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Portable ultrasound technologies for estimating gestational age in pregnant women: a scoping review and analysis of commercially available models

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Portable ultrasound technologies for estimating gestational age in pregnant women: a scoping review and analysis of commercially available models

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ABSTRACT

Objectives: To identify all available studies assessing the use of portable ultrasound devices for pregnant women, with the specific aim of finding evidence for devices used to determine gestational age and their validity when compared to conventional ultrasound machines. We also wanted to determine what portable ultrasound models are commercially available for obstetric use.

Design: Systematic scoping review

Primary and secondary outcome measures: Extracted variables included study design, population, method of ultrasound measurement, devices used and whether studies formally validated accuracy against conventional ultrasound

Results: We searched four databases – Medline, Embase, CINAHL, and Maternal and Infant Care. In total 56 studies from 34 countries were identified; most were observational studies. Across all studies, 27 different portable ultrasound models (from 17 manufacturers) were evaluated. Twenty-one studies assessed use of portable ultrasound for evaluating fetal characteristics or estimating gestational age, and 10 of these were formal validation studies. In total, six portable devices have been validated for gestational age estimation against a conventional ultrasound comparator. The web searches identified 102 portable devices (21 manufacturers). These were a mix of handheld devices that connected to a phone or computer, or laptop-style portable ultrasound devices. Prices ranged from \$1,190 to \$30,000 USD and weight ranged from 0.9kg to 13.0kg.

Conclusion: While the number of commercially available portable ultrasound devices continues to grow, there remains a lack of peer-reviewed, quality evidence demonstrating their accuracy and validity when compared to conventional ultrasound machines. This review identified some models that may be useful in gestational age estimation in low-resource settings, but more research is required to help implement the technology at scale.

Trial registration: Registered via Open Science Framework (DOI: 10.17605/OSF.IO/U8KXP)

ARTICLE SUMMARY

Strengths and limitations of this study

- We applied a detailed and tailored search strategy to a wide range of data sources to identify as many relevant studies as possible, including a variety of medical databases.
- The screening and data extraction processes were completed by two independent reviewers, with any conflicts resolved by a third reviewer, ensuring consistency and accuracy of the findings within the review.
- The findings from our formal scoping review were augmented by additional web searches of ultrasound manufacturers, providing additional insight into the commercial availability of devices, and allowing reflection on the differences between number of products available and those reflected in the peer-reviewed literature.
- We acknowledge that the nature of a scoping review design only provides insight into the breadth of information available on a given topic, and does not take in to account the integrity or accuracy of individual studies identified
- We also acknowledge that ultrasound manufacturers may conduct their own internal research that may include validation against conventional devices but does not end up published in peer-reviewed journals.

BACKGROUND

The World Health Organization (WHO) recommends that all pregnant women should receive at least one ultrasound scan before 24 weeks' gestation to estimate gestational age, improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience.(1) An ultrasound scan for gestational age estimation is most accurate when it is performed in the first trimester of pregnancy.(2) Several antenatal interventions recommended by WHO confer benefit when used at specific gestational ages – such as antenatal corticosteroids for women at risk of preterm birth prior to 34 weeks' gestation (3), aspirin for women at increased risk of pre-eclampsia prior to 20 weeks' gestation (4) and induction of labour for post-term pregnancy (5) – and hence the safe and appropriate use of these interventions can be affected by accuracy of gestational age estimation. WHO's antenatal care recommendations emphasise the need for effective and reliable antenatal ultrasound services to be available to all pregnant women, in order to optimise maternal and newborn health outcomes.(6) However, in many low- and middle-income countries (LMICs), women's access to reliable antenatal ultrasound is often limited or only available in certain contexts, such as tertiary hospitals or in private health services.(7, 8) Resource constraints and limited infrastructure in rural health facilities further impacts the ability to implement traditional or conventional ultrasound machines in these settings.

Recent years have seen the development of portable, wireless, compact or mobile-based ultrasound systems for obstetric use.(9) If such portable ultrasound devices are as accurate as conventional, cart-based ultrasound systems – as well as being easy to use, affordable, and acceptable to women and their healthcare providers – they could help improve pregnant women's access to antenatal ultrasound, and thus increase coverage. A 2016 systematic review explored available research on the use of portable ultrasound devices in the triage, diagnosis, and management of adult patients in LMICs, and found 36 studies describing their use in cardiac screening, abdominal assessment, obstetric dating, and in rapid triage in rural areas or emergency settings.(9) While that review identified only three studies related to portable ultrasound use in pregnancy, a number of new portable ultrasound models have become commercially available since that review was conducted, including several models intended specifically for pregnant women.

We therefore aimed to conduct a scoping review to identify all available studies assessing the use of portable ultrasound devices for pregnant women, as well as aiming to identify what portable ultrasound models are currently commercially available. We did this review to help identify which (if any) devices would be useful for improving access to antenatal ultrasound for women in LMICs.

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METHODS

Study design

Scoping reviews are a useful methodology for examining the range and nature of existing literature on a topic.(10, 11) They are well suited to addressing relatively broad questions, as they can create a map of the existing literature in a reproducible and transparent manner.(12) Scoping reviews can provide insights into how a topic has been studied, and whether knowledge gaps exist. This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) Methodology for Scoping Reviews, and is reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) standards.(10, 11) We first developed a review protocol which was registered online via the Open Science Framework website.(13) As a systematic review of publicly available data, ethics approval was not required. No patients or members of the public were involved in the design or conduct of this review.

Research ethics approval

As a systematic review of publicly available data, ethical approval was not required.

Patient and public involvement

No patient's or members of the public were involved in the design, conduction, or dissemination of results for this paper.

Eligibility criteria

For the scoping review, eligible studies were primary research studies that used any study design, conducted in any country, setting or language, provided that the study involved the use of a portable ultrasound device (variably described as point-of-care, wireless, compact, or mobile-based ultrasound devices) in pregnant women. We also included studies that pertained to training healthcare providers in the use of portable ultrasound devices for pregnancy-related indications. Studies were included regardless of the comparator used. We searched the literature from 1 January 2000 onwards, considering that portable ultrasound devices are a relatively new technology. While the aim of the review was to identify portable ultrasound devices specifically for gestational age estimation, we included any study that assessed the use of a portable ultrasound devices or data were missed. Studies that related to the use of conventional ultrasound systems only (i.e., cart-based ultrasound devices), or studies that assessed portable ultrasound use in clinical contexts outside of obstetric applications

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were not included. Conference abstracts, case reports, case series, study protocols and editorial letters were also not eligible. Systematic reviews were not considered eligible but were checked for any studies not identified through our searches.

Literature searching and assessment of eligibility

We searched four databases – Medline, Embase, CINAHL, and Maternal and Infant Care – on 29 July 2021. With support from two information specialists, search strategies were constructed for each database, combining relevant synonyms and search terms for pregnancy (including terms related to foetal biometry and GA estimation) and portable ultrasound devices (Supplemental Tables S1-S4). Identified citations were collated and de-duplicated in Endnote (14), before uploading to Covidence for screening (15). Two reviewers independently screened and assessed titles and abstracts of all retrieved citations for potential eligibility. For potentially eligible studies, full texts were retrieved and assessed by two independent reviewers according to the review's eligibility criteria. Disagreements during both stages were resolved either through discussion or consultation with a third author.

Separate to the searches of these four databases, we used Google searches to identify portable ultrasound devices that were commercially available at the time of searching. These searches used structured search terms and synonyms to identify manufacturers of portable ultrasound systems (Supplementary Table S5). We also searched individual websites of ultrasound manufacturers to identify what (if any) portable ultrasound systems were currently available (Supplementary Table S6). Once the scoping review was completed, we updated these searches to ensure that manufacturers identified in the included studies were also included in these web searches.

Data collection and analysis

For the scoping review, data extraction was conducted using a customised Google Sheet, which was pre-tested and refined on five eligible studies. For each included study we extracted data on: study title, author, year of publication, country and region where the study was conducted, study design, population, setting, stage of pregnancy, method of measurement (transabdominal, transvaginal, and/or transperineal), device used, and what parameters were assessed. By parameters, we mean whether the study reported on accuracy, effects on health outcomes, feasibility, whether training programs were used, and whether they compared findings to conventional ultrasound devices. The country where a study was conducted was classified into income levels using 2021 World Bank categories.(16)

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Study designs were classified according to the Centre for Evidence-Based Medicine's published hierarchies of evidence,(17) while those studies that self-described as pilot, field, or validation studies were classified as "other primary research design". We also classified each study based on its main objective – for example, whether the study used portable ultrasound primarily for: gestational age estimation, confirming pregnancy, routine antenatal ultrasound scans, identifying ectopic pregnancy, identifying or monitoring placental abnormalities, congenital anomaly screening, monitoring labour progress, or emergency/trauma applications for pregnant women (Supplementary Table S7). For those studies that formally validated a portable device against a conventional ultrasound system for gestational age estimation, the findings of that validation analysis were reported.

All data were extracted by two reviewers independently, with disagreements resolved through discussion or consulting a third reviewer. As a scoping review, quality assessment of individual studies was not performed. Data were analysed descriptively. For the purposes of reporting review findings, the term "portable ultrasound" was used to mean any point-of-care, wireless, compact, or mobile-based ultrasound device, as distinct from conventional (non-portable) or cart-based ultrasound devices.

For the web searches to identify commercially available portable ultrasound devices, we extracted available data on country of manufacture, countries of registration, intended use and user, what training is provided or available, and the device characteristics. This included the device's power supply, battery life, transducers, obstetric software pre-sets, estimated lifetime, drop and waterproof standards, weight, dimensions, accessories, screen resolutions, software requirements, storage, data export options, price, and warranty. In 2018, WHO published a policy brief on their antenatal care recommendations, identifying eight suggested requirements that obstetric ultrasound equipment should meet for antenatal care (Box 1). We assessed all identified ultrasound systems against these eight requirements.(6)

Box 1. Suggested equipment capacity for obstetric ultrasound (reproduced with permission from the World Health Organization's recommendations on antenatal care for a positive pregnancy experience) (6)

- Real-time, grayscale capabilities
- Transabdominal transducer (3–5 MHz)
- Transvaginal US transducer to help detect placental abnormalities and extrauterine pregnancies
- Adjustable acoustic power output controls with output display standards
- Freeze-frame capabilities and electronic callipers
- Obstetric presets (software) to estimate gestational age
- Capacity to print or store images
- Regular maintenance and servicing, important for optimal equipment performance

In general, service delivery settings that will only conduct routine basic obstetric ultrasound will not require a machine with additional features such as Doppler or 3-D/4-D imaging.

A transvaginal transducer may also be useful in some examinations where an experienced provider is unable to visualize anatomy with a transabdominal transducer.

RESULTS

Literature searches for the scoping review identified 2,770 citations, of which 793 duplicates were removed. Title and abstract screening of the remaining 1,977 unique citations identified 269 citations which were potentially eligible. After reviewing full texts, 56 studies were included for analysis (Figure 1). The most common reasons for exclusion included conference abstracts (86 studies), ultrasound device was not described (34 studies), or studies using an ineligible intervention (such as conventional ultrasound devices only) (26 studies). Six full texts were unable to be located.

Characteristics of included studies

Included studies were published between 2005 and 2021. Studies were conducted in 34 different countries across six regions (2 studies were conducted in multiple countries). High-income countries accounted for 24 studies (42.9%), lower middle-income countries for 13 studies (23.2%), upper-middle income for nine studies (16.1%), and low-income countries for eight studies (14.3%) (Table 1). In terms of geographical regions, 16 studies (28.6%) were from Sub-Saharan African countries, followed by Latin American and Caribbean countries (13 studies, 23.2%). The country with the highest number of studies was the United States (10 studies, 17.9%).

Table 1. Number of studies per World Bank (2021) income level

Income level		Number of	% of total
		studies	studies
High income	2	24	42.9%
Upper middle income	0	9	16.1%
Lower middle income		13	23.2%
Low income		8	14.3%
Multiple ¹	4	2	3.6%
Total		56	100.0%

¹ Both studies categorised under multiple were across countries classified as high income and upper middle income

 Cross-sectional study designs were most common (15 studies, 26.8%), followed by prospective or retrospective cohort studies (11 studies, 19.6%) and a single study using a case-control study design. The remaining 29 studies were pilot, field, or validation studies. Studies were most commonly using portable ultrasound devices for transabdominal assessment (36 studies, 64.3%). Other studies related to training programs for portable ultrasound use in pregnancy-related indications (9 studies, 16.1%), using portable devices with transvaginal ultrasound only (8 studies, 14.3%), and studies where existing ultrasound devices were modified, such as attaching a motor to a probe to allow for remote control of an ultrasound device (3 studies, 5.4%). In total, 21 studies related to assessment of fetal characteristics or performing gestational dating (37.5%). Other studies used portable ultrasound use in emergency/trauma situations involving pregnant women (10 studies, 17.9%) (Figure 2).

The 56 studies used 27 different portable ultrasound models, from 17 manufacturers (Table 2). Nearly half used a device produced by SonoSite, with the most common being the SonoSite M-Turbo (10 studies, 17.9%) followed by the General Electric (GE) VScan (8 studies), SonoSite Titan and Micromaxx (four studies each), and GE Voluson i (three studies). One device, the Enlace Hispano Americano de Salud (EHAS) Healthy Pregnancy Kit device, was described in two studies but does not appear to be commercially available.(18, 19)

Of the 56 studies, 47 (83.9%) primarily focused on pregnant women as participants, and nine studies (16.1%) collected data related to staff members who participated in portable ultrasound training programs. The 47 studies involved pregnant women without specific restrictions (32 studies), pregnant women who presented with vaginal bleeding (5 studies) or women with ectopic or clinically high-risk pregnancies (10 studies). For the nine studies that reported data on staff members being trained in portable ultrasound use, these involved multiple groups of health professionals (4 studies), physicians only (2 studies), nurses/midwives only (2 studies) and medical students (1 study).

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Manufacturer	Portable ultrasound device model	Number of	% total
		studies	studies
Enlace Hispano Americano de Salud (EHAS)	Healthy Pregnancy Kit specific (18, 19)	2	3.6%
General Electric	Logiq e (20)	1	1.8%
	Logiq I (21)	1	1.8%
	Voluson I (22-24)	3	5.4%
	VScan (25-32)	8	14.3%
Healcerion	SONON 300C (33)	1	1.8%
Konted	Gen 1 C10R (34)	1	1.8%
Lequio	US-304 (35)	1	1.8%
Mindray	DP-10 (36)	1	1.8%
	DP-20 (37, 38)	2	3.6%
Phillips	Lumify (39)	1	1.8%
	VISIQ (40)	1	1.8%
Primedic	Handyscan (41)	1	1.8%
Siemens	Accuson 10 (42)	1	1.8%
Signostics	Signos (43)	1	1.8%
SONON	300L (44)	1	1.8%
Sonoscanner	Orcheo Lite (45, 46)	2	3.6%
SonoScape	S2 (47)	1	1.8%
SonoSite	180 (48, 49)	2	3.6%
	180 Plus (50)	1	1.8%
	Edge (51)	1	1.8%
	M-Turbo (52-60)	9	16.1%
	Micromaxx (61-63)	3	5.4%
	Micromaxx OR M-Turbo (64)	1	1.8%
	S180 (65)	1	1.8%
	Titan (66-69) 🧠	4	7.1%
	Model not specified (70)	1	1.8%
Sony	Model not specified (71)	1	1.8%
Toshiba	SSA-510 A (72)	1	1.8%
Whale Imaging	Sigma P5 (73)	1	1.8%

Table 2. Number of studies, stratified by manufacturer and model of portable ultrasound device

Most studies (53 studies, 94.6%) were conducted in the antenatal period, though two were intrapartum and one was both antenatal and intrapartum. Of those 53 studies in the antenatal period, 10 were in the first trimester only, five in the second trimester only, five in the third trimester only and five across both second and third trimesters (the remaining 28 studies did not specify the pregnancy term period). Studies were conducted in outpatient antenatal care settings

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(30 studies, 53.6%), inpatient (24 studies, 42.9%), and community settings, such as local marketplaces or "field investigations" (8 studies, 14.3%). One study assessed portable ultrasound in the context of telemedicine, and one study did not describe the setting.

Accuracy of portable ultrasound devices

A total of 21 studies related to portable ultrasound use for assessment of fetal characteristics and/or gestational age estimation, though only 10 of these formally validated a portable device against a conventional ultrasound. Findings from these 10 studies – including study design, objective, devices used, and key findings – are presented in Table 3. The devices used in these 10 studies were the GE VScan (4 studies); GE Logiq i (1 study); Konted Gen 1 C10R (1 study); Mindray DP-10 (1 study); Siemens Accuson 10 (1 study); SonoSite M-Turbo (1 study); and SonoSite Titan (1 study). These validation studies investigated device accuracy with regards to fetal number, fetal lie, gestational age, placental location, small or large for gestational age, and fetal biometric measurements such as biparietal diameter and femur length. Of these 10 studies, nine reported that the portable ultrasound device was partially or fully validated.

Commercially available portable ultrasounds

Web searches identified 106 portable ultrasound devices made by 26 different manufacturers (Supplemental Table S8). The majority were produced in China, and prices ranged from USD\$1,190 to \$30,000. Devices ranged in weight from 0.9kg to 13.0kg and battery life was from 40 minutes up to 8 hours. Identified devices were a mix of handheld devices with either wired or wireless connection to a user's device (typically a phone or computer), or laptop-style portable ultrasound devices.

Where sufficient data were available, we compared available devices against the requirements identified in WHO's antenatal care recommendations for ultrasound devices (Box 1). Though we did not have complete data on all identified devices, it was common for identified devices to have a transabdominal transducer, greyscale imaging capabilities, adjustable acoustic power output controls, freeze-frame capabilities, the capacity to store and print images, and obstetric presets. For most devices, information was not available on whether regular servicing and maintenance was offered, and it was less common for transvaginal transducers to be available.

