



SOUND|ERGONOMICS

6830 NE Bothell Way Suite C-236, Kenmore, WA 98028
(206) 41-8151 www.soundergonomics.com

ULTRASOUND PRODUCT EVALUATION FOR OAKWORKS MEDICAL

Product: Multispecialty Ultrasound Exam Table

Discussion

Ergonomic design incorporates anthropometric data and the adjustability of workstation equipment. To accommodate multiple users, equipment should be adjustable to fit the physical dimensions of 90% of the user population with the lower limits of adjustability chosen to fit the 5th percentile female and the upper limits to fit the 95th percentile male. The largest differences in physical dimensions are related to gender, age, and ethnicity.¹ A broad range of adjustability will fit the largest population of users. Information on the anthropometry of populations from different countries varies in its thoroughness. Data on a number of countries, such as South America, Africa, Russia and some Far Eastern populations, are incomplete. The majority of data from the United States has been collected on military personnel and are used for the basis of design comparisons.² For the purposes of equipment design, the differences in anthropometric data from this population to other user populations may not be significant.

Overall design of an ultrasound exam table should incorporate features that allow for multiple adjustments, ease of mobility and accessible brakes that are quickly activated. Ultrasound exam tables are not designed to be transport stretchers; however, the features of the table should allow the sonographer to quickly position the exam table within the exam room in order to achieve the most comfortable work position. There should be no features that interfere with positioning the patient close to the user or positioning the ultrasound system close to the table.. The table should be designed to be used by the sonographer in both seated and standing positions with a wide range of height adjustability. Additional, exam-specific features should be available which will allow the user to adapt the table for a variety of different exam specialties.

Product Evaluation

An ergonomic evaluation of the Oakworks multispecialty ultrasound exam table was performed using The Industry Standards for the Prevention of Work-Related Musculoskeletal Disorders in Sonography.¹ This allows for an objective review of exam table features as they relate to the accepted standards for this profession and not as they compare to other exam tables in the industry.

Exam Table Assessment:

EVALUATION FACTOR	Yes	No	N/A or Not eval'd
Height adjustability			
1. Low enough to allow patients to get on & off unassisted	X		
2. Height range allows user to maintain arm abduction less than 30 degrees	X		
3. Allows user to alternate sitting & standing during the exam	X		
4. Maneuverable and full-wheel mobility	X		
5. Easily operated wheel locks	X		
ACCESSIBILITY			
6. Open access from all sides	X		
7. Table support & frame do not interfere with minimal user reach/arm abduction	X		
8. Side rails do not extend beyond the table top	X		
9. User can place knees and/or feet underneath	X		
10. Dropping footboard & retractable foot rests	X		
11. Drop away/cut-out section for cardiac apical access			X
CONTROLS			
12. Controls are electronic	X		
13. Controls are accessible	X		
14. Controls are easy to use	X		

OTHER OPTIONS			
15. Trendelenburg/reverse Trendelenburg	X		
16. Fowler capability	X		

In addition to the above, the exam table was also evaluated for appearance, patient comfort and safety and user interface.

Observations

The Oakworks multispecialty ultrasound exam table exceeds all the industry standards as defined above. A number of additional observations are discussed below.

Overall appearance/design:

This table has a very sleek and uncluttered appearance. One feature that is impressive is the dual tower design, which ensures stability of the table and flexibility in its range of adjustability. The mattress extends to the edge of the table top frame and does not taper down to the frame. This feature allows the user to position patients on the edge of the table and allows room for arm support cushions for the sonographer.

A patient can be positioned with his/her head at either end of the table. This feature is important for optimal patient access and reducing sonographer reach and arm abduction.

Locking mechanisms:

This table has both central locking casters and individual wheel locks (all operated by foot) as standard features. These allow the sonographer to choose the locking mechanism that is the most accessible during patient transfer and for re-positioning the table during an exam. The central locking mechanism is beneath the table which keeps it out of the way of anyone walking around the table. It is accessible in all but the lowest position of the table; however, a slight extension of the mechanism's foot bar will allow access in this position.

Height range:

This range is from 22" to 38", which is very generous. The lowest position allows for easy patient access, both from a standing position and from a wheelchair. The range up to 38" allows the sonographer to position the table so that his/her arm abduction can be minimized regardless of the type of exam. This height is also important when the exam table is used during ultrasound-guided interventional procedures. An extensive height range allows sonographers to alternate between standing and sitting throughout each exam. It also accommodates the height range of the majority of sonographers working in a facility.

Electric controls:

Table height, Trendelenburg and reverse Trendelenburg and Fowler are all controlled electrically. A hand switch controls all 3 positions and a foot switch controls Fowler and table height. The availability of both control devices allows the sonographer to have one device on each side of the table for the quickest, easiest access. Table height adjustability, available on both controls, is the most important for sonographer access to the patient and for reducing injury risk factors. If this control is manual or is not easy to reach, sonographers will not take the time to make height adjustments, and this feature no longer contributes to the ergonomics of an exam table.

Of note, was the fact that the floor clearance of the table was enough so that the table could be moved over the foot control. If this was not the case and the control obstructed the movement of the table within the exam room, it might be removed from the exam table and, therefore, not used by the sonographers.

The addition of slots in the table frame at various locations will aid in positioning the hand control so that it is easily accessible to the sonographer and out of the way during the exam.

Mobility:

The exam table was moved around within a simulated exam room space, on linoleum and on carpet, with and without a “patient” on it. The table moves freely on both surfaces, with and without weight. Control of the table will be easier with the planned addition of some type of handle or finger slots.

Patient positioning/accommodation:

The upper section of the table has 2 adjustable panels, one on each side of the table that can be raised for support of the patients when they are in lateral decubitus positions or posterior oblique positions. This feature also allows the sonographer to step into the open space created by raising the panel and, thus, be closer to the patient. Each panel has 4 different angles of adjustment which will accommodate a variety of exam types.

The table width is 30”, which will accommodate a wide range of patient sizes. The table lift and load capacities are the same at 600 lbs. This is an extremely important feature since a table that will not lift as much weight as it can hold, cannot be adjusted in height during the ultrasound exam to reduce either sonographer arm abduction or trunk bending to reach the patient. A load capacity that is higher than the lift capacity detracts from the ergonomic design of an exam table used for ultrasound and/or interventional procedures.

Side rails:

These are designed to fold under the table frame so that they do not obstruct access to the patient. They are low enough so that they can be up in place during an exam and not cause excessive sonographer reaching and/or arm

abduction. The design of the side rails and their position on the table frame allow the patient to use them for support when the table is moved into reverse Trendelenburg.

Footboard/foot supports (stirrups):

The footboard on this exam table is manually controlled and can be adjusted at different angles to the table. This feature, along with the Fowler, Trendelenburg and reverse Trendelenburg controls, makes it possible for multiple patient positions – both for better access by the sonographer and for patient comfort. The foot supports (stirrups) have a long extension and wide range of sideways rotation. The footboard can be raised while the supports are extended which is ideal for patient comfort and re-positioning. Proposed minor changes in the configuration of the actual foot rest will add to patient comfort when the foot supports are in use.

Other features:

- a) Paper roll holder – This feature is excellent in its design. It is recessed under the head of the table frame which eliminates any obstruction to patient access from the head of the table. The holder can also be folded down against the table and, thus, be completely out of the way if it were not in use.
- b) Head rest – This item can easily be attached to the head of the table, both for patient comfort and for access to the patient's neck. Its design allows it to be used when the patient is in either a supine or prone position.
- c) T-rails – This feature can be attached at a number of locations on the table frame and can support the addition of different items, such as an I.V. pole or a Shoulder Assist device. Another possibility is the attachment of a stand (or shelf) that could be positioned partially over the patient and used to hold a hand-carried ultrasound system or a procedure tray. The sonographer or physician could position this stand so as to reduce or eliminate the need to reach or twist to access the ultrasound system or the tray. Because the t-rail can be easily removed, these items can be added only when needed and do not have to be permanently attached to the table frame.

Conclusions

We found this exam table to be outstanding in its design, ergonomic features and user interface. An ergonomic exam table is a pivotal piece of the ultrasound exam room workstation and should be easy and quick to adjust, factors which ensure that it will be used to its full capacity. We found the features of this exam table exceeded not only the industry standards but our expectations of how we could position this table for a variety of ultrasound exams.

Submitted by: Carolyn T. Coffin, MPH, RDMS, RVT, RDCS
CEO & Consultant, Sound Ergonomics, LLC
Joan P. Baker, MSR, RDMS, RDCS
President & Consultant, Sound Ergonomics, LLC

References:

1. Society of Diagnostic Medical Sonography, Industry Standards for the Prevention of Musculoskeletal Disorders in Sonography, 2003:2.
2. Kroemer K, Grandjean E. *Fitting the Task to the Human. A Textbook of Occupational Ergonomics*. 2nd ed. Philadelphia: Taylor & Francis, Inc; 1997.
3. Salvendy G. *Handbook of Human Factors and Ergonomics*. New York; John Wiley & Sons, Inc; 1997.