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Susan Murphey knows tables! Medical imaging exam tables, that is. A PSHFES member and Community Projects Chair, Susan is also President of Essential Ergonomics, a healthcare consulting firm. She recently completed a product development project with Medical Positioning, Inc. to design an ergonomically-friendly exam table for diagnostic medical sonography. The Soneva™ table was designed specifically to address the ergonomic issues faced by radiology-based sonographers, who perform a variety of exams ranging from obstetrics and gynecology to abdominal, vascular and superficial structures. Studies indicate a 90% injury rate among sonographers, mostly attributed to awkward and sustained postures, excess force, reach and shoulder abduction.

PSHFES recently interviewed Susan about her experience working with the table's designers:

**PSHFES:** How did you get involved in the design of the table?

**Susan Murphey:** I was contacted by Medical Positioning. The company had been recently bought by Ruben Salinas, and he was interested in taking the company in new directions, including a specific emphasis on sonographer ergonomics. My work in ultrasound ergonomics was known by their Clinical Coordinator, Debra Fulps, and she recommended me to the new President of the company.

**PSHFES:** What process did you use to decide on the important ergonomic features of the design?

**SM:** I have done extensive research over the past 10 years on the mechanism of injury among diagnostic medical sonographers, including several research projects published in peer reviewed journals. Using a combination of those results, empirical knowledge of the science of ergonomics, and direct experience having spent more than 20 years as a Diagnostic Medical Sonographer, I was able to incorporate ergonomic features specific to each type of exam likely to be performed using the table.

**PSHFES:** Was there any resistance from the designers to incorporating ergonomics features, and if so, how did you get past that?

**SM:** I was extremely fortunate with Medical Positioning's commitment to the project. So often there are conflicting priorities between design engineers, the price point and the end user's needs, that ergonomics ends up being compromised. While we had to be sensitive to cost in order to have a marketable product, the design group was fully committed to the ergonomic focus of this project, so that there was no resistance to my insistence on developing ergonomic solutions for the variety of work tasks the table would be used for.

**PSHFES:** What was the design process like? Were there early prototypes, testing, etc.?

**SM:** I have been involved in numerous product design consulting projects and this, by far was the most open and interactive group I have ever worked with. Often companies will work behind the scenes and

then have me come in and review the product, either at various stages along the way or at the completion of the process. With Medical Positioning, I was intimately involved in every aspect of development from Day 1.

The project began by having me visit their facility in Kansas City, Missouri and perform an extensive evaluation and assessment of their current line of ultrasound exam tables. A report was generated with recommendations for aspects of their current designs felt to be lacking in ergonomic value. This was followed by a discussion with Medical Positioning's Design Team for beginning concept development on a new table. I had bimonthly conference calls with the Design Team and the President of the company, with many CAD drawings and emails sent back and forth in between discussions. I flew to Kansas City roughly every six weeks to meet with the team in person and review the progress, including early prototypes. One of the advantages I brought to the project along with my ergonomics expertise was my clinical experience in diagnostic ultrasound. I had done all the types of ultrasound studies that we were designing the table for. In August, about three-fourths of the way through the process, we put together a focus group of clinical sonographers and had them review the table and provide comment. This was extremely helpful in confirming the direction of the project. We were on the right track.

**PSHFES:** How long did the whole process take?

**SM:** Once we started the project, they turned most of their attention toward solely working on the development of the Soneva™ Table, so we were able to really streamline the process; start to finish was about eight months...unheard of! The final prototype was completed in early October. I made one more trip to Kansas City to review it prior to product launch. The Soneva™ Table was released at the national Society for Diagnostic Medical Sonography annual conference in mid-October. The response from sonographers was overwhelmingly positive.

**PSHFES:** What specific ergonomic features are in the table? What issues do they help to overcome? What do you expect the impact will be on preventing injuries?

**SM:** The Soneva™ Table is designed for what is referred to as the "General Imaging" ultrasound lab. These labs are usually part of the radiology department of hospitals or stand alone clinics. The types of studies performed in these labs both differ and overlap those exams performed in cardiology-based labs (echocardiography) or vascular-based labs. They are often performing a large variety of exam types, each with its unique set of ergonomic challenges. Many table manufacturers attempt to accommodate the ergonomic challenges by combining features from cardiac or vascular tables rather than designing something specifically for the general lab, or facilities will simply purchase a transport stretcher for their ultrasound labs, which was designed for something else entirely.

The highest risk for injury among general lab sonographers is to the shoulder and neck, followed by hand and wrist, primarily due to sustained awkward postures, excess reach, abduction, applied force and grip force. The Soneva™ allows sonographers to access the region of interest more easily, reducing awkward postures, reach and abduction through improved patient positioning, access and adjustability.

**PSHFES:** How about impact of table design on the quality of the examination?

**SM:** Since the ability to obtain diagnostic information is dependent on obtaining suitable imaging windows, optimizing patient positioning for access to the area of interest is valuable in streamlining the duration of the procedure, thereby reducing sonographer struggle time, improving productivity and minimizing exposure to risk factors for sonographer injury. Improving access to imaging windows also stands to improve the diagnostic quality of the exam. Additionally, improved imaging windows obviates the need for some of the applied force required to obtain an image, so will potentially address issues of excess applied force and grip force as well.

**PSHFES:** Anything else to share about working on a design project that might be interesting for other ergonomists or companies thinking about bringing in an ergonomist to help with design?

**SM:** I think it's critical to get end user input on any product design project. Medical Positioning was fortunate, in that I brought both ergonomic design experience and sonography experience to this project. But I've seen product design work that had great merit from an engineering standpoint, but lacked usability, because they failed to consult the end user during the design process. There is also often a disconnect between the engineer doing the design work, the marketing communications of the product and the applications training at installation. You can have the best product in the world, but if they don't know how to use it, it's of no benefit. I would strongly advise all companies considering having an ergonomist involved in the design of a project to also be sure their sales and applications personnel fully understand the ergonomic concepts designed into the final project, in order to be able to assist their customer in fully utilizing the benefits of the ergonomic design.

To see the results of Susan's work, visit [www.sonevatable.com](http://www.sonevatable.com) and check out this unique ultrasound exam table.