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 Table 3. Characteristics and findings from studies comparing portable ultrasound devices against conventional ultrasound for assessing fetal characteristics and gestational age estimation
 Solution

 Author
 Year
 Country
 Study design
 Sample size
 Main objective of study
 Portable
 Comparator
 Key findings
 Review team

Author	Year	Country	Study design	Sample size	Main objective of study	Portable	Comparator	Keyfindings	Review team
						ultrasound		м М М М М М М М М М М М М М М М М М М М	assessment
						device used		es	
Dougherty,	2021	United	Quality	113 pregnant	Implementation of a remote	GE Logiq i	A diagnostic obstetric	For Breetric measures and	Study
A et al (21)		States	assurance and	women	quality assurance and		ultrasound scan	calutations of estimated gestational	demonstrates
		(USA)	improvement		improvement protocol in		performed with Voluson	ag 🛱 🛱 💫 reader reliability ranged	validity for these
			protocol		obstetric point-of-care		E8 system by a trained	from Q . 79 to 0.85 for all parameters	measures
					ultrasound in low-resource		sonographer	except famur length. Over 94% of the	
					areas. Results of the			obsteeriessweep protocol ultrasound	
					implemented protocol were			ages Reze within 7 days of the	
					compared to gold-standard			cord ending gold-standard age	
					measurements			du	
Galjaard, S.	2014	Belgium	Cohort study	51 pregnant	Implementation of a pocket-	GE VScan	Comparison to routine	Recording fetal growth measurements,	Study
et al (27)			(prospective)	women	sized ultrasound machine for		scan performed by an	the end of the second agreement for	demonstrates
					performing routine third		experienced	mers Renents of biparietal diameter	validity for these
					trimester antenatal scans –		ultrasonographer on a	(BB) and good agreement for femur	measures
					assessing fetal growth, fetal		Voluson E730 Expert	length (🔁) and trans-cerebellar	
					wellbeing and placental			dianete; (TCD)	
					location				
Haragan, A.	2015	United	Diagnostic	251 pregnant	Use of a handheld ultrasound	GE VScan	Formal growth	Autors Sound a highly significant	Study
et al (28)		States	accuracy study	women	device to measure fetal		ultrasound by registered	correlation between handheld and	demonstrates
		(USA)			abdominal circumference		diagnostic medical	formal utrasound measurements of	validity for these
					(AC). Comparison to fundal		sonographers (device not	abgominal circumference (R=0.939;	measures
					height as well as formal		specified)	P< 901) Handheld ultrasound was also	
					ultrasound to compare			found to be viable for screening for	
					diagnostic accuracies for			FGE and GA	
					detecting fetal growth			ar on	
					restriction (FGR) or large for			tec ل	
					gestational age (LGA)		-		
Lausin, I. et	2009	Croatia	Diagnostic	100 pregnant	Comparison of a portable	Siemens	Larger, traditional	Pogable ultrasound device was found	Study
al (42)			accuracy study	women	ultrasound device in basic	Accuson 10	ultrasound devices used	to be effective for measuring the	demonstrates
					fetal biometric fetal		at the studies clinic	for wing quantity of amniotic fluid,	validity for some
					measurements to larger,		(devices not specified)	position of	measures, but
					conventional ultrasound			the fetuge and fetal heartbeat.	not for others
					machines			Regarding biometrical measurements,	
								BPD was determined in 97% of	
	2020	11.11	Durafut		De alexandre la la la		1) C	patients	
Maraci, M.	2020	United	Proof-of-	1 pregnant	Development and application	Konted Gen	1) Sonographer	ICD automated measurement (26.2	Study did not
et al (34)		Kingdom	concept	woman	of a machine learning	I CIUK	performed manual	mm) was an underestimation	demonstrate
		(UK)	evaluation		algorithm to automatically		estimation of ICD on	$(24.0 \text{ m} \mathbf{Q})$ and the best ital	Validity of a
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pilot study

women

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					diameter (TCD) in obstetric ultrasound images – firstly against a library of obstetric scan images, and then a real- world implementation using a scan from a portable ultrasound machine		hospital scan TCD measurement on the same subject made using a high-end ultrasound machine (GE Voluson E8)	masurement (36.2 mm). It is not known whether this is a fault of the scale being from a portable device, or from the automated system itself.	algorithm for TCD measurement	
Saul, T. et al (69)	2012	United States (USA)	Cross-sectional study	68 pregnant women	Determine the accuracy of emergency-physician performed gestational age estimation with a portable ultrasound, as compared to radiology department standard	SonoSite Titan	Gestational age estimated by ultrasound performed in the department of radiology (device not specified)	Exputting cases with no fetal pole, the mailing discrepancy between energie Gy-physician performed and racione department gestational age estimation was 2 days. The correlation coefficient was 0.978	Study demonstrates validity for these measures	
Sayasneh, A. et al (31)	2012	United Kingdom (UK)	Cohort study (prospective)	204 women	Evaluate the performance of a pocket-sized ultrasound machine as a tool for obstetric triage in three distinct population categories: 1) women with pain and bleeding in early pregnancy; 2) women presenting for routine obstetric ultrasound assessment; and 3) women with possible gynaecological pathology	GE VScan	Transvaginal and/or transabdominal examination depending on the clinical indication, using a Voluson E8 Expert	In group , there was good to very good aggeement or identifying preserve or absence of embryo, gestational sac, fetal heart motion, preserve or absence of embryo, gestational sac, fetal heart motion, preserve of the same of the same of the preserve of the same of the same of the same to be the same of the same of the same of the same to be the same of the same of the same of the same to be the same of the same of the same of the same preserve of the same of	Study demonstrates validity for these measures	
Shah, S. et al (59)	2010	United States (USA)	Cross-sectional study	96 ultrasound examinations on 38 pregnant women	Evaluation of emergency- physician performed ultrasound to determine gestational age, compared to conventional ultrasound	SonoSite M- Turbo	Formal sonography by an ultrasound technician using Accuvix XQ ultrasound machine	When comparing physician-performed metsurements with true gestational aggmeasurements, BPD had a coefficient of 0.947 and FL had a coefficient of 0.957. Physician's determination of fetal viewility wad an overall accuracy of	Study demonstrates validity for these measures	
Toscano,	2021	Peru	Single-centre	126 pregnant	Evaluation of a telediagnostic	Mindray	Concurrently performed	Teledia	Study	

minimally trained healthcare

professionals using a portable

system in which ultrasound

images were acquired by

ultrasound device (using

simple scan protocols) and

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DP-10

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Troyano L. et al (32)	2013	Spain	Pilot study	80 women	Validation of a new clinical application for an existing portable ultrasound device by modifying the device for transvaginal use and testing its applicability on a population of pregnant women	GE VScan	The same measurements performed with a traditional US device (Voluson 730 Expert)	When comparing to the conventional ultrasound findings, there was high Petropy of correlation coefficient for BFB, where cological measurements, and decell correlation	Study demonstrates validity for these measures
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DISCUSSION

Summary of main findings

This scoping review identified 56 studies related to the use of portable ultrasound devices in obstetric care, more than half of which were in LMICs. The review found that 27 portable ultrasound devices (from 17 manufacturers) had been formally evaluated in the peer-reviewed literature. These studies most commonly related to abdominal assessment using a portable ultrasound device, though studies relating to transvaginal ultrasound assessment and training programs for health care workers on using portable ultrasound were also identified. Our results found that only 10 studies formally validated portable ultrasound devices against a conventional ultrasound device, with six studies assessing fetal characteristics and four studies assessing gestational age estimation. These 10 studies incorporated seven devices, with which only six were described as valid compared to their conventional counterpart. By comparison, 102 portable ultrasound devices are currently commercially available. While many of the available devices are promising in terms of function, portability, and affordability, we identified no validation studies for the majority of commercially available devices.

Strengths and limitations

This review was conducted in accordance with a pre-specified protocol, and in line with current scoping review methodological guidance.(10-12) We searched a wide range of sources using robust search strategies, and studies were screened and extracted in duplicate and verified. The scoping review was augmented by additional web searches of ultrasound manufacturers, providing useful corollary information on the commercial availability of portable devices. However, some limitations must be acknowledged. Despite our best efforts, we were unable to locate six potentially eligible studies, which may have impacted the findings of this review. Also, some of the included studies required extensive discussions in the review team regarding the study design, intervention and what fetal measurements had been evaluated. We aimed to mitigate this through using operational definitions for study classification and data extraction, though this was challenging for some studies that were poorly reported. While nine studies were identified in which portable ultrasound devices were determined to be valid, it is possible that validation studies in other settings or populations may find different results. It is important to acknowledge that ultrasound manufacturers may have conducted formal validation for portable ultrasound devices, but that these may not be available in the public domain. However, we consider it critical that any such studies should be made publicly available in the peer-review literature, so that clinicians, administrators, and policymakers can appropriately scrutinise their accuracy and reliability.

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Interpretation

This is the first review specifically examining the use of portable ultrasound devices for use in pregnant women. A 2016 review by Becker et al investigated portable ultrasound use across multiple health topics, identifying only three studies on pregnancy-related indications.(9) Our review identified a higher number of studies, probably reflecting that a number of portable devices have entered the market since 2016, with an associated increase in research interest. It was noteworthy that over half of identified studies were conducted in LMICs, likely reflecting that this innovative technology is promising for limited-resource settings.

The large number of devices commercially available is consistent with expansion of this technology in recent years. However, only 27 of these devices have had been formally evaluated through some form of peer-reviewed research regarding their accuracy, feasibility, reliability, or acceptability. In their 2019 commentary on medical device regulation, Charlesworth and van Zundert argued that while medical device manufacturers may posit that it is too costly, time-consuming, and impractical to generate evidence on devices from large studies, primary research is undeniably critical to ensuring that large-scale implementation will be beneficial.(74) Relatedly, a major finding from this review is that further research on portable ultrasound devices – in particular their accuracy and acceptability when used in antenatal care contexts – are needed to guide decision-making around selection and procurement of ultrasound models.

Since 2016 WHO has recommended that all women should have an ultrasound prior to 24 weeks' gestation, however the coverage of ultrasound use remains limited in many countries.(7, 8) Findings of this review can be useful to maternity care clinicians, program administrators and policymakers who are seeking to identify reliable, affordable and portable ultrasound systems to use in their settings. However, available information was insufficient for most models, and only 10 had been formally validated for fetal biometry measures. In order to respond to this knowledge gap, and the growing number of commercially available devices, further peer-reviewed studies into portable ultrasound devices for obstetric use are required. Ideally, these studies would demonstrate convincingly that handheld devices perform as well as conventional ultrasound systems used in obstetrics.

CONCLUSION

A large number of portable ultrasound devices for obstetric use are commercially available, however there is limited peer-reviewed research that has formally assessed how these devices perform against conventional ultrasound machines. Findings from this review, combined with future studies that assess the accuracy and validity of new technologies, can help support safe and effective implementation of portable devices, particularly for limited-resource settings where access to obstetric ultrasound is limited.

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AUTHOR CONTRIBUTIONS

AE developed the review protocol and data extraction tools. AE and SMcD developed the search strategy. AE, EF and SA conducted title/abstract and full-text screening and data extraction. AE prepared the first draft of the analysis, which was reviewed by all authors and revised following their input. All named authors contributed to the writing of this manuscript.

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Lorena Romero helped with the initial design of the search strategy. Anna Shalit and Lauren Vallely helped with the initial title/abstract screening.

COMPETING INTERESTS

The authors declare no competing interests.

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DATA SHARING STATEMENT

Dataset available from the Dryad repository, DOI: (awaiting contact from Dryad).

RESEARCH ETHICS APPROVAL

As a systematic review of publicly available data, ethical approval was not required.

REFERENCES

1. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.

2. Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. Cochrane Database of Systematic Reviews. 2015(7).

3. World Health Organization. WHO recommendations on interventions to improve preterm birth outcomes. Geneva: World Health Organization; 2015.

4. World Health Organization. WHO recommendations on antiplatelet agents for the prevention of pre-eclampsia. Geneva, Switzerland: WHO; 2021.

5. World Health Organization. WHO recommendations: Induction of labour at or beyond term. Geneva, Switzerland: World Health Organization; 2018.

6. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience: ultrasound examination. Geneva, Switzerland: WHO; 2018.

7. Shah S, Bellows BA, Adedipe AA, Totten JE, Backlund BH, Sajed D. Perceived barriers in the use of ultrasound in developing countries. Critical Ultrasound Journal. 2015;7(1):11.

8. Franklin HL, Mirza W, Swanson DL, Newman JE, Goldenberg RL, Muyodi D, et al. Factors influencing referrals for ultrasound-diagnosed complications during prenatal care in five low and middle income countries. Reproductive Health. 2018;15(1):204.

9. Becker DM, Tafoya CA, Becker SL, Kruger GH, Tafoya MJ, Becker TK. The use of portable ultrasound devices in low- and middle-income countries: a systematic review of the literature. Tropical Medicine & International Health. 2016;21(3):294-311.

10. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Annals of internal medicine. 2018;169(7):467-73.

11. Peters MD, Godfrey C, McInerney P, Baldini Soares C, Khalil H, Parker D. Scoping reviews. Joanna Briggs Institute reviewer's manual. 2017:408-46.

12. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evidence Synthesis. 2020;18(10).

13. Eggleston AV, J. Point-of-care ultrasound technologies for gestational age dating: rapid scoping review: OSF Registries; 2021 [Available from: https://doi.org/10.17605/OSF.IO/U8KXP.

14. Web of Science Group. EndNote USA: Clarivate; 2020 [cited 2020 October 14]. Available from: <u>https://endnote.com/</u>.

15. Covidence. About Covidence Australia2020 [cited 2020 October 14]. Available from: https://www.covidence.org/.

16. World Bank Group. The World Bank USA: The World Bank Group; 2021 [Available from: <u>https://www.worldbank.org/</u>.

17. CEBM. Centre for Evidence Based Medicine [cited 2020 May 1]. Available from: https://www.cebm.net/.

18. Crispin Milart PH, Diaz Molina CA, Prieto-Egido I, Martinez-Fernandez A. Use of a portable system with ultrasound and blood tests to improve prenatal controls in rural Guatemala. Reproductive health. 2016;13:110.

19. Crispin Milart PH, Prieto-Egido I, Diaz Molina CA, Martinez-Fernandez A. Detection of high-risk pregnancies in low-resource settings: a case study in Guatemala. Reproductive health. 2019;16(1):80.

20. Kawooya MG, Nathan RO, Swanson J, Swanson DL, Namulema E, Ankunda R, et al. Impact of Introducing Routine Antenatal Ultrasound Services on Reproductive Health Indicators in Mpigi District, Central Uganda. Ultrasound quarterly. 2015;31(4):285-9.

 21. Dougherty A, Kasten M, DeSarno M, Badger G, Streeter M, Jones DC, et al. Validation of a Telemedicine Quality Assurance Method for Point-of-Care Obstetric Ultrasound Used in Low-Resource Settings. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2021;40(3):529-40.

22. Di Lieto A, De Falco M, Pontillo M, Carbone IF, Di Nardo MA, Di Lieto D. The wireless tele-ultrasonography in prenatal telemedicine. Giornale Italiano di Ostetricia e Ginecologia. 2011;33(3):158-62.

23. Rijken MJ, de Wit MC, Mulder EJH, Kiricharoen S, Karunkonkowit N, Paw T, et al. Effect of malaria in pregnancy on foetal cortical brain development: a longitudinal observational study. Malaria journal. 2012;11:222.

24. Rijken MJ, Moroski WE, Kiricharoen S, Karunkonkowit N, Stevenson G, Ohuma EO, et al. Effect of malaria on placental volume measured using three-dimensional ultrasound: a pilot study. Malaria journal. 2012;11:5.

25. Bruns RF, Menegatti CM, Martins WP, Junior EA. Applicability of pocket ultrasound during the first trimester of pregnancy. Medical Ultrasonography. 2015;17(3):284-8.

26. Dalmacion GV, Reyles RT, Habana AE, Cruz LMV, Chua MC, Ngo AT, et al. Handheld ultrasound to avert maternal and neonatal deaths in 2 regions of the Philippines: an iBuntis R intervention study. BMC pregnancy and childbirth. 2018;18(1):32.

27. Galjaard S, Baeck S, Ameye L, Bourne T, Timmerman D, Devlieger R. Use of a pocketsized ultrasound machine (PUM) for routine examinations in the third trimester of pregnancy. Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2014;44(1):64-8.

28. Haragan AF, Hulsey TC, Hawk AF, Newman RB, Chang EY. Diagnostic accuracy of fundal height and handheld ultrasound-measured abdominal circumference to screen for fetal growth abnormalities. American journal of obstetrics and gynecology. 2015;212(6):820.e1-8.

29. Mbuyita S, Tillya R, Godfrey R, Kinyonge I, Shaban J, Mbaruku G. Effects of introducing routinely ultrasound scanning during Ante Natal Care (ANC) clinics on number of visits of ANC and facility delivery: a cohort study. Archives of public health = Archives belges de sante publique. 2015;73(1):36.

30. Pedersen JK, Sira C, Trovik J. Handheld transabdominal ultrasound, after limited training, may confirm first trimester viable intrauterine pregnancy: a prospective cohort study. Scandinavian journal of primary health care. 2021;39(2):123-30.

31. Sayasneh A, Preisler J, Smith A, Saso S, Naji O, Abdallah Y, et al. Do pocket-sized ultrasound machines have the potential to be used as a tool to triage patients in obstetrics and gynecology? Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2012;40(2):145-50.

32. Troyano Luque JM, Ferrer-Roca O, Barco-Marcellan MJ, Sabatel Lopez R, Perez-Medina T, Perez-Lopez FR. Modification of the hand-held Vscan ultrasound and verification of its performance for transvaginal applications. Ultrasonics. 2013;53(1):17-22.

33. Kim J, Kim S, Jeon S, Jung S. A longitudinal study investigating cervical changes during labor using a wireless ultrasound device. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia

and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians. 2018;31(13):1787-91.

34. Maraci MA, Yaqub M, Craik R, Beriwal S, Self A, von Dadelszen P, et al. Toward pointof-care ultrasound estimation of fetal gestational age from the trans-cerebellar diameter using CNN-based ultrasound image analysis. Journal of medical imaging (Bellingham, Wash). 2020;7(1):014501.

35. Kodaira Y, Pisani L, Boyle S, Olumide S, Orsi M, Adeniji AO, et al. Reliability of ultrasound findings acquired with handheld apparatuses to inform urgent obstetric diagnosis in a high-volume resource-limited setting. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2021;153(2):280-6.

36. Toscano M, Marini TJ, Drennan K, Baran TM, Kan J, Garra B, et al. Testing telediagnostic obstetric ultrasound in Peru: a new horizon in expanding access to prenatal ultrasound. BMC pregnancy and childbirth. 2021;21(1):328.

37. Amoah B, Anto EA, Osei PK, Pieterson K, Crimi A. Boosting antenatal care attendance and number of hospital deliveries among pregnant women in rural communities: a community initiative in Ghana based on mobile phones applications and portable ultrasound scans. BMC pregnancy and childbirth. 2016;16(1):141.

38. Anto EA, Amoah B, Crimi A. Segmentation of ultrasound images of fetal anatomic structures using random forest for low-cost settings. Annual International Conference of the IEEE Engineering in Medicine and Biology Society IEEE Engineering in Medicine and Biology Society Annual International Conference. 2015;2015:793-6.

39. Straily A, Malit AO, Wanja D, Kavere EA, Kiplimo R, Aera R, et al. Use of a Tablet-Based System to Perform Abdominal Ultrasounds in a Field Investigation of Schistosomiasis-Related Morbidity in Western Kenya. The American journal of tropical medicine and hygiene. 2021.

40. Vinayak S, Sande J, Nisenbaum H, Nolsoe CP. Training Midwives to Perform Basic Obstetric Point-of-Care Ultrasound in Rural Areas Using a Tablet Platform and Mobile Phone Transmission Technology-A WFUMB COE Project. Ultrasound in medicine & biology. 2017;43(10):2125-32.

41. Busch M. Portable ultrasound in pre-hospital emergencies: a feasibility study. Acta anaesthesiologica Scandinavica. 2006;50(6):754-8.

42. Lausin I, Kurjak A, Miskovic B, Stanojevic M. Sonoscope, fiction or reality? Gynaecologia et Perinatologia. 2009;18(1):30-3.

43. Shorter M, Macias DJ. Portable handheld ultrasound in austere environments: use in the Haiti disaster. Prehospital and disaster medicine. 2012;27(2):172-7.

44. Choi MJ, Lim CM, Jeong D, Jeon H-R, Cho KJ, Kim SY. Efficacy of intraoperative wireless ultrasonography for uterine incision among patients with adherence findings in placenta previa. The journal of obstetrics and gynaecology research. 2020;46(6):876-82.

45. Arbeille P, Zuj K, Blouin J, Georgescu M, Saccomandi A, Andre E, et al. Remote echography & Doppler using tele-operated compact motorised probes & portable echograph. Application to 200 isolated patient in rural areas. Angeiologie. 2016;68(3):23-34.

46. Arbeille P. Tele-operated echograph and motorised probe transducer for remote echography in isolated environment. Application to space exploration and isolated medical centre. Ultrasound in Medicine and Biology. 2015;41(4 SUPPL. 1):S28.

47. Lindgaard K, Riisgaard L. 'Validation of ultrasound examinations performed by general practitioners'. Scandinavian journal of primary health care. 2017;35(3):256-61.

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48. Bentley S, Hexom B, Nelson BP. Evaluation of an Obstetric Ultrasound Curriculum for Midwives in Liberia. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2015;34(9):1563-8.

49. Kimberly HH, Murray A, Mennicke M, Liteplo A, Lew J, Bohan JS, et al. Focused maternal ultrasound by midwives in rural Zambia. Ultrasound in medicine & biology. 2010;36(8):1267-72.

 50. Blaivas M, Kuhn W, Reynolds B, Brannam L. Change in differential diagnosis and patient management with the use of portable ultrasound in a remote setting. Wilderness & environmental medicine. 2005;16(1):38-41.

51. Shah S, Adedipe A, Ruffatto B, Backlund BH, Sajed D, Rood K, et al. BE-SAFE: Bedside sonography for assessment of the fetus in emergencies: educational intervention for late-pregnancy obstetric ultrasound. The western journal of emergency medicine. 2014;15(6):636-40.

