

Portable Ultrasound

Guide to Selection

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PORTABLE ULTRASOUND

Although diagnostic ultrasound has a wide variety of uses important for maternal and fetal health, it is rarely available in low-resource settings. Full-size ultrasound machines are both prohibitively expensive and quite large, making them impossible to take them into community settings. In recent years, the development of portable, compact ultrasound technologies have allowed health workers in smaller clinics and community settings to use this valuable tool in maternal and fetal health. As with full-size ultrasound machines, portable ultrasound machines have broader applicability beyond maternal and fetal health as they can be used to diagnose a variety of medical conditions. Thus far, there are few published studies on the use of portable ultrasound in low-resource settings and so the public health benefit, while implied, cannot be quantified at this time.ⁱ Because ultrasound only offers the means to detect health concerns, it is only effective if additional resources exist to treat the conditions identified.

Caution must be taken with the expansion of ultrasound into community settings to ensure that the devices are not being used for sex selection and female feticide.ⁱⁱ Currently, some countries ban the use of portable ultrasound or outlaw its use outside of approved health facilities. Devices that include a locking mechanism or system password may help prevent them from unauthorized use or removal from a facility.ⁱ Many existing portable devices offer password protection that is only intended to guard patient data and the devices can still be used without logging into the machine. Further, the small size of handheld devices prevents the installation of a locking mechanism. Therefore, clinics should take care to secure the equipment when it is not in use.

Portable ultrasound devices range in price from about US\$3,600 to US\$20,000. In addition to the cost of the machine, there are a number of other costs associated with ultrasound. Although a few portable ultrasound devices do come with a transducer (probe) included, transducers must often be purchased separately. Because transducers are designed for specific clinical applications, there are a variety of transducers available for each machine and the user will need to have the appropriate transducer for the intended clinical application. A transducer intended for abdominal or obstetric applications may cost an additional US\$1,500 to US\$2,500. Further, ultrasound requires the use of specific kinds of conductive gel to conduct

sound waves between the transducer and the patient's skin. Although the gel is not a significant operational cost, it must be available in order to prevent the use of locally available substances which can damage the transducer. Many battery-powered health technologies, including portable ultrasound, use lithium-ion (Li-ion) batteries. Li-ion batteries are the newest rechargeable battery technology on the market and changes and improvements have been occurring relatively quickly over the past 20 years. While considered to be the highest-quality rechargeable battery, they have a mid-range life cycle, are expensive to replace, and age more quickly at higher temperatures.^{iii,iv} Further, frequent power outages can have a significant impact on the lifespan of portable ultrasound devices.^v Training of staff to use ultrasound is also necessary. Doctors or midwives will require about two to three weeks of training to be able to conduct basic obstetric measurements using ultrasound.ⁱ

In a 2009 article, Harris and Marks defined important factors for portable ultrasound use in low-resource settings. These factors are outlined in the following summary of portable ultrasound technologies.ⁱ

This guide contains commercialized portable ultrasound devices available on the market today. The devices are organized by price

ⁱ Harris RD, Marks WM. Compact ultrasound for improving maternal and perinatal care in low-resource settings. *J Ultrasound Med.* 2009; 28: 1067–1076.

ⁱⁱ Ganatra B. Maintaining access to safe abortion and reducing sex ratio imbalances in Asia. *Reproductive Health Matters.* 2008;16(31, Supplement 1):90–98.

ⁱⁱⁱ Tyco Electronics. Comparison of NiCd, NiMH, and Li-Ion Batteries (White Paper). Available at: http://www.portal.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_408078_0_0_18/ECR-5892D%20NiCd%20NiMH%20Li-Ion.pdf. Accessed October 8, 2013.

^{iv} Battery University. Lithium-Based Batteries. BatteryUniversity.com. Available at: http://batteryuniversity.com/learn/article/lithium_based_batteries. Accessed October 8, 2013.

^v Seffah JD, Adanu RM. Obstetric ultrasonography in low-income countries. *Clinical Obstetrics and Gynecology.* 2009;52(2):250–255.

Permission granted from the manufacturers for all included photographs.

