumulate more dirt than power users. The wet scrub will be followed by a dry scrub, such as Avagard; therefore the wet scrub does not need to be completely sterile and the provider may lean against the edge of the sink for stability as needed. The hands and arms should then be fully dried before proceeding to the dry scrub. Some hospitals have dispensers that are touchless and only require the user to place their hands underneath, while a sensor automatically dispenses gel into the user's hand. More common, however, is a wall mount connected to a foot pump that manually dispenses gel. When a foot pump is the mechanism in place, the Avagard dispenser can be easily lifted out of its wall mount by an assistant who can press the small circular piece on the back to manually dispense the gel; it is not locked or snapped into place, but rather sits cradled in the wall mount.

To eliminate the potential for contamination after application, it is often easier to dispense the Avagard into the palm of the hand without applying it and then enter the operating room. Once in the OR near the sterile table, apply the Avagard to the hands and arms. This also allows the user the use of at least one hand to open doors and press buttons as needed. This can be helpful in ORs that do not have powered doors.

Box 10.6A Scrub-in Procedure Option

- Put the armrests of the chair up and turn the electric chair off.
- Wash with Avagard.
- Put large gown on.
- Put gloves on.
- Drape a sterile sheet behind the student's back.
- Put a sterile X-ray cassette drape on the wheelchair's non-control arm.
- Put a sterile C-arm drape on the wheelchair's control arm.
- Put the arms down and turn the chair on using sterile gloves.
- The author can then drive the chair, press buttons, and touch the armrests with sterile gloves.

Box 10.6B Scrubbing for the OR: An Approach for Those Utilizing a Standing Wheelchair While Maintaining Sterility of the Controls and Armrests

- Pre-wash using a wet scrub as described above, and dry hands and arms.
- Place the chair into the standing position with all required operative equipment in place (e.g., belts, straps, loupes, headlamps).
- Scrub with Avagard.
- Put on a 2XL or 3XL gown, wrapping the entire gown around the user, armrests, and chair.
- Don gloves.
- Wrap a ¾ sheet around the waist/chair/back, like a skirt. (A ½ sheet is often not large enough for this.)
- Pass a non-penetrating clamp to the circulator, who clamps the ¾ sheet in the back, covering the back of the chair as well.
- Use a second clamp to clamp the Velcro on the neck to keep it from popping open as the provider moves around against a rigid standing chair.

Box 10.6C Scrubbing for the OR: An Approach for Some Manual Wheelchair Users

- Pre-wash using a wet scrub.
- Dispense Avagard into the palm of one hand, but do not apply yet.
- If possible, use the other hand to navigate into the OR; alternatively, request a circulating nurse or tech to push the student near the operative field or have someone remove the Avagard dispenser from the wall and dispense it directly into the student's hands while the student is near the scrub tech.
- Put on gown and gloves.
- Wrap a 2XL or 3XL gown around the student's lap and legs and the back of the chair, and clamp it at the back of the chair.
- The student will need to have the circulator then push them to the operative field, and may require a platform to be elevated to the level of the field. Any movement during the procedure will require the circulator to push the student.

Observing in the OR

Observing operations is key to the effective clinical learning and formative experience. Context and the optimal use of available equipment, including mobility devices and OR service and equipment, will impact the student's access to adequate observation of the operation.

Mobility Devices, Such as Wheelchairs

Standing-power wheelchairs (which can move the user into a near-standing position) allow students to be at the same height as their colleagues and get closer to the surgical field. Students' arms are also free to assist with the surgery. Power chairs with a hydraulic elevate function (i.e., raising the seat) also increase a student's height and enable viewing of the surgical field. Students using elevate-function chairs may need to approach the surgical field from their own side rather than facing forward, given that they remain seated, which may limit students' reach. For students who use these devices and can stand independently with intermittent breaks, a stool can be placed in the operating room to allow the student to rest as needed.

Operating Room Equipment

For operation in deep body cavities where it may be difficult for a seated student to see, a head camera may be worn by the surgeon, with video streamed to OR monitors. If head cameras are not available, cameras mounted on lights over the operative field can provide an alternative means of streaming to OR monitors.