52. Varner CB, D.; Borgundvaag, B.; McLeod, S.; Carver, S. Correction: Fetal outcomes following emergency department point-of-care ultrasound for vaginal bleeding in early pregnancy. Canadian family physician Medecin de famille canadien. 2016;62(8):628.

53. Bailey C, Carnell J, Vahidnia F, Shah S, Stone M, Adams M, et al. Accuracy of emergency physicians using ultrasound measurement of crown-rump length to estimate gestational age in pregnant females. The American journal of emergency medicine. 2012;30(8):1627-9.

54. Chiem AT, Chan CH-Y, Ibrahim DY, Anderson CL, Wu DS, Gilani CJ, et al. Pelvic ultrasonography and length of stay in the ED: an observational study. The American journal of emergency medicine. 2014;32(12):1464-9.

55. Hall EA, Matilsky D, Zang R, Hase N, Habibu Ali A, Henwood PC, et al. Analysis of an obstetrics point-of-care ultrasound training program for healthcare practitioners in Zanzibar, Tanzania. Ultrasound Journal. 2021;13(1):18.

56. Mbonyizina C, Ntirushwa D, Bazzett-Matabele L, Ntasumbumuyange D, Rulisa S, Magriples U. Point of care ultrasound: does the presence of ascites in severe pre-eclampsia correlate with poor maternal and neonatal outcome? Tropical medicine & international health : TM & IH. 2019;24(8):1018-22.

57. Osborne B, Thoirs K, Parange N. The effectiveness of simulation training in the teaching of skills required for sonographic fetal assessment in mid-trimester pregnancy1. Sonography. 2016;3(Supplement 1):46.

58. Reynolds TA, Amato S, Kulola I, Chen C-JJ, Mfinanga J, Sawe HR. Impact of point-ofcare ultrasound on clinical decision-making at an urban emergency department in Tanzania. PloS one. 2018;13(4):e0194774.

59. Shah S, Teismann N, Zaia B, Vahidnia F, River G, Price D, et al. Accuracy of emergency physicians using ultrasound to determine gestational age in pregnant women. The American journal of emergency medicine. 2010;28(7):834-8.

60. Vyas A, Moran K, Livingston J, Gonzales S, Torres M, Duffens A, et al. Feasibility study of minimally trained medical students using the Rural Obstetrical Ultrasound Triage Exam (ROUTE) in rural Panama. World journal of emergency medicine. 2018;9(3):216-22.

61. Dean AJ, Ku BS, Zeserson EM. The utility of handheld ultrasound in an austere medical setting in Guatemala after a natural disaster. American journal of disaster medicine. 2007;2(5):249-56.

62. MacVane CZ, Irish CB, Strout TD, Owens WB. Implementation of transvaginal ultrasound in an emergency department residency program: an analysis of resident interpretation. The Journal of emergency medicine. 2012;43(1):124-8.

63. Shah SP, Epino H, Bukhman G, Umulisa I, Dushimiyimana JMV, Reichman A, et al. Impact of the introduction of ultrasound services in a limited resource setting: rural Rwanda 2008. BMC international health and human rights. 2009;9:4.

64. Wang R, Reynolds TA, West HH, Ravikumar D, Martinez C, McAlpine I, et al. Use of a beta-hCG discriminatory zone with bedside pelvic ultrasonography. Annals of emergency medicine. 2011;58(1):12-20.

65. Wylie B, Mawindo P, Nyirenda O, Kuyenda R, Malenga A, Kalilani-Phiri L, et al. Accuracy of gestational dating in an observational pregnancy malaria cohort in Malawi: An ultrasound demonstration project. American Journal of Tropical Medicine and Hygiene. 2010;83(5 SUPPL. 1):287.

66. Adhikari S, Blaivas M, Lyon M. Diagnosis and management of ectopic pregnancy using bedside transvaginal ultrasonography in the ED: a 2-year experience. The American journal of emergency medicine. 2007;25(6):591-6.

67. Adler D, Mgalula K, Price D, Taylor O. Introduction of a portable ultrasound unit into the health services of the Lugufu refugee camp, Kigoma District, Tanzania. International journal of emergency medicine. 2008;1(4):261-6.

68. Kolbe N, Killu K, Coba V, Neri L, Garcia KM, McCulloch M, et al. Point of care ultrasound (POCUS) telemedicine project in rural Nicaragua and its impact on patient management. Journal of ultrasound. 2015;18(2):179-85.

69. Saul T, Lewiss RE, Rivera MDR. Accuracy of emergency physician performed bedside ultrasound in determining gestational age in first trimester pregnancy. Critical ultrasound journal. 2012;4(1):22.

70. Goodman A, Black L, Briggs S. Obstetrical care and women's health in the aftermath of disasters: the first 14 days after the 2010 Haitian earthquake. American journal of disaster medicine. 2014;9(1):59-65.

71. Ndiaye P, Aris FB, Diedhiou A, Wone I, Dia AT. [Annual assessement of a mobile ultrasonography service in the region of Ziguinchor, Senegal]. Bilan d'activite annuel de l'echographie en strategie avancee dans la region de Ziguinchor (Senegal). 2007;67(1):38-42.

72. Dimassi K, Douik F, Ajroudi M, Triki A, Gara MF. Ultrasound Fetal Weight Estimation: How Accurate Are We Now Under Emergency Conditions? Ultrasound in medicine & biology. 2015;41(10):2562-6.

73. Sibbald CA, Nicholas JL, Chapnick M, Ross N, Gandor PL, Waters WF, et al. Fetal brain ultrasound measures and maternal nutrition: A feasibility study in Ecuador. American journal of human biology : the official journal of the Human Biology Council. 2021;33(2):e23467.

74. Charlesworth M, van Zundert AAJ. Medical device regulation: the need for clinical vigilance and oversight. Anaesthesia. 2019;74(6):693-5.

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FIGURES

Figure 1. PRISMA flowchart of screening process for scoping review

Figure 2. Studies classified by their main objective in using a portable ultrasound

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Point-of-care ultrasound technologies for gestational age dating: protocol for a rapid scoping review

8 April 2021

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Background

Obstetric ultrasound (US) is performed to obtain fetal biometry, which facilitates estimation of gestational age (GA), particularly when a scan is performed early in pregnancy. Accurate and precise GA assessment supports appropriate time-sensitive interventions during pregnancy and management of pregnancy complications.

WHO currently recommends that all pregnant women should receive at least one US scan before 24 weeks gestation to estimate GA, improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience.(1) Furthermore, in 2015 WHO recommended that ACS should be administered to women up to 34 weeks' gestation if they are at risk of imminent preterm birth.(2) The recommendation remarks caution that clinicians need to have a high confidence in the accuracy of the GA estimate, as there is currently insufficient evidence on the benefits and possible harms of ACS use beyond 34 weeks. A 2018-2019 WHO policy survey identified that obstetric ultrasound machines are in the national list of commodities

The importance of accuracy of GA estimation in preterm management was further emphasised by the findings of the recent WHO ACTION-I Trial.(3) ACTION-I was a multi-country, randomized trial involving pregnant women at risk of preterm birth between 26 weeks 0 days and 33 weeks 6 days of gestation.(4) The trial demonstrated that antenatal dexamethasone treatment of women at risk of early preterm birth in low-resource countries resulted in a significantly lower risk of neonatal mortality to 28 days of life (RR 0.84, 95% CI 0.72 - 0.97) and any baby death (RR 0.88; 95% CI 0.78 to 0.99), as well as reduced early neonatal death, severe respiratory distress at 24 hours, neonatal hypoglycemia at 6 hours, resuscitation at birth and use of continuous positive airway pressure. Importantly, the eligibility criteria for this trial stipulated that all women must have had an ultrasound-based estimate of GA prior to randomisation.

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WHO is currently engaged in guideline updating and implementation research activities, to take the findings of ACTION-I to scale. Widespread availability of effective and reliable antenatal ultrasound services are a necessary pre-condition to maximising the safe and appropriate use of ACS. In recent years, new handheld or point-of-care technologies - such as portable, wireless, compact or mobile-based ultrasound systems - have become more widely available. These options can be more affordable, user-friendly and durable than other ultrasound systems. In 2014, PATH published a guide to selecting portable ultrasound devices, identifying eight models ranging in price from \$3,600 to \$20,000.(5) For limited-resource contexts, the "ideal" handheld ultrasound system would be accurate, easy to use (and easy to train new users), affordable, durable and acceptable. However, no systematic review has assessed available handheld ultrasound technologies from the perspective of these parameters.

A 2018 narrative review by Kim et al identified 65 articles that explored issues affecting implementation of ultrasound technology in LMICs, and identified critical considerations such as health personnel capacity, maintenance, cost, overuse and misuse of ultrasound, miscommunication between the providers and patients, patient diagnosis and care management, health outcomes, patient perceptions and concerns about fetal sex determination.(6) Available studies used a wide range of ultrasound technologies.

Aim

To conduct a scoping review to describe what handheld ultrasound devices are available for gestational age dating, and what (if any) such devices can meet requirements for resource-limited settings.

Objectives

- 1. Identify available handheld ultrasound options currently available in market
- 2. Describe available ultrasound options in terms of:
 - Device characteristics:
 - Device: Manufacturer, model, design, countries of availability/registration, country of servicing, environmental requirements (if any), maintenance requirements, warranty
 - Functionality: Intended use / versatility, durability/robustness (life span), ease of use, power requirements, battery type and life (including rechargeability)
 - Hardware: dimensions, weight, probe / transducer options, screen resolution
 - Software: user interface (particularly simplicity), image storage, wireless connectivity
 - Device performance: Effectiveness and accuracy, fetal parameters that can be measured
 - Personnel and training requirements: Who can use it, and what are the training requirements?
 - **Costs:** resource requirements, cost, cost-effectiveness, affordability
 - Acceptability: providers, women
 - Feasibility:
 - Other implementation considerations: if any

Methods

Study design

A scoping review as defined by the Canadian Institutes of Health Research, is an 'exploratory project' used to 'systematically map the literature available on a topic' (7). The value of a scoping review is its capacity to identify and examine the range and nature of the existing literature (7, 8). Suited to systematically addressing broad questions, scoping reviews create a map of the existing literature across a body of evidence in a reproducible and transparent manner (9). By summarising the research findings in this way, it will provide insight into how the subject area, intrapartum care measures and their provision and quality, has been studied and whether knowledge gaps exist.

The review will be conducted per the Joanna Briggs Institute (JBI) Methodology for Scoping Reviews and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping

Reviews (PRISMA-ScR) standards (8, 10). This protocol will be publicly registered on the Open Science Foundation (osf.io) database.

Eligibility criteria

POPULATION	Pregnant women
INTERVENTION	Use of handheld, portable, wireless, compact or mobile-based ultrasound for
	gestational age estimation
COMPARISON	-
OUTCOMES	Device characteristics
	Device performance
	Human resources and training
	Costs
	Acceptability
	Feasibility
TIME PERIOD	Literature from 1 January 2000 to present
SETTING	Any country or setting

Literrature search and screening of citations

The literature search will be conducted in three separate steps. Across all steps, we aim to identify and collate any citations pertaining to the use of handheld ultrasound for gestational age estimation, that provides usable information for any one or more the outcomes of interest.

Step 1: Google searches using structured search terms and synonyms to identify all current manufacturers of handheld ultrasound systems. For example, GE Healthcare, SonoSite, Siemens and Philips are all multinational ultrasound manufacturers that have current models of handheld ultrasound currently in the market. Individual manufacturers may be contacted for further information. This will be augmented by information from topic specialists (such as representatives form ISUOG, PATH and WHO Medical Technologies staff) and international procurement specialists (such as WHO Procurement Department)

Step 2: The following databases will be searched: MEDLINE (Ovid), EMBASE (Ovid), Global Index Medicus (WHO), CINAHL (EBSCO), and Maternity and Infant Care (Ovid). Searches will be limited by date of publication to 1 January 2000, to ensure mapping of contemporary literature. Search terms include synonyms for pregnancy AND handheld ultrasound.

Two reviewers will independently screen the titles and abstracts of sources using Covidence, and select sources based on the inclusion and exclusion criteria. If criteria are not met through title and abstract examination, then the full texts will be reviewed. Reviewers will meet to discuss results and resolve any disagreements regarding selection. If disagreements persist, a third reviewer (JV) will independently screen the source in question.

Step 3: Grey literature searches of websites of relevant international organizations, such as WHO, PATH, USAID and ISUOG.

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Data Extraction

Data will initially be charted in an Excel spreadsheet according to the included data source and its characteristics, including publication year, journal, location research (i.e. one row per data source).

We will then chart data in a separate Excel spreadsheet, organized by individual ultrasound models. For each model, any information on the outcomes of interest will be extracted, with the relevant supporting data source cited.

Individual data sources will not be critically appraised, as per the JBI and PRISMA-ScR methodology.

It is anticipated that we may identify data sources or evidence that apply to handheld ultrasound devices, without specifying a particular manufacturer or model – for example, a systematic review pertaining to cost-effectiveness of handheld ultrasound technologies (regardless of model). These data will also be charted and analysed, as they can provide useful information to end users, regardless of what model of ultrasound is used.

Deliverables and timeline

Deliverables	Estimated date of completion
Contract commencement	1 March 2021
Review protocol submitted to OSF	15 April 2021
Searches run, citation screening completed	1 May 2021
Results completed and draft report of review findings completed	15 June 2021
Manuscript submitted for peer-review	15 July 2021

Authorship

It is anticipated that findings from the review will be disseminated through a peer-reviewed publication in an academic journal. Scientific paper/s emanating from this work will be co-authored by members of the evidence synthesis group, according to individuals' contributions and in accordance with ICMJE criteria.

References

1. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.

2. World Health Organization. WHO recommendations on interventions to improve preterm birth outcomes. Geneva: World Health Organization; 2015.

3. Oladapo OT, Vogel JP, Piaggio G, Nguyen MH, Althabe F, Gülmezoglu AM, et al. Antenatal Dexamethasone for Early Preterm Birth in Low-Resource Countries. N Engl J Med. 2020.

4. Collaborators WAT. The World Health Organization ACTION-I (Antenatal CorTicosteroids for Improving Outcomes in preterm Newborns) Trial: a multi-country, multi-centre, two-arm, parallel, double-blind, placebo-controlled, individually randomized trial of antenatal corticosteroids for women at risk of imminent birth in the early preterm period in hospitals in low-resource countries. Trials. 2019;20(1):507.

5. Program for Appropriate Technology in Health (PATH). Portable Ultrasound: Guide to Selection. 2014.

6. Kim ET, Singh K, Moran A, Armbruster D, Kozuki N. Obstetric ultrasound use in low and middle income countries: a narrative review. Reprod Health. 2018;15(1):129.

7. Tricco A, Oboirien K, Lotfi T, Sambunjak D. Scoping reviews: what they are and how you can do them. Canada: Cochrane 2017.

8. Peters MDJ, Godfrey CM, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping Reviews (2020 version). 2020. In: JBI Manual for Evidence Synthesis [Internet]. Joanna Briggs Institute. Available from: <u>https://synthesismanual.jbi.global</u>.

9. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Synth. 2020;18(10):2119-26.

10. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169(7):467-73.

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SUPPLEMENTAL FILE 1 – SEARCH STRATEGIES PER DATABASE

Supplementary Table S1. Search strategy for Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions(R) <1946 to July 29, 2021>, conducted on 29 July 2021

#	Query
1	exp Pregnancy/
2	exp Pregnancy Trimesters/
3	Prenatal Care/
4	exp Pregnancy Complications/
5	Pregnancy Outcome/
6	exp Pregnancy Tests/
7	Obstetrics/
8	Gestational Age/
9	exp Fetal Monitoring/
10	pregnan*.ti,ab,kf.
	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
11	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).ti,ab,kf.
12	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).ti,ab,kf.
13	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
15	centile* or crown-rump or limb-volume)).ti,ab,kf.
1.4	(gestation* age* or gestation* time* or "week* gestation*" or "week* of
14	gestation*").ti,ab,kf.
15	(trimester adj (growth* or development*)).ti,ab,kf.
16	((intrauterine or intra-uterine) adj (growth or development)).ti,ab,kf
17	or/1-16
18	exp Ultrasonography/
10	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
19	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).ti,ab,kf.
20	18 or 19
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21	Point-of-Care Systems/
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22	(point-of-care or point-of-patient-care or point-of-service or point-of-need).ti,ab,kf.
23	(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or compact or mobile or portable or POCUS).ti,ab,kf.
24	21 or 22 or 23
25	20 and 24
26	(((ultrasound or ultra-sound or ultrason*) adj10 (portab* or hand held or handheld or point- of-care or mobile or POC or bedside or bed-side or pocket-sized or wireless or wire-less or rapid or emergency or compact)) or POCUS).ti,ab,kf.
27	or/25-26
28	17 and 27
29	exp animals/ not humans/
30	28 not 29
31	limit 30 to yr="2000 -Current"

BMJ Open

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Supplementary Table S2. Search strategy for Embase database via Ovid, conducted on 29 July 2021

#	Query
1	fetus outcome/ or fetus risk/ or fetus weight/ or gestation period/ or gestational age/ or
	fetus control/
2	prenatal growth/ or fetus growth/ or fetal biophysical profile/ or prenatal development/ or
	fetus development/ or fetal well being/ or fetus maturity/ or fetus movement/
3	fetus disease/ or prenatal disorder/ or fetal malnutrition/ or fetus distress/ or fetus
	malformation/ or macrosomia/ or oligohydramnios/ or premature fetus membrane rupture/
	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
4	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).mp.
5	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).mp.
6	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
0	centile* or crown-rump or limb-volume)).mp.
7	(gestation* age* or gestation* time* or "week* gestation*" or "week* of gestation*").mp.
8	(trimester adj (growth* or development*)).mp.
9	((intrauterine or intra-uterine) adj (growth or development)).mp.
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11	"point of care ultrasound"/
	((point-of-care or point-of-patient-care or point-of-service or point-of-need) adj3 (US or
12	ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*)).mp.
13	((bedside or pocket or pocket-size* or handheld or hand-held or wireless or wire-less or
	compact or mobile or portable or POC) adj3 (US or ultraso* or scan* or ultra-sound* or
	ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or echograph* or
	sonogram* or sonograph* or doppler*)).mp.
14	pocus.mp.
15	11 or 12 or 13 or 14
16	10 and 15
17	ultrasound/

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18	echography/ or a scan/ or b scan/ or doppler ultrasonography/ or gray scale echography/ or real time echography/ or transvaginal echography/
19	echograph/ or cardiotocograph/ or doppler device/ or echocardiograph/ or ultrasound
	scanner/
20	doppler echo/ or doppler probe/
21	duplex doppler ultrasonography/ or pulsed doppler ultrasonography/
22	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
22	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).mp.
23	17 or 18 or 19 or 20 or 21 or 22
24	portable equipment/
25	(point-of-care or point-of-patient-care or point-of-service or point-of-need).mp.
26	(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or compact or
20	mobile or portable or POCUS).mp.
27	24 or 25 or 26
28	10 and 23 and 27
29	fetus echography/ or nuchal translucency measurement/
30	fetal ultrasound monitor/ or fetal doppler/ or obstetric ultrasound transducer/
	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) adj3 (ultraso* or scan* or ultra-
31	sound* or ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler)).mp.
32	29 or 30 or 31
33	27 and 32
34	16 or 28 or 33
	pregnancy/ or adolescent pregnancy/ or first trimester pregnancy/ or mother fetus
	relationship/ or multiple pregnancy/ or second trimester pregnancy/ or third trimester
35	pregnancy/ or unplanned pregnancy/ or unwanted pregnancy/ or multiple pregnancy/ or
	quadruplet pregnancy/ or quintuplet pregnancy/ or superfetation/ or triplet pregnancy/ or
	twin pregnancy/
36	prenatal care/ or prenatal diagnosis/ or prenatal screening/ or noninvasive prenatal testing/
	(pregnan* or superfetation or trimester* or first trimester* or first-trimester* or second
37	trimester* or second-trimester* or third trimester* or third-trimester* or mid-trimester* or
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	expectant mother* or expectant female* or prenatal or pre-natal or antenatal or ante-
	natal).mp.
38	35 or 36 or 37
39	15 and 38
40	23 and 27 and 38
41	39 or 40
42	34 or 41
43	(exp animal/ or nonhuman/) not exp human/
44	42 not 43
45	limit 44 to yr="2000 -Current"