VSCAN



Basic information

Manufacturer	GE Healthcare
Link	https://vscan.gehealthcare.com/
Manufacturer description	A pocket-sized visualization tool with ultrasound technology, GE Healthcare's Vscan can help redefine the physical exam.
Characteristics applicable to low-resource settings	Very lightweight and durable. Rechargeable Li-ion batteries for 1.5 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. AC charging only. Export scans only to PC with Windows XP or higher.
Features	Single transducer (probe) of 1.7–3.8MHz. On-screen display available in several languages including French and Spanish. Multiple medical applications beyond obstetrics. Images can be downloaded to a Windows-based PC.
Pre-/post-sales support	Yes
Approximate price	US\$7,900

Characteristics for use in low- resource settings	Lightweight (<10 lbs.)	✓
	Durable	✓
	Handheld transducer (2–5MHz) and ultrasound	NO
	Accurate measuring calipers on screen	✓
	Rechargeable batteries	✓
	Password protection on device (to protect patient data)	NO
	Locking mechanism on device (to prevent unauthorized use)	NO
	Service or maintenance available	✓

DP50

Basic information	Manufacturer	Mindray
	Link	http://www.mindray.com/
	Manufacturer description	A superior black and white ultrasound system that allows you to do more in less time without compromise in the quality of diagnosis. Designed as a stepping-stone into the world of ultrasound, DP-50 will meet your needs for general practices while maintaining your budget.
	Characteristics applicable to low-resource settings	Durable, but weighs 16 lbs without battery. Rechargeable Li-ion batteries for 2 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world.
	Features	Transducers (probes) sold separately. Multiple medical applications beyond obstetrics. On-screen display available in several languages including Chinese, French, Spanish, Portuguese. Has 320G integrated hard drive, USB ports for transferring images.
	Pre-/post-sales support	Yes
	Approximate price	US\$8,000
Characteristics for use in low-resource settings	Lightweight (<10 lbs.)	NO
	Durable	✓
	Handheld transducer (2–5MHz) and ultrasound	✓
	Accurate measuring calipers on screen	✓
	Rechargeable batteries	✓
	Password protection on device (to protect patient data)	NO
	Locking mechanism on device (to prevent unauthorized use)	NO
Service or maintenance available	✓	

MOBIUS SP1



Basic information

Manufacturer	Mobisante
Link	http://www.mobisante.com/
Manufacturer description	The world’s first smartphone-based ultrasound imaging system. This award-winning system, cleared by the Food and Drug Administration, brings ultrasound imaging within reach of health care professionals everywhere, helping health care professionals practice better medicine and reduce costs.
Characteristics applicable to low-resource settings	Very lightweight and durable. Rechargeable Li-ion batteries for 1.5 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. Export scans to PC with Windows 7, XP, or Vista.
Features	Mobisante works with nonprofits on discounts. Device has been tested in many low-resource settings. Comes with one transducer (probe). Scans can be transferred to PC via cellular, wireless, or USB connection. Supports charging from batteries, solar cells etc. via USB port, for “off the electrical grid” charging. Multiple medical applications beyond obstetrics. Password-protected MicroSD card for protection of patient data.
Pre-/post-sales support	Yes
Approximate price	US\$7,500

Characteristics for use in
low-resource settings

Lightweight (<10 lbs.)	✓
Durable	✓
Handheld transducer (2–5MHz) and ultrasound	✓
Accurate measuring calipers on screen	✓
Rechargeable batteries	✓
Password protection on device (to protect patient data)	✓
Locking mechanism on device (to prevent unauthorized use)	NO
Service or maintenance available	✓

MOBIUS TC1



Basic information

Manufacturer	Mobisante
Link	http://www.mobisante.com/
Manufacturer description	A tablet-based imaging system. This system, cleared by the Food and Drug Administration, brings high-resolution ultrasonic imaging within reach of health care professionals everywhere, helping health care professionals practice better medicine and reduce costs.
Characteristics applicable to low-resource settings	Lightweight and durable. Rechargeable Li-ion batteries for 4 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. Export scans to PC with Windows 7, XP, or Vista.
Features	Mobisante works with nonprofits on discounts. Comes with one transducer (probe). Scans can be transferred to PC via USB connection or emailed via wireless. AC charging only. Multiple medical applications beyond obstetrics.
Pre-/post-sales support	Yes
Approximate price	US\$8,000

Characteristics for use in
low-resource settings

Lightweight (<10 lbs.)	✓
Durable	✓
Handheld transducer (2–5MHz) and ultrasound	✓
Accurate measuring calipers on screen	✓
Rechargeable batteries	✓
Password protection on device (to protect patient data)	✓
Locking mechanism on device (to prevent unauthorized use)	NO
Service or maintenance available	✓

WED-3100



Basic information	Manufacturer	Shenzhen Well.D Medical Electronics Co., Ltd.	
	Link	http://www.welld.com.cn/	
	Manufacturer description	Not available	
	Characteristics applicable to low-resource settings	Lightweight and durable. Rechargeable Li-ion batteries for 3 hours of use. Li-ion batteries are high cost and are not readily available in all parts of the world. Export scans to PC.	
	Features	Comes with one transducer (probe). Standard AC charger and car charger. Multiple medical applications beyond obstetrics. On-screen display available in Chinese and English.	
	Pre-/post-sales support	Yes	
	Approximate price	US\$3,600	
Characteristics for use in low-resource settings	Lightweight (<10 lbs.)		✓
	Durable		✓
	Handheld transducer (2–5MHz) and ultrasound		✓
	Accurate measuring calipers on screen		✓
	Rechargeable batteries		✓
	Password protection on device (to protect patient data)		NO
	Locking mechanism on device (to prevent unauthorized use)		NO
Service or maintenance available		✓	

ACUSON P10

Basic information	Manufacturer	Siemens
	Link	http://www.healthcare.siemens.com/
	Manufacturer description	The ACUSON P10 ultrasound system is the first pocket ultrasound device—a handheld diagnostic and screening tool designed for physicians, nurses, emergency medical technicians, and clinical professionals.
	Characteristic s applicable to low-resource settings	Very lightweight and durable. Rechargeable Li-ion batteries for 1.5 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. AC charging only. Export scans to PC.
	Features	Single transducer (probe) of 2–4MHz. On-screen display available in several languages including French and Spanish. Comes with two battery packs.
	Pre-/post-sales support	Yes
	Approximate price	US\$9,000
Characteristics for use in low-resource settings	Lightweight (<10 lbs.)	✓
	Durable	✓
	Handheld transducer (2–5MHz) and ultrasound	✓
	Accurate measuring calipers on screen	✓
	Rechargeable batteries	✓
	Password protection on device (to protect patient data)	✓
	Locking mechanism on device (to prevent unauthorized use)	✓
Service or maintenance available	✓	

SIGNOS RT



Basic information

Manufacturer	Signostics
Link	http://www.signosticsmedical.com/
Manufacturer description	Signos RT Personal Ultrasound, the world's most-affordable, simple-to-use, palm-sized ultrasound instrument.
Characteristics applicable to low-resource settings	Very lightweight and durable. Rechargeable Li-ion batteries for 2 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. Can be charged with AC, USB, or car charger. Export scans to PC.
Features	Comes with one transducer (probe) of customer's choice. Multiple medical applications beyond obstetrics. Password protected MicroSD card for protection of patient data.
Pre-/post-sales support	Yes
Approximate price	US\$6,500

Characteristics for use in low-resource settings

Lightweight (<10 lbs.)	✓
Durable	✓
Handheld transducer (2–5MHz) and ultrasound	✓
Accurate measuring calipers on screen	✓
Rechargeable batteries	✓
Password protection on device (to protect patient data)	✓
Locking mechanism on device (to prevent unauthorized use)	NO
Service or maintenance available	✓

NANOMAXX®



Basic information

Manufacturer	SonoSite
Link	http://www.sonosite.com/products/nanomaxx#accessories
Manufacturer description	Simple control, high-quality diagnostic imaging, color power Doppler, and color-flow velocity, the NanoMaxx® ultrasound system helps physicians make clinical decisions or guide interventional procedures.
Characteristics applicable to low-resource settings	Lightweight and durable. Rechargeable Li-ion batteries for 2 hours of continuous scanning. Li-ion batteries are high cost and are not readily available in all parts of the world. AC charging only. Export scans to PC or Mac.
Features	Transducers (probes) sold separately. Device has kickstand for tabletop use. Designed per military specifications for durability. Multiple medical applications beyond obstetrics. SonoSite offers the SoundCaring program which provides US- or Canadian-based charitable organizations that meet program guidelines with remanufactured NanoMaxx systems for use in low-resource settings around the globe. Program provides the systems for free, but organization must buy one transducer (probe).
Pre-/post-sales support	Yes
Approximate price	US\$19,000

Characteristics for use in
low-resource settings

Lightweight (<10 lbs.)	✓
Durable	✓
Handheld transducer (2–5MHz) and ultrasound	✓
Accurate measuring calipers on screen	✓
Rechargeable batteries	✓
Password protection on device (to protect patient data)	✓
Locking mechanism on device (to prevent unauthorized use)	NO
Service or maintenance available	✓

This guide to selection is part of a six-piece series of Survive and Thrive guides, including birthing and cesarean section simulators, continuous positive airway pressure (CPAP), fetal monitors, portable ultrasound, rechargeable lighting, and thermoregulation devices. You can search for any of these guides in the PATH Publications Catalogue at <http://www.path.org/publications/index.php>.

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