

10 tips for portable ultrasound in remote locations.

By Dr. Ben LaBrot

1. To give yourself the best possible results and to protect your equipment in remote settings, make sure you **bring the right gear and treat it right!**


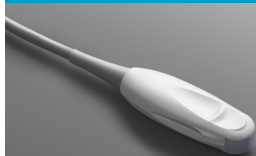


Our hand-held ultrasound machines travel nested in foam in hard cases (we use Pelican cases). Weight and volume are often limited when traveling to remote locations—you may have to carry your equipment in a small plane or boat (or carry it on foot) so pick a case that is **lockable, watertight and impact resistant**, but the lightest and lowest profile case that will fit your machine. I use our Pelican case as a seat when scanning patients lying at floor level. Inside the dim, unlit homes where I frequently scan, screen glare is not often a problem, but when scanning outside, remember to **face your machine away from the sun** so you will be able to see the screen.



Pack your accessories (gel, ultrasound wipes, spare probes, spare batteries) in the same case to ensure you have all your supplies together and **easy to access** wherever you end up carrying your machine. If you will be working in an area with no electricity, make sure you know in advance how many exams can be done on one charge (test this with a full battery), and **bring enough spare batteries to last your whole clinic**. If the deployment is extended, consider bringing a small generator, car battery and inverter, or solar power source to charge your machine. Remember, if you have a vehicle with a battery, a 12V→110 inverter can be used to charge your ultrasound from your car, boat, or plane. **Always be mindful of your power use**—turn off the ultrasound when not in use!

Bring extra gel (remember that ANY gel can work in an emergency; we have used gel hand sanitizer, and once, even grape jelly to scan effectively), sterilizing wipes, and a roll of paper towels (you can tuck them into your patients' waistbands to protect their clothes from the gel). Don't forget to **bring a tarp and some string** if you will need to rig up a private ultrasound scanning room in the middle of the jungle!

Pick your probes for maximum variety of exams and prioritize exams that will probably be more common (pre-natal scans are by far the most common in remote primary care). We carry the following 4 probes with our SonoSite Edge, allowing us to **conduct a wide array of exams**, from the ever-present prenatal scan to the rarer orbital scan or visualization of the brachial plexus:

C60x	C11x	P21x	HFL38x
			
Abdominal, Gynecology, Musculoskeletal, Nerve, Obstetrics	Abdominal, Cardiology, Neonatal, Nerve, Vascular	Abdominal, Cardiology, Obstetrics, Orbital, TCD	CIMT, Musculoskeletal, Nerve, Small Parts, Vascular, Venous

Hope this helps as you prepare your kit for the field! Don't forget to **brush up on any exams** that you expect will be common and try and **research what conditions you are likely to encounter**. Happy scanning everyone!



2. Most pregnant women you will encounter with your ultrasound in remote rural settings REALLY want to know the gender of their baby. To give yourself the best chance of a clear view, get the woman to eat or drink something sweet (like orange juice) an hour beforehand to make the baby move around a bit more.
3. Move heaven and earth to **create a private area to conduct your scan**—preferably in the patient’s home, where they will feel the most comfortable, but use tarps, have your helpers hold up sheets for ten minutes, go behind a hedge, etc. if a private area is simply not possible. You can do a lot of ultrasound exams, including prenatal, with the patient seated in a chair with only the belly exposed if this is acceptable to the patient. However, **always work to maximize your patients’ privacy**—for example, if conducting a pre-natal scan in a chair, drape a towel or cloth over the exposed belly and manipulate the probe under the towel so no part of the patient is ever exposed to view.
4. You can usually visualize the ovaries very well using a normal abdominal probe, and forego the invasive vaginal probe unless you really need to look at the cervix. Locate the bladder in the midline externally, and simply slide the probe left or right to obtain great longitudinal views of the ovaries. In remote rural populations, anything you can do to make your exams or procedures less invasive while still effective helps **build trust and increases patient compliance**. Remember, you can always do a subsequent transvaginal scan if needed, but many ovarian pathologies can be identified or excluded by external viewing.
5. **Keep the tube of gel in your pocket to keep it warm**, ALWAYS ask the patient if it is the first time they have had an ultrasound exam, and ALWAYS explain what you are going to do before you do it. **Reassure them that their exam should not hurt at all**, and position the screen so the patient can see. Most developing world patients who have experience with health care expect a certain ‘heavy handedness’ and brusqueness from their doctors, so explain what you are looking at, what you are doing and why. Going to the doctor can be scary even for a population with a high baseline health knowledge; imagine what it may be like for a patient with very low health knowledge when you start unpacking all kinds of complicated-looking equipment and then tell them to lie down and lift up their shirt.
6. To speed your exclusion of placenta previa, remember this handy rule of thumb: **if ANY part of the placenta touches the top of the uterus, there can be no previa**.
7. For a good view of the heart from the subxiphoid location, you can **take advantage of the liver’s great ability to transmit sound waves**. Place the probe slightly to the right of the xiphoid process, and adjust your depth to look past the liver to the heart. Remember to try and **keep your probe in parallel with the plane of the patient’s body**, and lower than the costal margin when viewing the heart.
8. In settings where general anesthesia support is unavailable, **ultrasound-guided nerve blocks can achieve anesthesia over a potentially large body region** for complicated wound repairs, burn debridement, orthopedic reductions and operations. The use of ultrasound in this context can decrease the number of needle sticks and greatly increase the effectiveness of regional anesthesia.
9. **Estimating blood loss when laboratory hemoglobin is not available can be done by measuring the IVC diameter**. After losing a pint of blood, patients’ IVC expiratory diameter reduces (on average, in a study by Lyons and Brannman in 2005) from 17.4mm to 11.9mm. Another study by Yanagawa et al. (2007) found that trauma patients presenting with shock and initially responding to resuscitation, and with a smaller IVC diameter (avg. 6mm) were more likely to drop their BP again compared to those with a larger IVC diameter; this was found to be a better predictor than heart rate. Multiple ultrasound measurements of IVC in trauma patients can be useful to get a sense of blood loss over time.
10. When planning to save images in a remote setting so you can send them for specialist review when you return to base, **be sure to take LOTS of images**, and take the time you need to make sure you get the best images possible! A picture is worth a thousand words, but only if the picture shows enough for your consulting docs to work with. Always remember that you can’t just send the patient back down the hall for another scan when they live at the top of a jungle-covered mountain or far away through a maze of mangrove islands and rough seas.