Supplementary Table S3. Search strategy for CINAHL database via EBSCO, conducted on 29 July 2021

#	Query
	(MH "Fetus") OR (MH "Fetal Heart") OR (MH "Placenta") OR (MH "Embryo") OR (MH "Fetal
	Membranes") OR (MH "Umbilical Cord") OR (MH "Umbilical Arteries") OR (MH "Umbilical
	Veins") OR (MH "Fetal Abnormalities") OR (MH "Fetal Diseases") OR (MH "Fetal Growth
1	Retardation") OR (MH "Fetal Macrosomia") OR (MH "Fetal Distress") OR (MH "Fetus") OR
	(MH "Fetal Weight") OR (MH "Fetal Development") OR (MH "Fetal Movement") OR (MH
	"Fetal Well-Being") OR (MH "Fetal Monitoring") OR (MH "Fetal Biophysical Profile") OR (MH
	"Fetal Monitoring, Electronic") OR (MH "Cardiotocography")
	((fetal or foetal or fetus* or foetus*) N3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
2	macrosomia or size* or sizing or anatom* or aneuploid* or "body proportion*" or
	proportion* or wellbeing or well-being or matur* or "organ matur*" or status* or
	movement* or assess* or nutrition* or malnutrition*))
3	((AGA or SGA or LGA or FGR or IUGR or small or large) N3 (fetus* or foetus*))
Λ	((fetal or foetal or fetus* or foetus*) N3 (percentile* or centile* or "z-score*" or "growth
4	centile*" or "crown-rump" or "limb-volume"))
5	("gestation* age*" or "gestation* time*" or "week* gestation*" or "week* of gestation*")
6	(trimester N1 (growth* or development*))
7	((intrauterine or "intra-uterine") N1 (growth or development))
8	1 or 2 or 3 or 4 or 5 or 6 or 7
9	(MH "Point-of-Care Testing")
	(("point-of-care" or "point-of-patient-care" or "point-of-service" or "point-of-need") N3 (US
10	or ultraso* or scan* or "ultra-sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*))
11	((bedside or pocket or "pocket-size*" or handheld or "hand-held" or wireless or "wire-less"
	or compact or mobile or portable or POC) N3 (US or ultraso* or scan* or "ultra-sound*" or
	"ultra-sonogr*" or "ultra-sonic*" or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler*))
12	(pocus)
13	9 or 10 or 11 or 12

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14	8 and 13
15	(MH "Ultrasonography")
16	(MH "Ultrasound Technologists")
	(MH "Ultrasonography, Doppler") OR (MH "Echocardiography, Doppler") OR (MH
17	"Echocardiography, Doppler, Color") OR (MH "Echocardiography, Doppler, Pulsed") OR (MH
	"Ultrasonography, Doppler, Duplex") OR (MH "Ultrasonography, Doppler, Color") OR (MH
	"Ultrasonography, Doppler, Pulsed")
10	(ultraso* or scan* or "ultra-sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or
10	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler)
19	15 or 16 or 17 or 18
20	(MH "Portable Equipment")
21	("point-of-care" or "point-of-patient-care" or "point-of-service" or "point-of-need")
22	(bedside or "pocket-sized" or handheld or "hand-held" or wireless or "wire-less" or compact
22	or mobile or portable or POCUS)
23	20 or 21 or 22
24	8 and 19 and 23
25	(MH "Ultrasonography, Prenatal") OR (MH "Nuchal Translucency Measurement")
	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) N3 (ultraso* or scan* or "ultra-
26	sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler))
27	25 or 26
28	23 and 27
29	14 or 24 or 28
	(MH "Pregnancy") OR (MH "Pregnancy, High Risk") OR (MH "Pregnancy, Prolonged") OR (MH
30	"Pregnancy, Multiple") OR (MH "Pregnancy, Quadruplet") OR (MH "Pregnancy, Quintuplet")
	OR (MH "Pregnancy, Triplet") OR (MH "Pregnancy, Twin") OR (MH "Superfetation") OR (MH
	"Pregnancy Trimesters") OR (MH "Pregnancy Trimester, First") OR (MH "Pregnancy
	Trimester, Second") OR (MH "Pregnancy Trimester, Third") OR (MH "Pregnancy,
	Unplanned") OR (MH "Pregnancy, Unwanted") OR (MH "Maternal-Fetal Exchange")
31	(MH "Obstetric Care") OR (MH "Prenatal Care") OR (MH "Prepregnancy Care") OR (MH
	"Noninvasive Prenatal Testing")

(pregnan* or superfetation or trimester* or "first trimester*" or "first-trimester*" or
"second trimester*" or "second-trimester*" or "third trimester*" or "third-trimester*" or
"mid-trimester" or "expectant mother" or "expectant female" or prenatal or "pre-natal"
or antenatal or "ante-natal")
30 or 31 or 32
Pregnancy terms
13 and 33
19 and 23 and 33
34 or 35
29 or 36
S29 or S36 - Limiters - Publication Year: 2000-2021
S29 OR S36 - Limiters - Publication Year: 2000-2021; Human

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Supplementary Table S4. Search strategy for Maternity and Infant Care database, conducted on 29 July 2021

#	Query
	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
1	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).mp.
2	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).mp.
2	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
5	centile* or crown-rump or limb-volume)).mp.
4	(gestation* age* or gestation* time* or "week* gestation*" or "week* of gestation*").mp.
5	(trimester adj (growth* or development*)).mp.
6	((intrauterine or intra-uterine) adj (growth or development)).mp.
7	or/1-6
	((point-of-care or point-of-patient-care or point-of-service or point-of-need) adj3 (US or
8	ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*)).mp.
	((bedside or pocket or pocket-size* or handheld or hand-held or wireless or wire-less or
9	compact or mobile or portable or POC) adj3 (US or ultraso* or scan* or ultra-sound* or
5	ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or echograph* or
	sonogram* or sonograph* or doppler*)).mp.
10	pocus.mp.
11	or/8-10
12	7 and 11
13	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
13	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).mp.
14	(point-of-care or point-of-patient-care or point-of-service or point-of-need).mp.
15	(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or compact or
	mobile or portable or POCUS).mp.
16	or/14-15
17	7 and 13 and 16

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-10 /0
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18	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) adj3 (ultraso* or scan* or ultra- sound* or ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler)).mp.
19	16 and 18
20	12 or 17 or 19
21	(pregnan* or superfetation or trimester* or first trimester* or first-trimester* or second trimester* or second-trimester* or third trimester* or third-trimester* or mid-trimester* or expectant mother* or expectant female* or prenatal or pre-natal or antenatal or ante- natal).mp.
22	11 and 21
23	13 and 16 and 21
24	22 or 23
25	20 or 24
26	limit 25 to yr="2000 -Current"

SUPPLEMENTAL FILE 2 – SEARCH TERMS FOR ONLINE SEARCHES

Supplementary Table S5. Search terms used to identify portable ultrasound devices via Google searches

Portable device specific	Ultrasound manufacturers and distributors
Portable ultrasound device	Ultrasound manufacturers
Handheld ultrasound device	Ultrasound distributors
Compact ultrasound device	Ultrasound companies
Wireless ultrasound device	Ultrasound developers
	Medical supplies manufacturers
	Medical supplies distributors
	Medical supplies companies
	Medical device companies
	Medical device developers

SUPPLEMENTARY FILE 3 - LIST OF MANUFACTURERS'

Supplementary Table S6. List of manufacturers' websites searched for portable devices

7	
8	Manufacturer
9	Butterfly
10	General Electric
11	Healcerion
12	Konted
13	
14	Mindray
15	Mindray
16	Phillips
17	Primedic
18	Samsung
19	Siemens
20	Signostics
21	SONON
22	Sonoscanner
23	SonoScape
24	SonoSite
25	Sony
26	Taskika
27	
28	Whale imaging
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SUPPLEMENTARY FILE 4 – PARAMETER CODES

Supplementary Table S7. Codes for each parameter extracted from eligible studies

Type of study	Population	Setting
Systematic review	Pregnant women - Ectopic pregnancy	Inpatient facility
Randomised controlled trial	Pregnant women - Vaginal	Outpatient facility
Cohort study - Prospective or retrospective	bleed	Both inpatient and outpatient facility
Cross-sectional study	Pregnant women – Trauma	Community
Case-control study Pregnant women - Caesarean section		Home-based
Other primary research design	Pregnant women - High risk (multiple)	Population-based
	Pregnant women - Pre-	Both outpatient and community
	Pregnant women – Malaria	Multiple
	Pregnant women – multiple	Other
	Pregnant women –	Unspecified
	Schistosomiasis	Telemedicine
	Pregnant women – all	
	Staff members – physicians	
	Staff members - nurses/midwives	2/
	Staff members - medical students	1
	Staff members – combination	
Intervention	Stage of pregnancy	Classification of study objective
Abdominal ultrasound	Antenatal – unspecified	Fetal characteristics /
Transvaginal ultrasound	Antenatal - first trimester	Pouting scans or observation
	Antenatal - second trimester	

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Abdominal and Transvaginal	Antenatal - third trimester	Pregnancy confirmation
ultrasound		
	Antenatal - second and third	Ectopic pregnancy
Transperineal ultrasound	trimester	
•		Genetic screening
Training curriculum	Intranartum	
	intrapartani	Emergency / Trauma
Automated systems	Doctoortum	
Automated systems	Postpartum	
		Placental abnormalities
Ultrasound modification	All periods	
		Labour progress
Ultrasound protocol	Multiple periods	
		Training program
Tele-ultrasound	Unspecified	
	•	
Health systems strengthening	Antenatal and Intranartum	
neurin systems strengthening		
	Antonatal and Postpartum	
	Antenatai and Postpartum	
	Intrapartum and Postpartum	

¹Other primary research designs included pilot studies, diagnostic accuracy studies, or field investigation/implementation studies

1	Manufacture	Model	Design	Country man	Facilitiv requ	Battery life	No. of probe
3	Butterfly	Butterfly iQ+	Handheld de	Not disclose	Mobile devic	>= 2 hours co	1
4	Chison	Eco 3 expert	Laptop style	China	Electricity plu	2.5 hours cor	7
5	Chison	Q5	Laptop style	Not disclosed	Electricty plu	Not disclosed	7
7	Chison	EBit30	Laptop style	China	Electricity plu	Not disclosed	10
8	Chison	Eco 5	Laptop style	China	Electricity plu	2.5 hours cor	7
9	Chison	Eco 2	Laptop style	China	Electricity plu	2.5 hours cor	7
10	Chison	SonoBook 9	Laptop style	China	Electricity plu	2 hours conti	27
11	Chison	SonoBook 6	Laptop style	China	Electricity plu	2 hours conti	10
13	Chison	SonoBook 8	Laptop style	China	Electricity plu	2 hours conti	13
14	Chison	SonoTouch 3	Tablet device	China	Electricity plu	Not disclose	9
15	Chison	FBit50	Lanton style	China	Electricity plu	3 hours conti	10
16 17	Chison	FBit60	Lanton style	China	Electricity plu	2 hours conti	10
18	Chison	Eco 6	Lanton style	China	Electricity plu	1 hour "full c	-0
19	Chison	SonoEve P5	Handheld de	China	Mohile devic	2.5 hours "di	1
20	Chison	Fro 1	Lanton style	China	Flectricity nlu	Not disclose	5
21	Clarius		Handbeld dev	Not disclose	Compatible r	60 minutes t	1
22		BILLE	Tablet device	Poland	Electricity plu	2.5 hours cor	1
24	Edan	Acclarix AV4	Lapton style	China	Electricity plu	1 hour 15 mi	4
25	Edan	Acclarix AV9	Laptop style	China	Electricity plu	1 hours conti	0 1 E
26	Eudii		Laptop style	China	Electricity plu	1 Hours contr	15
27	Euan		Laptop style	China	Electricity pl	1 F hours oor	11
20 29	Edan	050 Prime	Laptop style	China	Electricity pl	1.5 nours cor	11
30	Edan	DUS 60	Laptop style	China	Electricity plu	2 nours conti	6
31	GE Healthcai	versana activ	Laptop style	Not disclose	Electrclity plu	Not disclosed	11
32	GE Healthcai	Nextgen Log	Laptop style	Not disclose	Electricity plu	60 minutes t	14
33 34	GE Healthcar	Vscan Extend	Handheld de	Not disclose	Electricity plu	60 minutes t	1
35	GE Healthcar	Vscan Air	Handheld de	Not disclose	Mobile devic	50 minutes t	1
36	GE Healthcar	Vscan Extend	Handheld de	Not disclose	Electricity plu	60 minutes t	1
37	Healcerion	Sonon 300C	Handheld dev	vice with wire	Electricity plu	3 hours conti	1
38	Interson	SiMPLi GP	USB probe w	Not disclose	Laptop/comp	Dependent o	1
40	Konted	C6	Laptop style	China	Electricty plu	Not disclosed	4
41	Konted	Gen3 C10	Wireless ultr	China	Compatible r	3 hours conti	3
42	Konted	Gen4Pro	Wireless ultr	China	Compatible r	3.5 hours cor	4
43	Konted	C9	Laptop style	China	Electricity plu	Not disclosed	6
44 45	Konted	C10 T	Wireless ultr	China	Compatible r	3 hours conti	3
46	Lequio	US 304A	Handheld de	Japan	Compatible of	NA	1
47	Lequio	fST9500	Handheld de	Japan	Compatible of	NA	1
48	Lequio	US 304	Handheld dev	Japan	Compatible c	NA	1
49 50	Mindray	M7 premium	Laptop style	China	Electricity plu	Not disclosed	9
50	Mindray	TE7	Tablet device	China	Electricity plu	Not disclosed	11
52	Mindray	M9	Laptop style	China	Electricity plu	90 minutes t	10
53	Mindray	ME8	Laptop style	China	Electricity plu	Up to 8 hour:	10
54 55	Mindray	TE5	Tablet device	China	Electricity plu	2 hours conti	14
55	Mindray	M6	Laptop style	China	Electricity plu	Not disclosed	18
57	Mindray	DP-10	Laptop style	China	Electrciity plu	Not disclosed	6
58	Philips healtl	InnoSight	Handheld de	Taiwan	Electricty plu	90 minutes t	5
59 60	Phillips healt	CX50	Laptop style	Taiwan	Electricity plu	40 minutes c	16
UO	Phillips healt	Lumify	Handheld de	Taiwan	User-provide	N/A	3

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1	D · · · ·			NU U U U		2
2	Primedic	Handyscan	Portable bloc	Not disclose	Electricity pli 5 hours perm	2
3	Promed grou	M6	Laptop style	China	Electrciity pli Not disclosed	
4 5	Promed grou	M8	Laptop style	China	Electricity pli Not disclosed	
6	Promed grou	M7 Plus	Laptop style	China	Electrciity pli 2 hours standby time	
7	Promed grou	M7	Laptop style	China	Electricity pli Not disclosed	
8	Ricso	Aurora A3	Laptop style	China	Electricity pl 2 hours	6
9	Ricso		Lanton style	China	Electricity plu 3 hours conti	6
10	Picso			China	Electricity plu Not disclosed	U
11	RICSU Dises			China	Electricity phylot disclosed	
12	RICSO	BX-220	Laptop style	China	Electricity prinot disclosed	-
13 1 <i>1</i>	Ricso	BX-330	Laptop style	China	Electricity pli Not disclose	6
14	Ricso	Aurora A5	Laptop style	China	Electricity pli Not disclose	6
16	Ricso	BX-550	Laptop style	China	Electricity pli 2 hours	6
17	Ricso	Ultramate U	Laptop style	China	Electrciity pli 2 hours conti	6
18	Samsung	HM70 EVO	Laptop style	Not disclose	Electricity pli 7.5 hours (wi	10
19	Samsung	HM70A	Laptop style	Not disclose	Electricity pli 3 hours conti	17
20	SIESOE	SIFULTRAS 4	Tablet device	Not disclose	Electricity pli Not disclosed	
21	SIESOE	SIFLII TRAS 4	Tablet device	Not disclose	Electricity plu Not disclosed	
22			Lanton style	Not disclosed	Electricity plu 2 hours	16
24			Laptop style	Not disclosed	Electricity plu Net disclosed	10
25	SIFSOF	SIFULI RAS O	Laptop Style	Not disclosed	Electricity pli Not disclosed	2
26	SIFSUF	SIFULIRAS 6	Laptop style	Not disclose	Electricity pli Not disclose	8
27	SIFSOF	SIFULTRAS 8	Laptop style	Not disclose	Electricity pli 8 hours	7
28	SIFSOF	SIFULTRAS 8	Laptop style	Not disclose	Electricity pli 8 hours	5
29 30	SIFSOF	SIFULTRAS 6	Laptop style	Not disclosed	Electricity pli Not disclosed	5
31	SIFSOF	SIFULTRAS7.	Tablet style (Not disclose	Electricity plug for chargin	4
32	SIFSOF	SIFULTRAS 3	Handheld de	Not disclosed	Mobile devic Dependent o 3 (in 1)	
33	Sonictec	Pocket Ultras	Wireless har	Not disclosed	Mobile devic 3 hours conti	5
34	Sonoque	C5PL	Handheld de	Not disclose	Compatible r 3 hours conti	2
35	Sonoque	C6C	Handheld de	Not disclose	Compatible r 3 hours	1
30 27	Sonoque	CAPI	Handheld de	Not disclose	Compatible r 3 hours conti	2
38	Sonoque		Handhold do	Not disclosed	Compatible r 2 hours	1
39	Sonoque	CSC		Not disclosed		1
40	Sonoque	6	Handheid de	Not disclose		T
41	Sonoque	C3	Handheid de	Not disclose(Compatible r 3 hours conti	1
42	SonoScanner	Orcheo Lite 1	Laptop style	Not disclose	Electricity pli 1hr 30 minut	9
43	SonoScanner	Ondina	Laptop style	Not disclose	Electricity pli 1hr 30 minut	8
44 45	SonoScanner	T-Lite	Tablet style (Not disclose	Electricity pli 3 hours conti	11
46	SonoScanner	Orcheo Lite	Laptop style	Not disclose	Electricity pli 1hr 30 minut	8
47	SonoScanner	U-Lite	Tablet style (Not disclosed	Electricity pli Not disclose Not discl	osec
48	Sonoscape	ХЗ	Laptop style	China	Electricity pl 90 minutes c	11
49	Sonoscape	E3	Laptop style	China	Electricity pl 90 minutes c	11
50	Sonoscape	E2	Laptop style	China	Electricity pl 90 minutes c	11
51 52	Sonoscane	 \$2	Lanton style	China	Electricity pli 60 minutes c	13
53	Sonoscape	52	Lanton style	China	Electricity pl 90 minutes c	1/
54	Sonoscape	50	Laptop style	China	Electricity pl 90 minutes c	20
55	Sonoscape	59 60 Euro		China	Electricity pil 90 minutes c	50 22
56	Sonoscape	So Exp		China	Electricity pit 90 minutes c	22
57	Sonoscape	X5	Laptop style	China	Electricity pli 90 minutes c	11
58 50	Sonoscape	E2 Pro	Laptop style	China	Electricity pli 90 minutes c	11
59 60	Sonoscape	E1 Exp	Laptop style	China	Electricity pli 90 minutes c	13
~~	Sonosite	Edge II	Laptop style	Not disclose	Electricity pli 2 hours	13

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Sonosite Terason Terason Vave Vinno Vinno Vinno Vinno Vinno Vinno Whale Ima	M-Turbo uSmart 320 uSmart 330 Vave US A6 Q 8 5 6 A5 gi Sigma P5	Laptop style O Tablet device O Laptop style Handheld de Laptop style Handheld de Laptop style Laptop style Laptop style Laptop style Laptop style	Not disclose Not disclose Not disclose China China China China China China China Not disclose	Electrciity pli 2 hours Electrciity pli Not disclose Electricty plu Not disclose Compatible r 1 hours cont Electricity pli 90 minutes Compatible I Not disclose Electricity pli Not disclose Electricity pli Not disclose Electricity pli 1 hour contin Electricity pli 1 hour contin Electricity pli 3 hours cont	11 16 15 1 Not disclose Not disclose Not disclose Not disclose 5 1 1 1 1 1 1 1 1 1 1 1 1 1
16 17 18 19 20 21 22 23 24 25 26 27 28						
29 30 31 32 33 34 35 36 37 38 39 40 41						
42 43 44 45 46 47 48 49 50 51 52 53 54						

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1					
2	Transducer o Imaging moc Fetal param(Weight (g	g) D	Dimensions	Device/ScreePrice (USD)
3 4	Curved; phas M-mode, B-r "OB measuri 3	309 1	L63 x 56 x 35	Lightening ca	\$1,999
5	1x convex; 2> B-mode; B/B Dedicated of Not disclo	ose(N	Not disclose	Rotatable LE Not disclos	ed
6	1x convex; 1> B-mode; 2B- Ob/Gyn mea Not disclo	ose(3	304 x 406 x 1	15 inch high- Not disclos	ed
7	1x convex; 3> 3D/4D, color Not reported 75	500 N	Not disclose	15-inch LED : Not disclos	ed
8	1x convex; 2> B-mode; B/B Ob/Gyn appl 65	500 3	335 x 155 x 3	12-inch LED SNot disclos	ed
9 10	1x convex; 2> B-mode; B/B Dedicated ob 60	000 N	Not disclose	12-inch LED (Not disclos	ed
11	7x linear; 1x M-Mode, An; "Auto-NT me 55	500 3	355 x 355 x 7	15-inch HD L	\$28,900
12	1x convex; 2> Color dopple: Not reported 54	400 N	Not disclose	15"LED HD sc	\$17,900
13	1.5 MHz-23 I Not disclose Obstetric app 54	400 N	Not disclosed	15-inch LED I	\$14,600
14	Details uncle M-Mode; Col Ob/gyn appli 45	500 2	254 x 51 x 3C	10.4-inch tou	\$12,400
15 16	1x convex; 2> B-mode; 2Br Ob/Gyn appl 75	500 N	Not disclose	15-inch LED ։	\$11,100
17	1x convex; 2> 2D; 3D/4D Ob/Gyn appl 75	500 N	Not disclose	15-inch LED 🛿	\$10,400
18	1x convex; 2> B-mode; 2B- fetal biomet 59	900 3	330 x 330 x 1	12 inch LED (\$6,400
19	1x convex B-mode: M-r Not disclose(Not disclo	ose(6	50 x 172 x 74	User's device	\$5.265
20	1x convex: 2> B-mode: B/B Ob/gvn appli 63	350 N	Not disclose	12-inch LED I	\$3.500
21	Convex probe B-mode: cold Obstetric cal	392 1	64 x 78 x 38	Dependent o	\$4 900
23	1x convex: 1x B Mode: B+B Not discloser	100 3	810 x 280 x F	12-inch I FD I Not disclos	ې ۱,500 مط
24	2x linear: 1x B-mode: M-r Ob/gvn appli	250 J	770 v 388 v /	15 6" high re	\$27 000
25	Ax convex: Ax B-mode: cold fotal biomoti	250 7		15.6 inch TEI	\$27,000
26	4x convex, 4) B-mode, coll retain biometi 92	250.5			\$25,550 \$0.276
2/	2X curved; 1X B-mode B; IV Obstetric pre	200 3	350 X 370 X 2		\$9,370 ¢0.405
20 29	wide range - B-mode; Mi-r Ob/Gyn mea	300 3	331 X 220 X 3	12.1 nign re	\$9,195
30	1x convex; 1x B, 2B, 4B, B+Ob/gyn appli	100 3	330 x 220 x 3	12.1" IFI-LC	\$5,999
31	3x phased; 3: Not disclose: "Automate a 50	000 N	Not disclose	15.3 inch hig Not disclose	ed
32	2x convex; 1> B-mode; M-r Ob calcs and 52	200 7	70 x 340 x 34	15-inch LCD (\$18,100
33	Phased; line: B-mode; M-r Not disclose: DU: 321P	P: 12 D	DU: 168 x 76	Comes with	\$4,995
34 35	Curved; Linea B-mode; colc Not dsiclose 2	205 1	l31 x 64 x 31	Bluetooth co	\$4,495
36	Phased B-mode; M-r Not disclose DU: 321P	P: 8 5 D	DU: 168 x 76	Comes with	\$2,995
37	3.5MHz B-mode Obstetric pre 3	390 7	78 x 38 x 229	Dependent o	\$5 <i>,</i> 300
38	Curved array B-W mode Customised 1	110 1	L50 x 62	Dependent o Not disclos	ed
39	1x convex; 1> B&W mode: Ob/gyn appli 45	500 3	360 x 360 x 9	15 inch LCD ι Not disclos	ed
40 41	1x linear; 1x Not disclose(Ob/gyn appli 3	308 1	L56 x 60 x 24	Dependent o Not disclos	ed
42	1x convex; 1> B, B/M, colo Ob/gyn appli 2	270 1	156 × 60 × 20	Dependant o \$1,000 - \$1	,900
43	1x convex: 1> B. B/B. B/M. Ob/gvn appli Not disclo	ose(4	100 x 394 x 1	15 inch LCD c	\$5.000
44	1x linear: 1x B. B/M. colo Ob/gvn appli 2	227 1	L57 x 70 x 30	Dependent o	\$1.699
45	2 8/3 3/4 0 NB mode: B B Ob-Gy prester	265 1	43 x 79 x 30	Dependent o Not disclos	ed
46 47	2.8/3.3/4.0 MHz convex Ob-Gy preste	265 1	144 x 79 x 30	Dependent o Not disclos Dependent o Not disclos	ed
48	3 5MHz conv B mode: B B Ob-Gy prest	170 1	144 x 75 x 50	Dependent o Not disclos Dependent o Not disclos	od
49	Details uncle Bulse Ways I Ob/gyn mear Not discle		lat disclosor	15" high ross Not disclos	od
50	2x convex /in P mode: M r Obstatrics ns			15 mgn lest Not disclos	eu
51	3x convex (in B-mode; M-r Obstetrics pc 82	200 9	97 X 295 X 38	15 men nign- Not disclos	eu
52	3X convex (In B-mode; M-r Obstetrics pa	500 3	362 x 390 x 5	15.6 INCH LEL NOT DISCIOS	ed
55 54	1x convex; 2> B-mode; M-r Obstetrics pa 30	JUU 3	322 x 364 x 4	15.6 INCH LEL NOT DISCLOS	ea
55	Details uncle Not disclose: Ob/gyn mea: Not disclo	ose(N	Not disclose(15 Inch touch	\$27,000
56	6x curved; 2x B/M/PW & F Ob/gyn mea: 5,5	500 3	361 x 357 x 7	15" LCD Mon	\$18,000
57	1x convex; 2> B-mode; B/B "Measureme 55	500 1	l61 x 290 x 3	12.1 inch LEE	\$1,700
58	2x curved; lir 2D; M-mode; Fetal biomet DU: 2460) D	DU: 320 x 22	Comes with	\$16,948
59 60	Unclear of ty 2D; M-mode; OB/GYN clin 6,1	170 4	13 x 394 x 3	15-inch LCD (\$20,000
	curved; linea 2D; Color dor 4-measurem 1	136 1	L14 x 45	Compatible v	\$5,380

1			NI I I	2000		400 4		NU U U U
2	3.5/5.0 MHz d	ual frequenc	Not disclsoe(2000	115	x 190 x 1	5 Inch IFI LC	Not disclosed
3	unsure of ho [,] E	B, B B, 4B, E	Obstetric pa	Not disclose	Not	disclose	15-inch LED s	Not disclosed
4 5	Unsure of all E	3/W, color d	Obstetrics ar	Not disclose	Not	disclose	15 inch LCD s	Not disclosed
6	Not disclose (E	3, B B,4B, B	Obstetric pao	6500	330	x 150 x 3	12.1 inch LEC	Not disclosed
7	unsure of ho [,] E	B, B B, 4B, E	Obstetric pao	6500	Not	disclose	15-inch LED s	Not disclosed
8	1x convex; 2> E	3/W	Ob/gyn appli	Not disclosed	Not	disclosed	12-inch LED (Not disclosed
9	1x convex; 1> E	B-mode; C-m	Not disclose	Not disclose	Not	disclosed	15-inch LED s	Not disclosed
10	Not disclose E	3/W	Not disclose	Not disclose	Not	disclosed	12-inch LED (Not disclosed
11	Not disclose F	3/W	Not disclose	Not disclose	Not	disclosed	10-inch CRT	Not disclosed
12		s /\\/	Not disclose	6000	Not	disclosed	12-inch I CD (Not disclosed
14		solar dapplay	Ob/ava appli	5500	120	thick	12 inch LED	Not disclosed
15	1x convex, 2x C		Ob/gyn appli	3500	120	diaglasse	12-IIICII LED I	Not disclosed
16	Ix convex; 2) E	3/ VV	Ob/gyn appil	3500	NOT	disclose	10.4-Inch IF	Not disclosed
17	1x convex; 2> N	Not disclose	Obstetric pac	2500	Not	disclose	12-Inch LED (Not disclosed
18	3x curved; 2x N	Not disclose	Ob/gyn appli	Not disclose	Not	disclose	15 inch LCD (Not disclosed
20	4x curved; 5x 2	2D Imaging r	Obstetrics m	6100	63.8	x 388.5	15 inch LCD (Not disclosed
21	"Broard rang N	Not disclose	Ob/gyn appli	Not disclose	Not	disclose	13.3 Inch Toı	Not disclosed
22	"Broard rang N	Not disclose	Ob/gyn appli	2000	Not	disclose	13.3 Inch Toւ	Not disclosed
23	Multiple opti N	Not disclose	Ob/gyn appli	5400	Not	disclose	Not disclose	\$19,500
24	1x convex; 1> E	B, B B, 4B, E	Ob/gyn appli	Not disclosed	Not	disclosed	Not disclose	\$9,877
25	1x convex; 2> E	B, B B, 4B, E	Ob/gyn appli	Not disclose	Not	disclosed	15 Inch LCD ያ	\$9,877
20	1x convex: 1) E	B.B/B.M.B/N	Obstetrics pa	7000	380	x 212 x 3	15-inch LCD (\$8,999
28	1x convex: 1x 2		Ob/gyn annli	6000	370	x 382 x (15 inch I CD c	\$8,889
29	1x convex; 1y =	$\mathbf{R} \mathbf{R} \mathbf{I} \mathbf{R} \mathbf{A} \mathbf{R} \mathbf{F}$	Ob/gyn appli	Not disclose	Not	disclosed	15 Inch LED (\$0,005 \$7.455
30		$\mathbf{D}, \mathbf{D} \mid \mathbf{D}, \mathbf{T} \mathbf{D}, \mathbf{D}$	Ob/gyn appli Ob/gyn appli	Not disclosed	Not	disclosed	12 inch color	\$6 5 20
31		b, bb, wi, cb			NOL	125	12 mcm color	\$0,089 \$3,905
32	IX COnvex; IX			90		125	Dependent o	\$2,895
34	1x convex; 1)	Not disclose	Not disclose(280	Not	disclose(Dependent o	Not disclosed
35	1x convex/ca E	B, B/M, Colo	OB Measure	240	157	x 66 x 22	Dependent o	\$4,400
36	1x convex E	B, B/M, Colo	OB Measure	240	157	x 66 x 22	Dependent o	\$3,500
37	1x convex/ca E	B, B/M, COLO	OB Measure	240	155	x 70 x 2C	Dependent o	\$3,200
38	1x convex E	B, B/M, Colo	OB Measure	240	155	x 70 x 2C	Dependent o	\$2 <i>,</i> 490
39	1x convex E	В <i>,</i> В/М	OB Measure	240	154	x 70 x 19	Dependent o	\$2,190
40 41	1x convex E	B-mode; B/N	OB Measure	240	155	x 70 x 2C	Dependent o	\$1,190
42	2x convex; 2> E	B-mode; M-r	Ob/Gyn appl	Not disclose	Not	disclosed	Not disclose	Not disclosed
43	2x convex: 2> E	B-mode: M-r	Ob/Gyn appl	4600	370	x 290 x 7	15-inch full F	Not disclosed
44	Range from F	Pulsed Wave	Obstetric an	1000	253	x 174 x 1	10-inch HD to	Not disclosed
45	2x convex: $2x$	B-mode: M-r	Ob/Gyn annl	5500	420	x 370 x 8	15-inch HD L	000 022
46	Not disclose (Color dopplou	Ob/Gyn appl	Not disclosor	Not	disclosor	7-inch HD tou	\$30,000 \$7.845
47 48	1 Linoar 1y			Not disclosed	Not	disclosed		۲۰۵٬۱۶ ملا
49	1x Linear, 1x E	S-IVIOUE (2D	Ob/Gyn mea	Not disclosed	NOL			Not disclosed
50	1x Linear, 1x E	3-IVIOde (2D	Ob/Gyn mea	Not disclose	NOT	disclose(15.6" HD LCL	Not disclosed
51	1x Linear, 1x E	3-Mode (2D	Ob/Gyn mea	Not disclose	Not	disclose(15.6" HD LCL	Not disclosed
52	Wide range - E	B-Mode (2D	Ob/Gyn mea	13,000	230	x 350 x 1	15" HD LED V	Not disclosed
53	Wide range - E	3-Mode (2D	Ob/Gyn mea	7,900	230	x 350 x 1	15" HD LED V	Not disclosed
54 55	Wide range - E	3-Mode (2D	Ob/Gyn mea	7,800	357	x 392 x 1	15" HD LED V	Not disclosed
56	Wide range - E	3-Mode (2D	Ob/Gyn mea	7,800	357	x 392 x 1	15" HD LED V	Not disclosed
57	1x linear; 2x E	3/ 2B/ 4B/ N	Ob/Gyn mea	4500	378	x 61 x 34	15.6 inch Wi	\$9,000 - \$15,000
58	1x Linear, 1x E	3/ 2B/ 4B/ N	Ob/Gyn mea	Not disclose	Not	disclosed	15.6" High R	\$8,995
59	10 listed as " E	B-mode; 2B-	Ob/Gyn mea	6500	378	x 352 x 1	15.6 inch LCE	\$7,363
00	Types not dir 2	2D; M-mode	Yes, includin	4600	330	x 315 x E	12.1 inch dis	\$29,000

1			
2	Types not dir 2D; M-mode; Yes, includin	3900 299 x 274 x 7 10.4 inch dis	Ş10,100
3	5x linear: 3x, 2D (B-Mode) Obstetric me	2230 230 x 327 x 311 6 inch I CF	\$22,000
4			<i>722,000</i>
-	5x linear; 2x 2D (B-Mode) Obstetric me	6700 89 x 396 x 38 15" Backlit P	Ş18,751
5	Not disclose(B-mode: col(Ob/Gyn mea	340 169 x 54 x 38 Dependent o Not di	sclosed
6	Not disclosed b model, cold ob, cymmed		
7	Not disclose(Not disclose(Obstetrics m No	t disclose(Not disclose(15.6 inch LEL Not di	sciosed
8	1x convex; 1> Not disclose(Obstetric ap) No	t disclose(Not disclose(Dependent o Not di	sclosed
9	Not disclose Not disclose Ob/au appli No	t disclosov Not disclosov Not disclosov Not di	colocod
10	Not discloser not discloser Ob/gyll appli no		sciosed
11	"up to 23MH Not disclose(Ob/gyn appli	3,500 Not disclose Not disclose Not di	sclosed
12	Not obviously B-mode: M-r Obstetric me	3800_340 x 387 x 715.6 inch hig	\$20,169
12			¢20)200
1.0	Unclear of all Not disclose(Obstetric app No	t disclose(Not disclose(Not disclose(\$14,900
14	1x linear; 1x 2D (B) Mode Ob/Gyn appl	6350 390 x 320 x 7 15-inch HD S Not di	sclosed
15			
16			
17			
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e gr Transabdomi Transvaginal Adiustable a Software rec War ntv Storago on d Do -l +i

2	Software rec Warranty	Storage on d	Real-time gr	Transabdom	Transvaginal	Adjustable a
3	Apple iOS 13 1 year manut	Unlimited clo	TRUE	TRUE	FALSE	FALSE
4	In-built softy Not disclosed	8GB memory	TRUE	TRUE	TRUE	TRUE
5	"Built in soft Not disclosed	Built in mem	TRUE	TRUE	TRUE	TRUE
6	In built softy Not disclosed	Not disclosor	TRUE			TDUE
/ 8	In-built softw Not disclosed		TRUE	TRUE	TRUE	TRUE
9	In-built softwinot disclosed	8GB memory	TRUE	TRUE	TRUE	TRUE
10	In-built softw Not disclosed	8GB memory	TRUE	TRUE	TRUE	TRUE
11	In-built softv 3 year warra	128G HDD - '	TRUE	TRUE	TRUE	TRUE
12	In-built softv Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
13	In-built softv Not disclosed	up to 10,000	TRUE	TRUE	TRUE	TRUE
14	In-built softv Up to 2 year	16GB HDD	TRUE	TRUE	TRUE	TRUE
15 16	In-built softy Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
10	In-built softy Not disclosed	320GB SSD	TRUE	TRUE	TRUE	TRUE
18	In-built softw 90-day warra	320gh storag	TRUE	TRUE	TRUE	TRUE
19	Appears to o 2 year warra	User's device	TRUE	TRUE	EALSE	TRUE
20	Appears to 0 2 year warra	Duilt in mom	TRUE	TRUE	TOUE	TRUE
21		Built in mem	TRUE	TRUE	TRUE	TRUE
22	IOS: IOS 11 c 3 year warra	Dependent o	IRUE	TRUE	IRUE	IRUE
23	In-built softv 2-year manu	60GB interna	TRUE	TRUE	TRUE	FALSE
24 25	In-built softv Not disclosed	16GB memo	TRUE	TRUE	TRUE	TRUE
26	System come Not disclosed	120GB SSD s	TRUE	TRUE	TRUE	TRUE
27	System come 2 year warra	500gb intern	TRUE	TRUE	TRUE	TRUE
28	In-built softv 3-year warra	504MB built-	TRUE	TRUE	TRUE	TRUE
29	In-built softy Not disclosed	504MB built-	TRUE	TRUE	TRUE	TRUE
30	In-built softy 5 year manuf	256GB SSD	TRUE	TRUE	FALSE	TRUE
31 32	Windows [®] 1(5 year manut	128GB SSD	TRUE	TRUE	TRUE	TRUE
33	Product com 2 year manuf	Data stored i	TRUE			TDUE
34	Andreid phor 2 year manuf	Data Storeur	TRUE	TRUE	FALSE	TRUE
35	Android phor 3 year manu	0p to 500 ex	TRUE	TRUE	FALSE	TRUE
36	Product com 3 year manu	Data stored I	IRUE	FALSE	FALSE	IRUE
37	Device is con Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
38	OS: Window: Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
39 40	In-built softv Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
40	Android; iOS Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
42	iOS app avail Not disclosed	Dependent o	TRUE	TRUE	TRUE	TRUE
43	In-built softv Not disclosed	500GB HDD	TRUE	TRUE	TRUE	TRUE
44	Android: iOS Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
45	Compatible \ Not disclose	Dependent o	TRUE	TRUE	FALSE	TRUE
46 47	Compatible \ Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
47	Compatible v Not disclosed	Dependent o	TDUE	TDUE	EALSE	TDUE
49	Compatible (Not disclosed		TRUE	TRUE	FALSE	TRUE
50	Product com Not disclosed	320GB nard	TRUE	TRUE	FALSE	TRUE
51	Product com 5-year warra	System hard	IRUE	IRUE	IRUE	IRUE
52	Product com 5-year warra	System hard	TRUE	TRUE	TRUE	TRUE
53	Product com 5-year warra	System hard	TRUE	TRUE	TRUE	TRUE
54 55	Product com Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
56	Product com 5-year warra	1 TB HDD	TRUE	TRUE	TRUE	TRUE
57	Product com Not disclosed	system hard	TRUE	TRUE	TRUE	FALSE
58	Product com Up to 5 years	128G of inte	TRUE	TRUE	TRUE	TRUE
59	System com(Not disclosed	Internal stora	TRUE	TRUE	TRUE	TRUE
60	Android 5.0 c 3 year manuf	Internal store	TRUF	TRUF	FALSE	TRUF
			· · ·	· · · • • • •	· · ·	

1					
2	In-built softv Not disclose Minimum 20	TRUE	TRUE	TRUE	TRUE
3 1	System come Not disclose (Internal hard	TRUE	TRUE	TRUE	TRUE
5	System come Not disclose (Storage not e	TRUE	TRUE	TRUE	TRUE
6	System come Not disclose 64GB SSD; C	TRUE	TRUE	TRUE	TRUE
7	System comeNot disclosee Internal hard	TRUE	TRUE	TRUE	TRUE
8	System comeNot disclosee Built-in 60GE	TRUE	TRUE	TRUE	TRUE
9 10	System comeNot disclosee Not disclosee	TRUE	TRUE	TRUE	TRUE
11	System comeNot disclosee Built storage	TRUE	FALSE	FALSE	TRUE
12	System come Not disclose Not disclose	TRUE	FALSE	FALSE	TRUE
13	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
14 15	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
16	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
17	System come Not disclose 32GB SSD	TRUE	TRUE	TRUE	TRUE
18	Not disclose Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
19	"Samsung M1 year manu Maximum 2,	TRUE	TRUE	TRUE	TRUE
20	Product com 12 months m Not disclose	TRUE	TRUE	FALSE	TRUE
22	Product com 12 months m Not disclose	TRUE	TRUE	FALSE	TRUE
23	Product com 12 months rr "Large Image	TRUE	TRUE	TRUE	TRUE
24	Product com 12 months m Not disclose	TRUE	TRUE	TRUE	TRUE
25 26	Product com 12 months rr "Freeze/real	TRUE	TRUE	TRUE	TRUE
27	Product com 12 months m video storage	TRUE	TRUE	TRUE	TRUE
28	Product com 12 months rr Storage amo	TRUE	TRUE	TRUE	TRUE
29	Product com 12 months rr "Hardisk, US	TRUE	TRUE	TRUE	TRUE
30 21	Product com 12 months rr "Large volur	TRUE	TRUE	TRUE	TRUE
32	Requires wir 12 months m Dependant o	TRUE	TRUE	FALSE	TRUE
33	Compatible v 2 year manu Dependent o	TRUE	TRUE	TRUE	FALSE
34	iOS compatil 1 year warra Dependent o	TRUE	TRUE	FALSE	TRUE
35	iOS compatil 2 year warra Dependent o	TRUE	TRUE	FALSE	TRUE
30 37	iOS compatil 1 year warra Dependent o	TRUE	TRUE	FALSE	TRUE
38	iOS compatil 3 year warra Dependent o		TRUE	FALSE	TRUE
39	iOS compatil 1 year warra Dependent o			FALSE	TRUE
40	iOS compatil 1 year warra Dependent o		TRUE	FALSE	TRUE
41	In-built softw Not discloser Not discloser		TRUE	TRUE	TRUE
43	In-built softw Not disclose 251 GB SSD		TRUE	TRUE	TRUE
44	In-built softw Not disclose >40000 imagination in the softw Not disclose >40000 imagination in the software softw		TRUE	TRUE	TRUE
45	In-built softw Not disclose(250 GB SSD)	TRUE	TRUE	TRUE	TRUE
46 47	In-built softw Not disclose (In to 10,000		FALSE	FALSE	TRUE
48	System com(2 years distri 500GB interr				TRUE
49	System com(2 years distri 500GB interr	TDUE	TRUE	TRUE	TRUE
50	System com(2 years distri 500GB inter			TDUE	
51	System com(2 years distri 200GB inter	TDUE	TRUE	TDUE	
52 53	System come 2 years distri 520 GB inter				
54	System come 2 years distri 500GB inter				
55	System come 2 years distri 500GB inter		TRUE		TRUE
56	System come Not disclose CCD hard drift				
57 58	System come Not disclose (SSD nard driv				
59	System comenot disclose (500GB Interr	TOUE	TRUE	TRUE	
60	System comenot disclose(SUUGB Interr	IKUE	TRUE	TRUE	
	in-pulit softy 5-year manu Available, bu	IRUE	IRUE	IRUE	IRUE

2 3 4 5 6 7 8 9 10 11 12 13	In-built softv 5-year manu Available, bu Windows 10 Not disclsoe(480GB SSD Windows 10 Not disclsoe(1TB SSD Not disclose(Unlimited w; Dependent o Product com; Not disclose(Not disclose(Compatible r Not disclose(Not disclose(Product com; Not disclose(Not disclose(Product com; Not disclose(Not disclose(Software in- Not disclose(Not disclose(TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE FALSE TRUE FALSE FALSE TRUE TRUE	TRUE TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	In-built softv Not disclose(256GB SSD	TRUE	TRUE	TRUE	TRUE
30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46					

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Freeze-fram، Obstetric pre Capacity to ۲ Regular mai، URL/Sou	ırce
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2	Freeze-fram	Obstetric pre	Capacity to p R	egular mai	I URL/Source
3	TRUE	TRUE	TRUE	FALSE	https://store.butterflynetwork.com/au/
4	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/b-w-ultrasou
5 6	TRUE	TRUE	TRUE	FALSE	https://www.providianmedical.com/ult
7	TRUE	TRUE	FALSE	FALSE	https://www.chison.com/ebit/ebit-30.h
8	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/eco/eco-5.htr
9	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/b-w-ultrasou
10	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/sonobook/sor
12	TRUE	FALSE	TRUE	FALSE	https://www.chison.com/sonobook/sor
13	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/sonobook/sor
14	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/sonotouch/so
15	TRUE	TRUE	FALSE	FALSE	https://www.chison.com/ebit/ebit-50.k
16 17	TRUE	TRUE		FALSE	https://www.chison.com/ebit/ebit-60.k
18	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/eco/eco-6.htr
19	TRUE		TRUE		http://www.chisonsonoeve.com/index
20	TDUE	TRUE	TRUE		http://www.chison.com/b-w-ultrasou
21	TRUE	TRUE	TRUE	FALSE	https://www.chison.com/p-w-ultrasour
22	TRUE		TRUE	FALSE	https://cidius.com/du/scamers/cs/
24	TRUE	FALSE	TRUE	FALSE	https://www.draminski.com/med/doct
25	TRUE	TRUE	TRUE	FALSE	nttps://www.edan.com/upioads/2021
26	TRUE	TRUE	TRUE	FALSE	https://www.edan.com/product/a/AX8
27	TRUE	TRUE	TRUE	FALSE	https://edanusa.com/product/u60-diag
28 29	TRUE	TRUE	TRUE	FALSE	https://www.edan.com/Uploads/2020
30	TRUE	TRUE	TRUE	FALSE	https://www.edan.com/Uploads/2020(
31	TRUE	TRUE	TRUE	FALSE	https://www.ultrasoundportables.com/
32	TRUE	TRUE	TRUE	FALSE	https://www.gehealthcare.com/produc
33	TRUE	TRUE	TRUE	FALSE 🭊	https://handheldultrasound.gehealthca
35	TRUE	TRUE	TRUE	FALSE	https://handheldultrasound.gehealthca
36	TRUE	TRUE	TRUE	FALSE	https://handheldultrasound.gehealthca
37	TRUE	TRUE	TRUE	FALSE	https://www.healcerion.com/explore-s
38	TRUE	TRUE	TRUE	FALSE	https://interson.com/simpli-series/http
39 40	TRUE	TRUE	TRUE	FALSE	<u>http://www.konted.cn/products/color-c</u>
41	TRUE	TRUE	TRUE	FALSE	http://www.konted.cn/products/image
42	TRUE	TRUE	TRUE	FALSE	http://www.konted.cn/products/image
43	TRUE	TRUE	TRUE	FALSE	http://www.konted.cn/products/color-c
44	TRUE	TRUE	TRUE	FALSE	http://www.konted.cn/products/image
45 46	TRUE	TRUE	TRUE	FALSE	https://www.lequiopower.com/wp-con
47	TRUE	TRUE	TRUE	FALSE	https://www.lequiopower.com/wp-con
48	TRUE	TRUE	TRUE	FALSE	https://www.lequiopower.com/wp-con
49	TRUE	TRUE	TRUE	FALSE	https://www.mindray.com/au/product/
50 51	TRUE	TRUE	TRUE	FALSE	https://www.mindraynorthamerica.con
52	TRUE	TRUE	TRUE	FALSE	https://www.mindraynorthamerica.con
53	TRUE	TRUE	TRUE	FALSE	https://www.mindraynorthamerica.con
54	TRUE	TRUE	TRUE	FALSE	https://www.mindray.com/au/product/
55 56	TRUE	TRUE	TRUE	FALSE	https://www.mindray.com/au/product/
57	FALSE	TRUE	TRUE	FALSE	https://www.mindray.com/au/product/
58	TRUE	TRUE	TRUE	FALSE	https://www.philips.com.au/healthcare
59	TRUE	TRUE	TRUE	FALSE	https://www.philips.com.au/healthcare
60	TRUF	TRUE	TRUF	FALSE	https://www.philips.com.au/healthcare

2	TRUE	FALSE	TRUE	FALSE	https://www.yumpu.com/en/documen
3	TRUE	TRUE	TRUE	FALSE	http://promed-medical.com/productshc
4	TRUE	TRUE	TRUE	FALSE	http://promed-medical.com/productshe
5 6	TRUE	TRUE	TRUE	FALSE	http://promed-medical.com/productshe
7	TRUE	TRUE	TRUE	FALSE	http://promed-medical.com/productshe
8	TRUE	TRUE	TRUE	FALSE	https://ricso.com/product-item/aurora-
9	TRUE	FALSE	TRUE	FALSE	https://ricso.com/product-item/color-d
10	TRUE	FALSE	TRUE	FALSE	https://ricso.com/product-item/portabl
12	TRUE	FALSE	FALSE	FALSE	https://ricso.com/product-item/portabl
13	TRUE	FALSE	FALSE	FALSE	https://ricso.com/product-item/ultraso
14	TRUE	TRUE	TRUE	FALSE	https://ricso.com/product-item/color-d
15	TRUE	TRUE	FALSE	FALSE	https://ricso.com/product-item/portabl
10 17	TRUE	TRUE	FALSE	FALSE	https://ricso.com/product-item/full-dig
18	TRUE	TRUE	TRUE	FALSE	https://www.samsunghealthcare.com/
19	TRUE	TRUE	TRUE	FALSE	https://www.samsunghealthcare.com/
20	TRUE	TRUE		FALSE	https://www.sifsof.com/product/multi-
21		TDUE	FALSE		https://www.sifsof.com/product/multi
22			TDUE	FALSE	https://www.sifsof.com/product/mutt
24		TRUE		FALSE	https://www.sifeof.com/product/color-
25	TRUE	TRUE	FALSE	FALSE	https://www.sifeof.com/product/sifulti
26	TRUE	TRUE	TRUE	FALSE	https://www.sifsof.com/product/siluiti
27 29	TRUE	TRUE	TRUE	FALSE	nttps://www.sifsof.com/product/color-
20 29	TRUE	TRUE	TRUE	FALSE	https://www.sifsof.com/product/noteb
30	TRUE	TRUE	TRUE	FALSE	https://www.sifsof.com/product/color-
31	TRUE	TRUE	TRUE	FALSE	https://www.sifsof.com/product/sifulti
32	TRUE	FALSE	FALSE	FALSE	https://www.sifsof.com/product/color-
33 34	FALSE	FALSE	FALSE	FALSE 🥌	https://www.sonictec.com.au/
35	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c5pl-dual
36	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c6c-prem
37	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c4pl-dual
38	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c5c-porta
39 40	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c5-handh
41	TRUE	TRUE	TRUE	FALSE	https://www.sonoque.com/s/c3-portat
42	TRUE	TRUE	TRUE	TRUE	https://www.sonoscanner.com/en/proc
43	TRUE	TRUE	TRUE	TRUE	https://www.sonoscanner.com/en/proc
44	TRUE	TRUE	TRUE	TRUE	https://neurolite.ch/sites/default/files/
46	TRUE	TRUE	TRUE	TRUE	https://pdf.medicalexpo.com/pdf/sono
47	TRUE	TRUE	TRUE	FALSE	https://www.sonoscanner.com/en/proc
48	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
49	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
50 51	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
52	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
53	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
54	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
55 56	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
57	TRUE	TRUE	TRUE	FALSE	https://www.sonologic.com.au/view-pr
58	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
59	TRUE	TRUE	TRUE	FALSE	https://www.sonoscape.com/html/201
611					
00	TRUE	TRUE	TRUE	FALSE	https://www.sonosite.com/au/product

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE FALSE TRUE FALSE FALSE TRUE FALSE TRUE	FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE	https://www.sonosite.com/au/products https://www.terason.com/usmart-320(https://www.terason.com/usmart-330(https://www.terason.com/usmart-330(https://vavehealth.com/ https://promedstore-imaging.com/proc http://en.vinno.com/product/detail20.h http://en.vinno.com/product/detail20.h https://www.realtimeultrasoundmachi https://www.realtimeultrasoundmachi https://www.realtimeultrasoundmachi https://www.realtimeultrasoundmachi https://www.realtimeultrasoundmachi
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54					

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3	en/product/butterfly-iq/pro/https://www.butterflynetwork.com/specs
4	nd/eco-3-expert.html
5	rasound-machines/chison/chison-q5/
7	tmlhttps://www.medicalexpo.com/prod/chison-medical-technologies/product-70890-94852
8	nlbttps://www.gimaitaly.com/prodotti.asp?sku=33865&dept_selected=600&dept_id=6001
9	ad/eco-2 htmlhttps://www.medicalexpo.com/prod/chison-medical-technologies/product-708
10	<u>http://www.medicalexpo.com/prod/emson/medical-teemologies/product/oc</u>
11	<u>IODOOK-9.IIIIII</u>
12	<u>10book-6.ntminttps://www.providianmedical.com/ultrasound-machines/chison/chison-sonoc</u>
13 14	10book-8.htmlhttps://www.ultrasoundportables.com/images/brochures/SonoBook 8 Brochu
14	notouch-30.htmlhttps://www.providianmedical.com/ultrasound-machines/chison/chison-sou
16	<u>htmlhttps://www.sonologic.com.au/wp-content/uploads/2019/05/Sonologic-EBit50pdfhttp</u>
17	<u>htmlhttps://www.providianmedical.com/ultrasound-machines/chison/chison-ebit-60/</u>
18	nlhttps://www.providianmedical.com/ultrasound-machines/chison/chison-eco6/
19	php/Home/Index/product_show/id/32
20	nd/eco-1.htmlhttps://www.medicalsearch.com.au/eco1-ultrasound-machine/p/185716https:
21	
23	ors-on-call/draminski-blue/
24	726044612 361952 ndfhttps://zonomodical.com.au/ultrasound/ultrasonic.scappors/odan.au
25	<u>J720044015_501955.pumilips.//20nemedical.com.ad/ditrasound/ditrasonic-scanners/edan-ac</u>
26	<u></u>
27	nostic-ultrasound-system/
20 29	J511101412 1169/2.pdfhttps://www.ultrasoundportables.com/by-manufacturer/edan/edan-
30	<u>)511101439</u> 301497.pdfhttps://www.medicalsearch.com.au/dus-60-digital-portable-ultrasou
31	'by-manufacturer/ge/ge-versana-activehttps://www.gehealthcare.com.au/products/versana
32	<u>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound</u>
32 33	<u>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound</u> re.com/vscan-extend/
32 33 34	<u>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound</u> <u>re.com/vscan-extend/</u> <u>re.com/vscan-air/</u>
32 33 34 35 36	<u>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound</u> re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/
32 33 34 35 36 37	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c</pre>
32 33 34 35 36 37 38	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c vs://interson.com/medical/simpli-gp-medical/</pre>
32 33 34 35 36 37 38 39	:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c vs://interson.com/medical/simpli-gp-medical/
32 33 34 35 36 37 38 39 40	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c vs://interson.com/medical/simpli-gp-medical/ joppler/11.html _librany(62 html</pre>
32 33 34 35 36 37 38 39 40 41	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c vs://interson.com/medical/simpli-gp-medical/ joppler/11.html -library/62.html library/70 htmlhttps://www.alibaba.com/product.dotail/Konted.com/.pro.array.wireless.uli</pre>
32 33 34 35 36 37 38 39 40 41 42 42	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c ps://interson.com/medical/simpli-gp-medical/ s://interson.com/medical/simpli-gp-medical/ loppler/11.html -library/62.html -library/79.htmlhttps://www.alibaba.com/product-detail/Konted-gen4-pro-array-wireless-ult here deta(42 block block</pre>
32 33 34 35 36 37 38 39 40 41 42 43 44	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c vs://interson.com/medical/simpli-gp-medical/ joppler/11.html -library/62.html -library/79.htmlhttps://www.alibaba.com/product-detail/Konted-gen4-pro-array-wireless-ul- joppler/19.htmlhttps://www.alibaba.com/product-detail/Konted-gen4-pro-array-wireless-ul- joppler/19.htmlhttps://www.alibaba.com/product-detail/Konted-C9-Portable-Doppler-Ultras</pre>
32 33 34 35 36 37 38 39 40 41 42 43 44 45	<pre>:ts/ultrasound/point-of-care-ultrasound/nextgen-logiq-e-ultrasound re.com/vscan-extend/ re.com/vscan-air/ re.com/vscan-extend/ onon/sonon-300c >s://interson.com/medical/simpli-gp-medical/ ioppler/11.html -library/62.html -library/79.htmlhttps://www.alibaba.com/product-detail/Konted-gen4-pro-array-wireless-uli ioppler/19.htmlhttps://www.alibaba.com/product-detail/Konted-C9-Portable-Doppler-Ultras -library/84.htmlhttps://www.alibaba.com/product-detail/Portable-Wireless-Ultrasound-Mac</pre>
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Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #				
TITLE							
Title	1	Identify the report as a scoping review.	1				
ABSTRACT							
Structured 2 summary		Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2				
INTRODUCTION	INTRODUCTION						
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4				
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	4				
METHODS							
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	5				
Eligibility criteria	gibility criteria 6 Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.		5-6				
Information sources*	7 Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.		6				
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	SF1				
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6				
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6-7				
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6-7				
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA				



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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7	
RESULTS				
Selection of sources of evidence Give numbers of assessed for elig reasons for excl flow diagram.		Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9	
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-12	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	9-12	
DISCUSSION				
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	16	
Limitations	20	Discuss the limitations of the scoping review process.	16	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	18	
FUNDING				
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	19	

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).
 ‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the

[‡] The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.



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Portable ultrasound technologies for estimating gestational age in pregnant women: a scoping review and analysis of commercially available models

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Secondary Subject Heading:	Diagnostics, Radiology and imaging	
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Portable ultrasound technologies for estimating gestational age in pregnant women: a scoping review and analysis of commercially available models

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Word Count: 3,322

ABSTRACT

Objectives: To identify all available studies assessing the use of portable ultrasound devices for pregnant women, with the specific aim of finding evidence for devices used to determine gestational age and their validity when compared to conventional ultrasound machines. We also wanted to determine what portable ultrasound models are commercially available for obstetric use.

Design: Systematic scoping review

Primary and secondary outcome measures: Extracted variables included study design, population, method of ultrasound measurement, devices used and whether studies formally validated accuracy against conventional ultrasound

Results: We searched four databases – Medline, Embase, CINAHL, and Maternal and Infant Care. In total 56 studies from 34 countries were identified; most were observational studies. Across all studies, 27 different portable ultrasound models (from 17 manufacturers) were evaluated. Twenty-one studies assessed use of portable ultrasound for evaluating fetal characteristics or estimating gestational age, and 10 of these were formal validation studies. In total, six portable devices have been validated for gestational age estimation against a conventional ultrasound comparator. The web searches identified 102 portable devices (21 manufacturers). These were a mix of handheld devices that connected to a phone or computer, or laptop-style portable ultrasound devices. Prices ranged from \$1,190 to \$30,000 USD and weight ranged from 0.9kg to 13.0kg.

Conclusion: While the number of commercially available portable ultrasound devices continues to grow, there remains a lack of peer-reviewed, quality evidence demonstrating their accuracy and validity when compared to conventional ultrasound machines. This review identified some models that may be useful in gestational age estimation in low-resource settings, but more research is required to help implement the technology at scale.

Trial registration: Registered via Open Science Framework (DOI: 10.17605/OSF.IO/U8KXP)

ARTICLE SUMMARY

Strengths and limitations of this study

- We applied a detailed and tailored search strategy to a wide range of data sources to identify as many relevant studies as possible, including a variety of medical databases.
- The screening and data extraction processes were completed by two independent reviewers, with any conflicts resolved by a third reviewer.
- The findings from our formal scoping review were augmented by additional web searches of ultrasound manufacturers.
- We acknowledge that scoping reviews do not take in to account the integrity or accuracy of individual studies identified.
- We acknowledge that some studies may have been published outside of the databases and websites we searched.

BACKGROUND

The World Health Organization (WHO) recommends that all pregnant women should receive at least one ultrasound scan before 24 weeks' gestation to estimate gestational age, improve detection of fetal anomalies and multiple pregnancies, reduce induction of labour for post-term pregnancy, and improve a woman's pregnancy experience.(1) An ultrasound scan for gestational age estimation is most accurate when it is performed in the first trimester of pregnancy.(2) Several antenatal interventions recommended by WHO confer benefit when used at specific gestational ages – such as antenatal corticosteroids for women at risk of preterm birth prior to 34 weeks' gestation (3), aspirin for women at increased risk of pre-eclampsia prior to 20 weeks' gestation (4) and induction of labour for post-term pregnancy (5) – and hence the safe and appropriate use of these interventions can be affected by accuracy of gestational age estimation. WHO's antenatal care recommendations emphasise the need for effective and reliable antenatal ultrasound services to be available to all pregnant women, in order to optimise maternal and newborn health outcomes.(6) However, in many low- and middle-income countries (LMICs), women's access to reliable antenatal ultrasound is often limited or only available in certain contexts, such as tertiary hospitals or in private health services.(7, 8) Resource constraints and limited infrastructure in rural health facilities further impacts the ability to implement traditional or conventional ultrasound machines in these settings.

Recent years have seen the development of portable, wireless, compact or mobile-based ultrasound systems for obstetric use.(9) If such portable ultrasound devices are as accurate as conventional, cart-based ultrasound systems – as well as being easy to use, affordable, and acceptable to women and their healthcare providers – they could help improve pregnant women's access to antenatal ultrasound, and thus increase coverage. A 2016 systematic review explored available research on the use of portable ultrasound devices in the triage, diagnosis, and management of adult patients in LMICs, and found 36 studies describing their use in cardiac screening, abdominal assessment, obstetric dating, and in rapid triage in rural areas or emergency settings.(9) While that review identified only three studies related to portable ultrasound use in pregnancy, a number of new portable ultrasound models have become commercially available since that review was conducted, including several models intended specifically for pregnant women.

We therefore aimed to conduct a scoping review to identify all available studies assessing the use of portable ultrasound devices for pregnant women, as well as aiming to identify what portable ultrasound models are currently commercially available. We did this review to help identify which (if any) devices would be useful for improving access to antenatal ultrasound for women in LMICs.

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METHODS

Study design

Scoping reviews are a useful methodology for examining the range and nature of existing literature on a topic.(10, 11) They are well suited to addressing relatively broad questions, as they can create a map of the existing literature in a reproducible and transparent manner.(12) Scoping reviews can provide insights into how a topic has been studied, and whether knowledge gaps exist. This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) Methodology for Scoping Reviews, and is reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) standards.(10, 11) We first developed a review protocol which was registered online via the Open Science Framework website.(13) As a systematic review of publicly available data, ethics approval was not required. No patients or members of the public were involved in the design or conduct of this review.

Patient and public involvement

No patient's or members of the public were involved in the design, conduction, or dissemination of results for this paper.

Eligibility criteria

For the scoping review, eligible studies were primary research studies that used any study design, conducted in any country, setting or language, provided that the study involved the use of a portable ultrasound device (variably described as point-of-care, wireless, compact, or mobile-based ultrasound devices) in pregnant women. We also included studies that pertained to training healthcare providers in the use of portable ultrasound devices for pregnancy-related indications. Studies were included regardless of the comparator used. We searched the literature from 1 January 2000 onwards, considering that portable ultrasound devices are a relatively new technology. While the aim of the review was to identify portable ultrasound devices specifically for gestational age estimation, we decided to use eligibility criteria that captured any study assessing the use of a portable ultrasound devices might have multiple uses (such as gestational age estimation, assessing position of the placenta, or detecting fetal anomaly). Studies that related to the use of conventional ultrasound systems only (i.e., cart-based ultrasound devices), or studies that assessed portable ultrasound use in clinical contexts outside of obstetric applications were not included. Conference abstracts, case reports, case series, study protocols and editorial

 letters were also not eligible. Systematic reviews were not considered eligible but were checked for any studies not identified through our searches.

Literature searching and assessment of eligibility

We searched four databases – Medline, Embase, CINAHL, and Maternal and Infant Care – on 29 July 2021. With support from two information specialists, search strategies were constructed for each database, combining relevant synonyms and search terms for pregnancy (including terms related to foetal biometry and GA estimation) and portable ultrasound devices (Supplemental Tables S1-S4). Identified citations were collated and de-duplicated in Endnote (14), before uploading to Covidence for screening (15). Two reviewers independently screened and assessed titles and abstracts of all retrieved citations for potential eligibility. For potentially eligible studies, full texts were retrieved and assessed by two independent reviewers according to the review's eligibility criteria. Disagreements during both stages were resolved either through discussion or consultation with a third author.

Separate to the searches of these four databases, we used Google searches to identify portable ultrasound devices that were commercially available at the time of searching. These searches used structured search terms and synonyms to identify manufacturers of portable ultrasound systems (Supplementary Table S5). We also searched individual websites of ultrasound manufacturers to identify what (if any) portable ultrasound systems were currently available (Supplementary Table S6). Once the scoping review was completed, we updated these searches to ensure that manufacturers identified in the included studies were also included in these web searches.

Data collection and analysis

For the scoping review, data extraction was conducted using a customised Google Sheet, which was pre-tested and refined on five eligible studies. For each included study we extracted data on: study title, author, year of publication, country and region where the study was conducted, study design, population, setting, stage of pregnancy, method of measurement (transabdominal, transvaginal, and/or transperineal), device used, and what parameters were assessed. By parameters, we mean whether the study reported on accuracy, effects on health outcomes, feasibility, whether training programs were used, and whether they compared findings to conventional ultrasound devices. The country where a study was conducted was classified into income levels using 2021 World Bank categories.(16)

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Study designs were classified according to the Centre for Evidence-Based Medicine's published hierarchies of evidence, (17) while those studies that self-described as pilot, field, or validation studies were classified as "other primary research design". We also classified each study based on its main objective – for example, whether the study used portable ultrasound primarily for: gestational age estimation, confirming pregnancy, routine antenatal ultrasound scans, identifying ectopic pregnancy, identifying or monitoring placental abnormalities, congenital anomaly screening, monitoring labour progress, or emergency/trauma applications for pregnant women (Supplementary Table S7). For those studies that formally validated a portable device against a conventional ultrasound system for gestational age estimation, the findings of that validation analysis were reported. As a scoping review, quality assessment of individual studies was not performed. Data were analysed descriptively. For the purposes of reporting review findings, the term "portable ultrasound" was used to mean any point-of-care, wireless, compact, or mobile-based ultrasound device, as distinct from conventional (non-portable) or cart-based ultrasound devices.

For the web searches to identify commercially available portable ultrasound devices, we extracted available data on country of manufacture, countries of registration, intended use and user, what training is provided or available, and the device characteristics. This included the device's power supply, battery life, transducers, obstetric software pre-sets, estimated lifetime, drop and waterproof standards, weight, dimensions, accessories, screen resolutions, software requirements, storage, data export options, price, and warranty. In 2018, WHO published a policy brief on their antenatal care recommendations, identifying eight suggested requirements that obstetric ultrasound equipment should meet for antenatal care (Box 1). We assessed all identified ultrasound systems against these eight requirements.(6)

Box 1. Suggested equipment capacity for obstetric ultrasound (reproduced with permission from the World Health Organization's recommendations on antenatal care for a positive pregnancy experience) (6)

- Real-time, grayscale capabilities
- Transabdominal transducer (3–5 MHz)
- Transvaginal US transducer to help detect placental abnormalities and extrauterine pregnancies
- Adjustable acoustic power output controls with output display standards
- Freeze-frame capabilities and electronic callipers
- Obstetric presets (software) to estimate gestational age
- Capacity to print or store images
- Regular maintenance and servicing, important for optimal equipment performance

In general, service delivery settings that will only conduct routine basic obstetric ultrasound will not require a machine with additional features such as Doppler or 3-D/4-D imaging.

A transvaginal transducer may also be useful in some examinations where an experienced provider is unable to visualize anatomy with a transabdominal transducer.

Review only

RESULTS

Literature searches for the scoping review identified 2,770 citations, of which 793 duplicates were removed. Title and abstract screening of the remaining 1,977 unique citations identified 269 citations which were potentially eligible. After reviewing full texts, 56 studies were included for analysis (Figure 1). The most common reasons for exclusion included conference abstracts (86 studies), ultrasound device was not described (34 studies), or studies using an ineligible intervention (such as conventional ultrasound devices only) (26 studies). Six full texts were unable to be located. All data used in the results are publicly available online.(18)

Characteristics of included studies

Included studies were published between 2005 and 2021. Studies were conducted in 34 different countries across six regions (2 studies were conducted in multiple countries). High-income countries accounted for 24 studies (42.9%), lower middle-income countries for 13 studies (23.2%), upper-middle income for nine studies (16.1%), and low-income countries for eight studies (14.3%) (Table 1). In terms of geographical regions, 16 studies (28.6%) were from Sub-Saharan African countries, followed by Latin American and Caribbean countries (13 studies, 23.2%). The country with the highest number of studies was the United States (10 studies, 17.9%).

Table 1. Number of studies per World Bank (2021) income level

Income level	Number studies	of % of total studies
High income	24	42.9%
Upper middle income	9	16.1%
Lower middle income	13	23.2%
Low income	8	14.3%
Multiple ¹	2	3.6%
Total	56	100.0%

¹ Both studies categorised under multiple were across countries classified as high income and upper middle income

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 Cross-sectional study designs were most common (15 studies, 26.8%), followed by prospective or retrospective cohort studies (11 studies, 19.6%) and a single study using a case-control study design. The remaining 29 studies were pilot, field, or validation studies. Studies were most commonly using portable ultrasound devices for transabdominal assessment (36 studies, 64.3%). Other studies related to training programs for portable ultrasound use in pregnancy-related indications (9 studies, 16.1%), using portable devices with transvaginal ultrasound only (8 studies, 14.3%), and studies where existing ultrasound devices were modified, such as attaching a motor to a probe to allow for remote control of an ultrasound device (3 studies, 5.4%). In total, 21 studies related to assessment of fetal characteristics or performing gestational dating (37.5%). Other studies used portable ultrasound use in emergency/trauma situations involving pregnant women (10 studies, 17.9%) (Figure 2).

The 56 studies used 27 different portable ultrasound models, from 17 manufacturers (Table 2). Nearly half used a device produced by SonoSite, with the most common being the SonoSite M-Turbo (10 studies, 17.9%) followed by the General Electric (GE) VScan (8 studies), SonoSite Titan and Micromaxx (four studies each), and GE Voluson i (three studies). One device, the Enlace Hispano Americano de Salud (EHAS) Healthy Pregnancy Kit device, was described in two studies but does not appear to be commercially available.(19, 20)

Of the 56 studies, 47 (83.9%) primarily focused on pregnant women as participants, and nine studies (16.1%) collected data related to staff members who participated in portable ultrasound training programs. The 47 studies involved pregnant women without specific restrictions (32 studies), pregnant women who presented with vaginal bleeding (5 studies) or women with ectopic or clinically high-risk pregnancies (10 studies). For the nine studies that reported data on staff members being trained in portable ultrasound use, these involved multiple groups of health professionals (4 studies), physicians only (2 studies), nurses/midwives only (2 studies) and medical students (1 study).

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Manufacturer	Portable ultrasound device model	Number of	% total
		studies	studies
Enlace Hispano Americano de Salud (EHAS)	Healthy Pregnancy Kit specific (19, 20)	2	3.6%
General Electric	Logiq e (21)	1	1.8%
	Logiq I (22)	1	1.8%
	Voluson I (23-25)	3	5.4%
	VScan (26-33)	8	14.3%
Healcerion	SONON 300C (34)	1	1.8%
Konted	Gen 1 C10R (35)	1	1.8%
Lequio	US-304 (36)	1	1.8%
Mindray	DP-10 (37)	1	1.8%
	DP-20 (38, 39)	2	3.6%
Phillips	Lumify (40)	1	1.8%
	VISIQ (41)	1	1.8%
Primedic	Handyscan (42)	1	1.8%
Siemens	Accuson 10 (43)	1	1.8%
Signostics	Signos (44)	1	1.8%
SONON	300L (45)	1	1.8%
Sonoscanner	Orcheo Lite (46, 47)	2	3.6%
SonoScape	S2 (48)	1	1.8%
SonoSite	180 (49, 50)	2	3.6%
	180 Plus (51)	1	1.8%
	Edge (52)	1	1.8%
	M-Turbo (53-61)	9	16.1%
	Micromaxx (62-64)	3	5.4%
	Micromaxx OR M-Turbo (65)	1	1.8%
	S180 (66)	1	1.8%
	Titan (67-70)	4	7.1%
	Model not specified (71)	1	1.8%
Sony	Model not specified (72)	1	1.8%
Toshiba	SSA-510 A (73)	1	1.8%
Whale Imaging	Sigma P5 (74)	1	1.8%

Table 2. Number of studies, stratified by manufacturer and model of portable ultrasound device

Most studies (53 studies, 94.6%) were conducted in the antenatal period, though two were intrapartum and one was both antenatal and intrapartum. Of those 53 studies in the antenatal period, 10 were in the first trimester only, five in the second trimester only, five in the third trimester only and five across both second and third trimesters (the remaining 28 studies did not specify the pregnancy term period). Studies were conducted in outpatient antenatal care settings (30 studies, 53.6%), inpatient (24 studies, 42.9%), and community settings, such as local

marketplaces or "field investigations" (8 studies, 14.3%). One study assessed portable ultrasound in the context of telemedicine, and one study did not describe the setting.

Accuracy of portable ultrasound devices

A total of 21 studies related to portable ultrasound use for assessment of fetal characteristics and/or gestational age estimation, though only 10 of these formally validated a portable device against a conventional ultrasound. Findings from these 10 studies – including study design, objective, devices used, and key findings – are presented in Table 3. The devices used in these 10 studies were the GE VScan (4 studies); GE Logiq i (1 study); Konted Gen 1 C10R (1 study); Mindray DP-10 (1 study); Siemens Accuson 10 (1 study); SonoSite M-Turbo (1 study); and SonoSite Titan (1 study). These validation studies investigated device accuracy with regards to fetal biometric measurements such as biparietal diameter and femur length, as well as fetal number, fetal lie, gestational age, placental location, small or large for gestational age. The studies were conducted with women across a range of gestational ages. Of these 10 studies, nine reported that the portable ultrasound device was partially or fully validated.

Commercially available portable ultrasounds

Web searches identified 106 portable ultrasound devices made by 26 different manufacturers (Supplemental Table S8). The majority were produced in China, and prices ranged from USD\$1,190 to \$30,000. Devices ranged in weight from 0.9kg to 13.0kg and battery life was from 40 minutes up to 8 hours. Identified devices were a mix of handheld devices with either wired or wireless connection to a user's device (typically a phone or computer), or laptop-style portable ultrasound devices.

Where sufficient data were available, we compared available devices against the requirements identified in WHO's antenatal care recommendations for ultrasound devices (Box 1). Though we did not have complete data on all identified devices, it was common for identified devices to have a transabdominal transducer, greyscale imaging capabilities, adjustable acoustic power output controls, freeze-frame capabilities, the capacity to store and print images, and obstetric presets. For most devices, information was not available on whether regular servicing and maintenance was offered, and it was less common for transvaginal transducers to be available.

BMJ Open Table 3. Characteristics and findings from studies comparing portable ultrasound devices against conventional ultrasound for assessing fetal characteristics and gestational age estimation

Author	Year	Country	Study design	Sample size	Gestational age	Portable ultrasound device used	Comparator		Review team assessment
Dougherty, A et al (22)	2021	United States (USA)	Quality assurance and improvement protocol	113 pregnant women	14–26 weeks	GE Logiq i	A diagnostic obstetric ultrasound scan performed with Voluson E8 system by a trained sonographer	For biometric networks and calculations of estimation estimation of estimation of estimation of estimation estimatis estimation estimation estimation estimat	Study demonstrates validity for these measures
Galjaard, S. et al (28)	2014	Belgium	Cohort study (prospective)	51 pregnant women	'Third trimester' (range not indicated)	GE VScan	Comparison to routine scan performed by an experienced ultrasonographer on a Voluson E730 Expert	Regarding end by an analysis of the source o	Study demonstrates validity for these measures
Haragan, A. et al (29)	2015	United States (USA)	Diagnostic accuracy study	251 pregnant women	24–40 weeks	GE VScan	Formal growth ultrasound by registered diagnostic medical sonographers (device not specified)	Authors found 3 highly significant correlation between handheld and formal ultrasoung measurements of abdominal circumference (8=0.939; P<.001). Handheld Ttragund was also found to be viable for screeping for FGR and LGA	Study demonstrates validity for these measures
Lausin, I. et al (43)	2009	Croatia	Diagnostic accuracy study	100 pregnant women	16–41 weeks	Siemens Accuson 10	Larger, traditional ultrasound devices used at the studies clinic (devices not specified)	Portable Frascind device was found to be effective for measuring the following: quantity Gammotic fluid, position of the placenta, position of the fetus, and fetal heartbeat Regarding biometrical measurements PD was determined in 97% of pagents FL in 73% and AC in only 67%.	Study demonstrates validity for some measures, but not for others
Maraci, M. et al (35)	2020	United Kingdom (UK)	Proof-of- concept evaluation	1 pregnant woman	Not indicated	Konted Gen 1 C10R	1) Sonographer performed manual estimation of TCD on scan; and 2) clinical hospital scan TCD measurement on the same subject made using a high-end ultrasound machine (GE Voluson E8)	TCD autoroates measurement (26.2 mm) was an underegomation compared with manual measurement (34.9 mm) and the hospital measurement (36.2 mm). It is not known whether this is a fault of the scan being from a postable device, or from the automated system itself.	Study did not demonstrate validity of a machine learning algorithm for TCD measurement, though sample size is small (n=1)
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Saul, T. et al (70)	2012	United States (USA)	Cross-sectional study	68 pregnant women	'First trimester' (range not indicated)	SonoSite Titan	Gestational age estimated by ultrasound performed in the department of radiology (device not specified)	Excluding ases with no fetal pole, the median diagree by between emergency- physician deerformed and radiology department gestational age estimation was 2 days The orrelation co-efficient was 0.978	Study demo validity for measures
Sayasneh, A. et al (32)	2012	United Kingdom (UK)	Cohort study (prospective)	204 women	Group 1: 'early pregnancy' (range not indicated) Group 2: >14 weeks Group 3: Not applicable	GE VScan	Transvaginal and/or transabdominal examination depending on the clinical indication, using a Voluson E8 Expert	In group 17 the was good to very good agreement of inentifying presence or absence of the presence or absence of the presence or absence of the presence or absence of the presence of good to very good agreement for fetal presentat of the presental location, and placental of the presental location, and placental of the presentation of the presentation of the presentation very good for the presentation of	Study demo validity for measures
Shah, S. et al (60)	2010	United States (USA)	Cross-sectional study	96 ultrasound examinations on 38 pregnant women	14–40 weeks	SonoSite M- Turbo	Formal sonography by an ultrasound technician using Accuvix XQ ultrasound machine	When comparing physician-performed measurements with true gestational age measurements PD had a correlation coefficient of 0.347 and FL had a correlation coefficient of 0.957. Physician steer mination of fetal viability had an of all accuracy of 96% when using ultradiume	Study demo validity for f measures
Toscano, M. et al (37)	2021	Peru	Single-centre pilot study	126 pregnant women	'Second or third trimester' (range not indicated)	Mindray DP-10	Concurrently performed standard of care ultrasound obtained and interpreted by an experienced ultrasonographer	Telediagnotic vistem with ultrasound protocol sowe excellent agreement with standard of care ultrasound allowing identification of number of fetuses, fetal presentation, precental location, and assessmed of miniotic fluid volume. Intraclass orrelation was good or excellent or all fetal biometric measurements bincluding kappa coefficient of 0 bis for estimated gestational age	Study demo validity for t measures
Troyano L. et al (33)	2013	Spain	Pilot study	80 women	11–13 weeks	GE VScan	The same measurements performed with a traditional US device (Voluson 730 Expert)	When comparing to the conventional ultrasound findings, there was high Pearson's correction coefficient for BPD, gynaecological Reasurements, and overall correlation	Study demo validity for measures
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DISCUSSION

Summary of main findings

This scoping review identified 56 studies related to the use of portable ultrasound devices in obstetric care, more than half of which were in LMICs. The review found that 27 portable ultrasound devices (from 17 manufacturers) had been formally evaluated in the peer-reviewed literature. These studies most commonly related to abdominal assessment using a portable ultrasound device, though studies relating to transvaginal ultrasound assessment and training programs for health care workers on using portable ultrasound were also identified. Our results found that only 10 studies formally validated portable ultrasound devices against a conventional ultrasound device. Four studies assessed accuracy of gestational age estimation, while six studies assessed accuracy of selected fetal biometry measures, which can be used in estimating gestational age. These 10 studies incorporated seven devices, with which only six were described as valid compared to their conventional counterpart. By comparison, 102 portable ultrasound devices are currently commercially available. While many of the available devices are promising in terms of function, portability, and affordability, we identified no validation studies for the majority of commercially available devices.

Strengths and limitations

This review was conducted in accordance with a pre-specified protocol, and in line with current scoping review methodological guidance. (10-12) We searched a wide range of sources using robust search strategies, and studies were screened and extracted in duplicate and verified. The scoping review was augmented by additional web searches of ultrasound manufacturers, providing useful corollary information on the commercial availability of portable devices. However, some limitations must be acknowledged. Despite our best efforts, we were unable to locate six potentially eligible studies, which may have impacted the findings of this review. Also, some of the included studies required extensive discussions in the review team regarding the study design, intervention and what fetal measurements had been evaluated. We aimed to mitigate this through using operational definitions for study classification and data extraction, though this was challenging for some studies that were poorly reported. While nine studies were identified in which portable ultrasound devices were determined to be valid, it is possible that validation studies in other settings or populations may find different results. Also, sample sizes for these studies were not large – up to 251 women, and including a proof-of-concept study in a single woman. (35) Hence we consider it likely that further studies will be required for these devices also. It is important to acknowledge that ultrasound manufacturers may have conducted formal validation for portable ultrasound devices,

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but that these may not be available in the public domain. However, we consider it critical that any such studies should be made publicly available in the peer-review literature, so that clinicians, administrators, and policymakers can appropriately scrutinise their accuracy and reliability.

Interpretation

This is the first review specifically examining the use of portable ultrasound devices for use in pregnant women. A 2016 review by Becker et al investigated portable ultrasound use across multiple health topics, identifying only three studies on pregnancy-related indications.(9) Our review identified a higher number of studies, probably reflecting that a number of portable devices have entered the market since 2016, with an associated increase in research interest. It was noteworthy that over half of identified studies were conducted in LMICs, likely reflecting that this innovative technology is promising for limited-resource settings.

The large number of devices commercially available is consistent with expansion of this technology in recent years. However, only 27 of these devices have had been formally evaluated through some form of peer-reviewed research regarding their accuracy, feasibility, reliability, or acceptability. In their 2019 commentary on medical device regulation, Charlesworth and van Zundert argued that while medical device manufacturers may posit that it is too costly, time-consuming, and impractical to generate evidence on devices from large studies, primary research is undeniably critical to ensuring that large-scale implementation will be beneficial.(75) Relatedly, a major finding from this review is that further research on portable ultrasound devices – in particular their accuracy and acceptability when used in antenatal care contexts – are needed to guide decision-making around selection and procurement of ultrasound models.

Since 2016 WHO has recommended that all women should have an ultrasound prior to 24 weeks' gestation, however the coverage of ultrasound use remains limited in many countries.(7, 8) Findings of this review can be useful to maternity care clinicians, program administrators and policymakers who are seeking to identify reliable, affordable and portable ultrasound systems to use in their settings. However, available information was insufficient for most models, and only 10 had been formally validated for fetal biometry measures. In order to respond to this knowledge gap, and the growing number of commercially available devices, further peer-reviewed studies into portable ultrasound devices for obstetric use are required. These studies would ideally be independent (free from any financial bias or incentives from device manufacturers); utilise a diagnostic accuracy design (or similar) for routine fetal biometry measures; assess promising handlhed devices against a

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standard control; and be peer-reviewed and publicly available. It is hoped that these studies would demonstrate convincingly that handheld devices perform as well as conventional ultrasound systems used in obstetrics.

CONCLUSION

A large number of portable ultrasound devices for obstetric use are commercially available, however there is limited peer-reviewed research that has formally assessed how these devices perform against conventional ultrasound machines. Findings from this review, combined with future studies that assess the accuracy and validity of new technologies, can help support safe and effective ty ces, par. implementation of portable devices, particularly for limited-resource settings where access to obstetric ultrasound is limited.

AUTHOR CONTRIBUTIONS

AE developed the review protocol and data extraction tools. AE and SMcD (an information specialist) developed the search strategy. AE, EF and SA conducted title/abstract and full-text screening and data extraction – conflicts were resolved by either EF or SA depending on which was not involved in the initial decision. AE prepared the first draft of the analysis, which was reviewed by all authors and revised following their input. All named authors contributed to the writing of this manuscript. The authorship team is comprised of medical doctors, a maternal and public health researcher, and an information specialist.

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Lorena Romero (an information specialist) helped with the initial design of the search strategy. Anna Shalit and Lauren Vallely (medical students) helped with the initial title/abstract screening.

COMPETING INTERESTS

The authors declare no competing interests.

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DATA SHARING STATEMENT

Extra data can be accessed via the Dryad data repository at http://datadryad.org/ with the doi: 10.5061/dryad.05qfttf5c

RESEARCH ETHICS APPROVAL

As a systematic review of publicly available data, ethical approval was not required.

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REFERENCES

1. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.

2. Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. Cochrane Database of Systematic Reviews. 2015(7).

3. World Health Organization. WHO recommendations on interventions to improve preterm birth outcomes. Geneva: World Health Organization; 2015.

4. World Health Organization. WHO recommendations on antiplatelet agents for the prevention of pre-eclampsia. Geneva, Switzerland: WHO; 2021.

5. World Health Organization. WHO recommendations: Induction of labour at or beyond term. Geneva, Switzerland: World Health Organization; 2018.

6. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience: ultrasound examination. Geneva, Switzerland: WHO; 2018.

7. Shah S, Bellows BA, Adedipe AA, Totten JE, Backlund BH, Sajed D. Perceived barriers in the use of ultrasound in developing countries. Critical Ultrasound Journal. 2015;7(1):11.

8. Franklin HL, Mirza W, Swanson DL, Newman JE, Goldenberg RL, Muyodi D, et al. Factors influencing referrals for ultrasound-diagnosed complications during prenatal care in five low and middle income countries. Reproductive Health. 2018;15(1):204.

9. Becker DM, Tafoya CA, Becker SL, Kruger GH, Tafoya MJ, Becker TK. The use of portable ultrasound devices in low- and middle-income countries: a systematic review of the literature. Tropical Medicine & International Health. 2016;21(3):294-311.

10. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Annals of internal medicine. 2018;169(7):467-73.

11. Peters MD, Godfrey C, McInerney P, Baldini Soares C, Khalil H, Parker D. Scoping reviews. Joanna Briggs Institute reviewer's manual. 2017:408-46.

12. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evidence Synthesis. 2020;18(10).

13. Eggleston AV, J. Point-of-care ultrasound technologies for gestational age dating: rapid scoping review: OSF Registries; 2021 [Available from: https://doi.org/10.17605/OSF.IO/U8KXP.

14. Web of Science Group. EndNote USA: Clarivate; 2020 [cited 2020 October 14]. Available from: <u>https://endnote.com/</u>.

15. Covidence. About Covidence Australia2020 [cited 2020 October 14]. Available from: https://www.covidence.org/.

16. World Bank Group. The World Bank USA: The World Bank Group; 2021 [Available from: <u>https://www.worldbank.org/</u>.

17. CEBM. Centre for Evidence Based Medicine [cited 2020 May 1]. Available from: https://www.cebm.net/.

[dataset] 18. Data from: Portable ultrasound technologies for estimating gestational age in pregnant women: a scoping review and analysis of commercially available models [Internet]. 2022.

19. Crispin Milart PH, Diaz Molina CA, Prieto-Egido I, Martinez-Fernandez A. Use of a portable system with ultrasound and blood tests to improve prenatal controls in rural Guatemala. Reproductive health. 2016;13:110.

20. Crispin Milart PH, Prieto-Egido I, Diaz Molina CA, Martinez-Fernandez A. Detection of high-risk pregnancies in low-resource settings: a case study in Guatemala. Reproductive health. 2019;16(1):80.

21. Kawooya MG, Nathan RO, Swanson J, Swanson DL, Namulema E, Ankunda R, et al. Impact of Introducing Routine Antenatal Ultrasound Services on Reproductive Health Indicators in Mpigi District, Central Uganda. Ultrasound quarterly. 2015;31(4):285-9.

22. Dougherty A, Kasten M, DeSarno M, Badger G, Streeter M, Jones DC, et al. Validation of a Telemedicine Quality Assurance Method for Point-of-Care Obstetric Ultrasound Used in Low-Resource Settings. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2021;40(3):529-40.

23. Di Lieto A, De Falco M, Pontillo M, Carbone IF, Di Nardo MA, Di Lieto D. The wireless tele-ultrasonography in prenatal telemedicine. Giornale Italiano di Ostetricia e Ginecologia. 2011;33(3):158-62.

24. Rijken MJ, de Wit MC, Mulder EJH, Kiricharoen S, Karunkonkowit N, Paw T, et al. Effect of malaria in pregnancy on foetal cortical brain development: a longitudinal observational study. Malaria journal. 2012;11:222.

25. Rijken MJ, Moroski WE, Kiricharoen S, Karunkonkowit N, Stevenson G, Ohuma EO, et al. Effect of malaria on placental volume measured using three-dimensional ultrasound: a pilot study. Malaria journal. 2012;11:5.

26. Bruns RF, Menegatti CM, Martins WP, Junior EA. Applicability of pocket ultrasound during the first trimester of pregnancy. Medical Ultrasonography. 2015;17(3):284-8.

27. Dalmacion GV, Reyles RT, Habana AE, Cruz LMV, Chua MC, Ngo AT, et al. Handheld ultrasound to avert maternal and neonatal deaths in 2 regions of the Philippines: an iBuntis R intervention study. BMC pregnancy and childbirth. 2018;18(1):32.

28. Galjaard S, Baeck S, Ameye L, Bourne T, Timmerman D, Devlieger R. Use of a pocketsized ultrasound machine (PUM) for routine examinations in the third trimester of pregnancy. Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2014;44(1):64-8.

29. Haragan AF, Hulsey TC, Hawk AF, Newman RB, Chang EY. Diagnostic accuracy of fundal height and handheld ultrasound-measured abdominal circumference to screen for fetal growth abnormalities. American journal of obstetrics and gynecology. 2015;212(6):820.e1-8.

30. Mbuyita S, Tillya R, Godfrey R, Kinyonge I, Shaban J, Mbaruku G. Effects of introducing routinely ultrasound scanning during Ante Natal Care (ANC) clinics on number of visits of ANC and facility delivery: a cohort study. Archives of public health = Archives belges de sante publique. 2015;73(1):36.

31. Pedersen JK, Sira C, Trovik J. Handheld transabdominal ultrasound, after limited training, may confirm first trimester viable intrauterine pregnancy: a prospective cohort study. Scandinavian journal of primary health care. 2021;39(2):123-30.

32. Sayasneh A, Preisler J, Smith A, Saso S, Naji O, Abdallah Y, et al. Do pocket-sized ultrasound machines have the potential to be used as a tool to triage patients in obstetrics and gynecology? Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2012;40(2):145-50.

33. Troyano Luque JM, Ferrer-Roca O, Barco-Marcellan MJ, Sabatel Lopez R, Perez-Medina T, Perez-Lopez FR. Modification of the hand-held Vscan ultrasound and verification of its performance for transvaginal applications. Ultrasonics. 2013;53(1):17-22.

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Page 22 of 54

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34. Kim J, Kim S, Jeon S, Jung S. A longitudinal study investigating cervical changes during labor using a wireless ultrasound device. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians. 2018;31(13):1787-91.

35. Maraci MA, Yaqub M, Craik R, Beriwal S, Self A, von Dadelszen P, et al. Toward pointof-care ultrasound estimation of fetal gestational age from the trans-cerebellar diameter using CNN-based ultrasound image analysis. Journal of medical imaging (Bellingham, Wash). 2020;7(1):014501.

36. Kodaira Y, Pisani L, Boyle S, Olumide S, Orsi M, Adeniji AO, et al. Reliability of ultrasound findings acquired with handheld apparatuses to inform urgent obstetric diagnosis in a high-volume resource-limited setting. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2021;153(2):280-6.

37. Toscano M, Marini TJ, Drennan K, Baran TM, Kan J, Garra B, et al. Testing telediagnostic obstetric ultrasound in Peru: a new horizon in expanding access to prenatal ultrasound. BMC pregnancy and childbirth. 2021;21(1):328.

38. Amoah B, Anto EA, Osei PK, Pieterson K, Crimi A. Boosting antenatal care attendance and number of hospital deliveries among pregnant women in rural communities: a community initiative in Ghana based on mobile phones applications and portable ultrasound scans. BMC pregnancy and childbirth. 2016;16(1):141.

39. Anto EA, Amoah B, Crimi A. Segmentation of ultrasound images of fetal anatomic structures using random forest for low-cost settings. Annual International Conference of the IEEE Engineering in Medicine and Biology Society IEEE Engineering in Medicine and Biology Society Annual International Conference. 2015;2015:793-6.

40. Straily A, Malit AO, Wanja D, Kavere EA, Kiplimo R, Aera R, et al. Use of a Tablet-Based System to Perform Abdominal Ultrasounds in a Field Investigation of Schistosomiasis-Related Morbidity in Western Kenya. The American journal of tropical medicine and hygiene. 2021.

41. Vinayak S, Sande J, Nisenbaum H, Nolsoe CP. Training Midwives to Perform Basic Obstetric Point-of-Care Ultrasound in Rural Areas Using a Tablet Platform and Mobile Phone Transmission Technology-A WFUMB COE Project. Ultrasound in medicine & biology. 2017;43(10):2125-32.

42. Busch M. Portable ultrasound in pre-hospital emergencies: a feasibility study. Acta anaesthesiologica Scandinavica. 2006;50(6):754-8.

43. Lausin I, Kurjak A, Miskovic B, Stanojevic M. Sonoscope, fiction or reality? Gynaecologia et Perinatologia. 2009;18(1):30-3.

44. Shorter M, Macias DJ. Portable handheld ultrasound in austere environments: use in the Haiti disaster. Prehospital and disaster medicine. 2012;27(2):172-7.

45. Choi MJ, Lim CM, Jeong D, Jeon H-R, Cho KJ, Kim SY. Efficacy of intraoperative wireless ultrasonography for uterine incision among patients with adherence findings in placenta previa. The journal of obstetrics and gynaecology research. 2020;46(6):876-82.

46. Arbeille P, Zuj K, Blouin J, Georgescu M, Saccomandi A, Andre E, et al. Remote echography & Doppler using tele-operated compact motorised probes & portable echograph. Application to 200 isolated patient in rural areas. Angeiologie. 2016;68(3):23-34.

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47. Arbeille P. Tele-operated echograph and motorised probe transducer for remote echography in isolated environment. Application to space exploration and isolated medical centre. Ultrasound in Medicine and Biology. 2015;41(4 SUPPL. 1):S28.

48. Lindgaard K, Riisgaard L. 'Validation of ultrasound examinations performed by general practitioners'. Scandinavian journal of primary health care. 2017;35(3):256-61.

49. Bentley S, Hexom B, Nelson BP. Evaluation of an Obstetric Ultrasound Curriculum for Midwives in Liberia. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2015;34(9):1563-8.

50. Kimberly HH, Murray A, Mennicke M, Liteplo A, Lew J, Bohan JS, et al. Focused maternal ultrasound by midwives in rural Zambia. Ultrasound in medicine & biology. 2010;36(8):1267-72.

51. Blaivas M, Kuhn W, Reynolds B, Brannam L. Change in differential diagnosis and patient management with the use of portable ultrasound in a remote setting. Wilderness & environmental medicine. 2005;16(1):38-41.

52. Shah S, Adedipe A, Ruffatto B, Backlund BH, Sajed D, Rood K, et al. BE-SAFE: Bedside sonography for assessment of the fetus in emergencies: educational intervention for late-pregnancy obstetric ultrasound. The western journal of emergency medicine. 2014;15(6):636-40.

53. Varner CB, D.; Borgundvaag, B.; McLeod, S.; Carver, S. Correction: Fetal outcomes following emergency department point-of-care ultrasound for vaginal bleeding in early pregnancy. Canadian family physician Medecin de famille canadien. 2016;62(8):628.

54. Bailey C, Carnell J, Vahidnia F, Shah S, Stone M, Adams M, et al. Accuracy of emergency physicians using ultrasound measurement of crown-rump length to estimate gestational age in pregnant females. The American journal of emergency medicine. 2012;30(8):1627-9.

55. Chiem AT, Chan CH-Y, Ibrahim DY, Anderson CL, Wu DS, Gilani CJ, et al. Pelvic ultrasonography and length of stay in the ED: an observational study. The American journal of emergency medicine. 2014;32(12):1464-9.

56. Hall EA, Matilsky D, Zang R, Hase N, Habibu Ali A, Henwood PC, et al. Analysis of an obstetrics point-of-care ultrasound training program for healthcare practitioners in Zanzibar, Tanzania. Ultrasound Journal. 2021;13(1):18.

57. Mbonyizina C, Ntirushwa D, Bazzett-Matabele L, Ntasumbumuyange D, Rulisa S, Magriples U. Point of care ultrasound: does the presence of ascites in severe pre-eclampsia correlate with poor maternal and neonatal outcome? Tropical medicine & international health : TM & IH. 2019;24(8):1018-22.

58. Osborne B, Thoirs K, Parange N. The effectiveness of simulation training in the teaching of skills required for sonographic fetal assessment in mid-trimester pregnancy1. Sonography. 2016;3(Supplement 1):46.

59. Reynolds TA, Amato S, Kulola I, Chen C-JJ, Mfinanga J, Sawe HR. Impact of point-ofcare ultrasound on clinical decision-making at an urban emergency department in Tanzania. PloS one. 2018;13(4):e0194774.

60. Shah S, Teismann N, Zaia B, Vahidnia F, River G, Price D, et al. Accuracy of emergency physicians using ultrasound to determine gestational age in pregnant women. The American journal of emergency medicine. 2010;28(7):834-8.

61. Vyas A, Moran K, Livingston J, Gonzales S, Torres M, Duffens A, et al. Feasibility study of minimally trained medical students using the Rural Obstetrical Ultrasound Triage Exam (ROUTE) in rural Panama. World journal of emergency medicine. 2018;9(3):216-22.

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62. Dean AJ, Ku BS, Zeserson EM. The utility of handheld ultrasound in an austere medical setting in Guatemala after a natural disaster. American journal of disaster medicine. 2007;2(5):249-56.

63. MacVane CZ, Irish CB, Strout TD, Owens WB. