Our Future: Deskilled or Super-Skilled?

Portable Ultrasound Use in Vascular Access: Deskilling or Super-Skilling?

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Central venous access in humans dates back to the early 20th century. Although no clinical applications were known at the time. Almost two decades later, in 1929, Forssmann accessed a cadaver heart (*Acta Anaesthesiol Scand Suppl* 1985;81:7-10). Before the 1970s, most central venous catheters were inserted through peripheral extremity veins. Internal jugular venous access became popular in the 1980s (*Acta Anaesthesiol Scand Suppl* 1985;81:7-10).The percutaneous insertion of a central venous catheter is an art perfected with gross anatomy knowledge and surface anatomy pearls; the technique is safe and efficient and complications are rare.

Ultrasound (US) guidance for central venous insertion was initially reported in the 1980s. It was used in patients with a history of failure or difficulties, unclear surface anatomy (e.g. obesity, burns), uncorrected coagulopathy, and neonates (*JPEN J Parenter Enteral Nutr* 1987;11:505-6; *Br J Anaesth* 1999;82:822-6). Initial use of US was often limited to vein localization with Doppler or US image, followed by blind needle stick. Real-time US guidance gradually gained popularity with advances in technology that made portable ultrasound machines smaller and more affordable. Accessories like sterile sleeves and gel availability made it easier for clinicians to adopt this technique. There is a significant body of literature showing that real-time ultrasound guidance has a higher first-attempt success rate, is less time consuming, reduces arterial puncture rate, and has a higher overall success rate when compared with methods using surface landmarks only (*Anesthesiology* 2020;132:8-43; *J Clin Monit Comput* 2015;29:177-82). In the latest recommendations published last year (2020) the ASA task force on central venous access also advocated for the use of ultrasound guidance, both static and/or real-time, for vessel localization, proof of patency, needle stick, and wire position (*Anesthesiology* 2020;132:8-43). In the view of mounting literature, hospitals across the U.S. have gradually adopted policies that either recommend or make it compulsory to use US guidance for central line placement, especially when using internal jugular or subclavian approaches.

Another advantage of ultrasound use is the visual aid it provides for teaching, as both the teacher and the learner have the same "visual information" compared to surface landmark-based teaching, which limits the tactile and palpation clues to the "operator only." According to the World Congress on Vascular Access, teaching with use of ultrasound is highly recommended (*Br J Anaesth* 2013;110:347-56). The use of ultrasound-guided teaching is part of the curriculum in residency programs across the nation. And today, residency graduates are well-versed at ultrasound use for vascular access. There is no research at this point that shows if residents trained with ultrasound-guided central vascular access can comfortably perform this procedure without it.

The frequent use of ultrasound has refined the skills and increased clinicians' comfort level with this technology. This fact has resulted in frequent use of ultrasound in routine and/or challenging arterial access. Ultrasound guidance is routinely used in the pediatric and neonatal population for arterial access as well as peripheral venous access in chubby children where baby fat rolls impair vein visibility (*Paediatr Anaesth* 2020;30:108-15). Also, in adult patients, ultrasound use for difficult peripheral venous access has increased in the last decade (*Ultrasound J* 2019;11:27).

The portable ultrasound has morphed into the pocket ultrasound in the last few years. Ultrasound probes, both wired and wireless, pair with omnipresent smartphones and tablets. These probes are cheap and can be easily and safely carried in personal luggage. This has revolutionized the access to ultrasound, and practitioners in low- to middle-income countries now have access to this useful technology in their everyday clinical practice. This technology, and the skill and expertise to use it, is only going to get better every day.

Now the question arises, if clinicians are using ultrasound guidance as a standard to obtain central venous access, can it be "deskilling" their ability to perform the procedure if this visual aid is not available? For centuries, map reading skills were an essential part of travel and navigation, but the technology of GPS in cars and smartphones has made paper maps obsolete and map-reading skills unnecessary. The technological revolution has the ability to change the paradigm and bring new meaning to "normal." Today, skills like driving a car are challenged by self-driving cars, and dates are decided by a swipe to the right or left – all because of new and innovative technology. Availability and familiarity with technology enhances skills and leads to innovation. In the OR of today, anesthesiologists are using ultrasound to confirm endotracheal tube position and bilateral lung ventilation, diagnose pneumothorax, epidural placement, nerve block placement, and to confirm peripheral intravenous catheter status (*Paediatr Anaesth* 2017;27:821-6). There is no limit to what tomorrow will bring. Although ultrasound may be deskilling us, it is such a versatile tool in skilled hands that there is no turning back.

Driving a car is not just the shifting of gears, but also road sense, judgment, traffic etiquette and rules, and many other factors. So is it likely true for vascular access; if forced in a situation, clinicians will probably prevail with their basic anatomy knowledge, clinical skills, and judgment. Ultrasound is a tool that complements the knowledge and skills of today's clinicians and is an inevitable aspect of the present and future of modern medicine. ■

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