Operative Case Selection

Operative teams or suites with high volumes of laparoscopic or robotic cases may be more easily adapted for viewing. Operative specialties in which surgeons frequently operate from a seated position (e.g., hand, plastic, or vascular surgery) may provide seated students the easiest access to the surgical field. Importantly, students' educational experience should not be sacrificed because of accommodations. In the past, some institutions have chosen a relatively simple option: having the student watch the same type of laparoscopic case for 2 months, rather than varying the exposure to a range of procedures and conditions. This must be avoided, because it severely impacts the student's clinical education and will have a lasting impact on their view of surgery as it ultimately relates to their clinical practice. As always, it remains key to work with the student to find a clinical site and team placement to optimize their education. Early engagement of key OR staff and the student to facilitate an open dialogue is essential to ensure the student's success.

Student Involvement in Decision-Making

Faculty should involve students with mobility impairments in the operation to their maximum physical capacity. Students who use wheelchairs or other mobility devices and do not have limited hand function should be able to perform surgical skills as long as adequate access to the surgical field has been provided. Students with limited fine motor skills may still be able to assist in retracting, suctioning, or driving the laparoscopic camera. Students with limited hand strength may still be able to assist in cutting, suturing, or knot tying. When invited to participate, and when asked how they may best participate, students can assist surgeons in determining solutions.

Adaptive Equipment

With technology rapidly advancing, there are many options available to students with disabilities in terms of adaptive equipment for physical examinations.

Veterinary Stethoscope

Veterinarians use stethoscopes with a longer tube between the head of the stethoscope in the earpieces. For students whose mobility limits their ability to get physically close to the patient, this extra length can be useful in ensuring the stethoscope head and can reach the heart of the patient while the student is wearing the stethoscope.

Electronic Stethoscope

Multiple variations on electronic stethoscopes are available on the market. Some models include Bluetooth technology, eliminating the need to be physically next to the patient to auscultate.

Camera-Based Devices

Portable cameras that send images remotely to devices can be used to examine skin, perform oral exams, or facilitate otoscopic examinations.

Adapting Standard Devices

Examples of standard clinical examination devices include reflex hammers and tuning forks. Foam or other materials can be used to increase the size of handles on standard physical exam equipment for easier use by students with limited hand function.

Designing Novel Equipment

Many people with disabilities are accustomed to designing and making their own equipment, when equipment is needed for their purposes but does not exist. Connecting students with disabilities with an occupational therapist or rehabilitative engineering department can be helpful if students would like to design and build their own equipment.

Limited Hand Functioning (LHF)

Students with LHF may face additional barriers beyond those described above. For students whose hand function limits their ability to gather the information necessary to make a clinical assessment, an intermediary may be a reasonable and necessary accommodation [25]. Intermediaries are nonmedical professionals who assist in gathering information. Intermediaries may help with routine tasks involved in information gathering without providing clinical input, like placing the stethoscope on a patient [25].

For invasive procedures not deemed essential functions, students may demonstrate competence by demonstrating the procedure in a simulation lab or directing a nonmedical professional to perform the procedure. For students who may be able to

perform invasive procedures and require some extra practice, a simulation center will be an important tool in allowing students to experiment with different techniques or equipment before performing the procedure on a patient.

Below we have listed common procedures organized by setting. For students with limited hand function who intend to perform these procedures, we have documented strategies that may eliminate some barriers to performing these procedures on patients. In general, giving students with disabilities the opportunity to simulate the procedure, practice multiple times, and pilot different approaches can help students with disabilities be prepared to practice these procedures in the clinical setting.

Outpatient

Pelvic Exams and Pap Smears

Pap smears are part of routine preventive screening. Pelvic examinations, while no longer recommended for routine screening, still have an important role in diagnosis and management for certain situations [26]. Speculum insertion is technically difficult and requires the user to hold the speculum with one hand. Metal specula require the user to tighten a screw to hold the speculum in place once it is inserted. Plastic specula, however, do not have a screw and may be easier to use for students with limited dexterity. For those who have difficulty maintaining finger extension to perform the pelvic exam, a small splint that leaves the fingertip exposed may be used.

Rectal Examinations

Similar to pelvic exams, rectal exams are no longer recommended for routine screening [27] yet are critical for certain clinical conditions. For students with limited mobility, the positioning of the patient can make this exam significantly easier or more difficult. Whenever possible, arranging a standardized patient session or time in the simulation lab will be helpful so the student has opportunities to practice via different approaches. Again, for students who have difficulty maintaining finger extension, a low-profile splint can be used.

Arthrocenteses and Joint Injections

While placement of the needle tip into the joint space (such as the knee or shoulder) requires very little strength, precision is important. Pushing or pulling the syringe's plunger does require some amount of strength and is frequently awkward for the typical student without disabilities as well. Allowing students time to practice with the equipment before performing the procedure will be helpful.

Inpatient

Peripheral Intravenous (PIV) Catheters

Because PIV catheters are a relatively benign procedure, training programs sometimes arrange opportunities for students to practice on each other. Performing this procedure requires significant precision and dexterity, with minimal strength. In the

inpatient setting, the members of the team most likely to insert PIVs are nurses. Students with limited hand function may find the packaging, syringes, and dressing more challenging to manage than the actual insertion of the PIV. In this case, a third party can assist with tasks which are necessary to the procedure but not central, like opening packaging. Peripheral blood draws involves skills very similar to the PIV above, but with somewhat less dexterity required.

Intubation

Intubating a patient is a time-sensitive maneuver that requires specific positioning. Students who use wheelchairs may need the head of the table lowered (or may need to raise their wheelchair, if it has that functionality). Positioning the patient at the very top of the table will assist the student in getting as close as possible to the patient. Depending upon the clinical setting in which the intubation is being performed, the bed may need to be moved to allow increased access to the space above the head of the bed. Independent intubation requires two hands, one to maneuver the laryngoscope and the other to insert the endotracheal tube (ETT). Proper use of the laryngoscope requires the application of some force. If managing the laryngoscope and ETT one-handed is challenging, a trained third party (e.g., respiratory therapist, nurse anesthetist, anesthesiologist) may manage the laryngoscope while the student visualizes the vocal cords and places the ETT. A bougie may make placement of the ETT easier if the angle of approach or precision of movements is challenging.

Suturing

Suturing is a common skill in the operating room and emergency department. Suturing with a needle driver requires some strength and dexterity. Practicing in the simulation center can give students time to become familiar with the equipment and the best way to use it given their hand function. Students with hand weakness may find some needle drivers easier to use than others or may require assistance loading the needle onto the needle driver. Tying knots may also be challenging for students with limited hand function. Practicing knot-tying technique with rope rather than suture may help students learn the process of tying without the added challenge of handling thin suture. Texturized surgical gloves (e.g., microgrip gloves) may also help students with limited grasp handle suture materials more easily.

Intermediaries

Intermediaries are individuals who play specific roles in supporting healthcare students, trainees, and practicing clinicians with disabilities to complete their tasks, under the direction of students with disabilities. Intermediaries do not perform clinical responsibilities or make clinical judgements for the students. Intermediaries work within the healthcare system and therefore are subject to the same occupational risks and exposures as any other healthcare worker. For this reason, it is critically important that intermediaries receive the same preventive and management training for healthcare, exposures, and injuries.

Psychological Disabilities

Psychological disabilities and the resulting functional limitations often overlap with other disabilities. Specific psychological disabilities like depression may impact two students in very different ways. We will not review psychological disability in this chapter; for a full review of mental health and disability in health science programs, see Chap. 5.

Section IV Simulation for Assessment and Determining Accommodations

Simulation is an educational technique that replaces or amplifies real-world experiences with guided experiences that evoke substantial aspects of the real world in a fully interactive manner [28]. A guided experience, commonly called debriefing, is the postsimulation formal, collaborative, reflective process of simulation where participants explore their emotions, question, reflect, and provide feedback to one another [29]; a majority of the critical learning takes place in this session as participants put together the pieces of the simulation puzzle and work to understand the meaning of each piece in contributing to the larger picture [30–31].

Simulations are mostly formative in nature and designed as a low-stakes, nongraded learning environment where mistakes are explicitly allowed as there is no risk of patient harm; this has been shown to improve medical resident performance [32]. Simulation calls upon students to enhance the application of course content, use information in new situations, and draw connections, thereby promoting higher levels of thinking and long-term retention [33].

In contrast to a standard textbook, the utilization of experiential learning through simulation is especially compelling because it is relevant to the student. The regular use of simulation in curriculum can help diverse learners, including those who rely on visual, auditory and kinesthetic modes of information processing. Simulation activities and exercises afford an opportunity for learners to apply what they have learned within a regulated, controlled environment and create another way in which students can connect with the information meaningfully [34–35].

Advantages of simulation include experiential learning, deliberate practice, and delivery of immediate feedback [36]. As a highly interactive, multisensory teaching modality, simulation can appeal to all learners, including those with identified disabilities (Table 10.5). Indeed, simulation holds unique promise for students with disabilities as a mechanism to develop alternative techniques, practice using assistive or adaptive equipment prior to starting clinical rotations, and even function as an alternative means of assessment.

Simulation as a Means of Assessment

In some instances, simulation has been used as an effective means of high-stakes assessment, such as a clinical skills or competency checkoff. The use of a

Table 10.5 Advantages of a simulation curriculum for students with disabilities

Anxiety	Practice clinical approaches and techniques prior to patient interaction
Dexterity	Facilitate practice, refinement, or adaptation of techniques Become accustomed to using potential adaptive equipment before seeing patients
Mobility	Determine any need for space and adaptive equipment prior to entering a clinical rotation
Anxiety/autism spectrum	Rehearse patient interactions while receiving feedback in a low-stakes, low-pressure environment Rehearse team-building and communication with other team members
Processing	Rehearse physical maneuvers to build muscle memory
Executive functioning	Develop organizational methods and approaches to patient care

simulation lab allows the program, using accommodation, to evaluate the skills of a student who would not otherwise be able to display competency during clinical skill checkoffs. When considering an accommodation, student disability resource professionals (DRP) should, as part of the interactive process, review accreditation guidelines if any on the use of simulation for learning and assessment, state board requirements, and clerkship organization guidance.

Simulation to Determine Accommodation

When working with health science students, a simulated clinical environment can be very useful for determining the impact of a disability on performance of specific tasks, such as physical examination or procedural skills. A controlled scenario can be presented to the student to determine *how* the disability impacts access and how accommodations to the environment or assistive devices reduce barriers, allowing students to perform clinical tasks, for example, the assessment of students' needs, or the efficacy of a particular accommodation in reducing barriers for a health professional with mobility or physical limitation. In the simulated setting, a common clinical scenario can be developed to allow the student to work through a complete clinical encounter (e.g., a history and physical). Unlike the actual clinical environment, conducting this examination in a simulation allows the scenario to be paused at any point to record, discuss, refine, and fully explore potential accommodations. New or modified scenarios can also be used to address new or anticipated challenges as the student rotates through the clinical portion of their education. Simulation could also be used as a dress rehearsal, empowering both the healthcare provider and the student with the disability to become comfortable with the accommodation before full clinical implementation. The ability to witness the procedure or approach in a simulated setting is often the catalyst for reducing fear or anxiety associated with an alternative or accommodated approach.

Simulation can be used to explore, in a more meaningful way, the impact of specific disability-related limitations on a student's functioning within the clinical setting. For students with limited hand function, low vision or hearing, chronic health

conditions, psychological, learning disabilities, or complex combinations can be explored and understood, and specific accommodations developed and tested in a simulation setting. Depending on the condition, disabilities may also vary over time adding to the complexity of the assessment and determination of best accommodations. In addition, simulation is an excellent mechanism for understanding the impact *variability* of a disability causes and the efficacy of potential accommodations under those conditions.

Simulation as Design Lab

The integration of accommodation devices and/or technologies with healthcare systems must be considered when designing an accommodation. In some cases, accommodations have not yet been developed or adapted to meet the individual needs of health professionals with disabilities. For example, there is no available suite of electronic medical record-integrated wireless cameras to assist those with mobility or hand dexterity disabilities in performing a physical examination. In this case, the simulation lab can be utilized as a design lab for development or adaptation of technologies.

Students may also require specialized or adapted access to information from existing clinical information systems such as cardiac monitor readings, vital sign displays, radiology images, electronic medical record information, or any number of other visual or auditory data systems as part of their clinical or educational duties. The use of multiple medical information, diagnostic and treatment systems should be considered as part of a comprehensive accommodation plan along with the integration of adaptive technologies with existing systems. The simulation center provides an excellent and innovative opportunity to assure both efficacy and integration prior to clinical experiences.

Access to Expertise

Simulation centers are home to a host of technology and education experts who assist medical educators in the design of medical and surgical simulations. This specialty expertise can be an invaluable resource for those assessing and designing accommodations for those with disabilities. Specifically, simulation operations specialists, or sim techs, can work with DRPs to understand and consider the multiple technology-intensive systems, including patient simulators, surgical simulators, task trainers, audiovisual systems, simulated EHRs, simulated medications, and medical equipment. They can also be consulted on the design, testing, or integration of an accommodation with existing healthcare systems and can provide expertise in scenario development to assess the efficacy and integration of assistive technologies. Medical education experts, who often provide guidance on curriculum development, scenario design, and student assessment, could also consult on design and/or assessment modalities with the goal of providing a comprehensive understanding of individual needs, efficacy, and integration of accommodations.

Value Proposition

When considering the effort, expertise, and resources utilized in developing a suite of accommodations without full understanding of a disability, as well as the enormous time and effort involved in developing post hoc accommodations when disabilities are not addressed prior to the clinical experience, the value of high-fidelity simulation for the assessing the impact of a disability along with the design, testing, and integration of accommodations cannot be underestimated. Rapidly developing an accommodation plan after a need is identified, without the input of expertise and value of fully developing, testing, and refining can lead to the use of poorly fitting accommodations. There can also be issues in the attempt to integrate the adaptation of standard accommodations not well suited or translatable to healthcare. Understanding a student's individual need, in the greater context of the specialty, is essential to developing appropriate tools to address accommodation needs. Integrating simulation faculty and staff helps to educate those within educational programs on best methods for full inclusion of students with specific disabilities and to appropriately train the next generation of healthcare professionals.

Simulation is a viable pedagogical platform to meet student learning needs by transferring learning acquisition into action in a team-based, low-stakes environment where patient risk is not a concern. Skill mastery requires more than a single learning experience; simulation allows for repetition while also motivating students in the realm of patient care. Despite the numerous advantages of the incorporation of simulation labs in health science education, there are still some barriers to accessibility for students with disabilities that should be considered and addressed (Table 10.6).

Table 10.6 Barriers to accessibility of a simulation curriculum

Barrier	Disability consideration	Strategy
Physical layout	Mobility impairments may require a review of the space to determine if adaptive equipment may be required	Review the space with the disability resource professional prior to the start of the academic year
Software compatibility with assistive technology	Students with reading, processing, or visual impairments may utilize screen readers or other assistive software in conjunction with standard hospital software or EHRs [37]	Consult with your disability professional regarding commonly utilized assistive technology/software [38] Ensure computers are equipped with the necessary assistive technology prior to the start of the course Avoid purchasing new software or technology without checking accessibility
Visual/oral communication	Deaf or hard of hearing people utilizing visual communication	Space may be required for students utilizing ASL interpreters or CART [38] Additional time may be required to arrange a clinically experienced ASL interpreter or CART captionist

(continue)

Table 10.6 (continued)

Barrier	Disability consideration	Strategy
Handouts and simulated patient information and patient notes	Processing, visual, anxiety, or executive functioning impairments	Any clinical accommodations should apply to simulated clinical scenario. These may include additional time to review patient files prior to the interaction, as well as additional time to complete patient notes in a reduced distraction environment [39]

Conclusion

In order to provide high-quality reasonable accommodations for healthcare students with disabilities, it is critical to collaborate to understand those students' perspectives and how their disabilities mesh with their education program. This chapter has provided an introduction to tools for identifying effective accommodations via a systematic approach, including intake questions, determining functional limitations in the context of the education program, and assessment of their effectiveness; these processes should be conducted by experienced disability resource professionals (DRPs) who communicate with the student as well as with clinical and educational leadership to enhance the institutional climate for accessibility. The preceding sections provide recommendations for people who have ADHD, autism spectrum disorder, learning disabilities, limited mobility, low vision, chronic health, or are deaf or hard of hearing; each disability experience provides a different lens through which to examine the clinical learning and working environment. As for the relevance of those recommendations, the authors themselves represent the lived experiences of people with disabilities who have innovated and adapted successfully to healthcare systems of education and practice by collaborating with DRPs, educators, clinicians, and colleagues. Many environments previously thought inaccessible, including emergency care and operating rooms, have been shown to be otherwise, particularly with the engagement of simulation resources for preparation. We note that many of these accommodations contribute to universal access principles by increasing access for patients with disabilities as well. These authentic solutions, far from exhaustive in their creativity, provide solid evidence that the healthcare education system can and must be made accessible to people with disabilities.

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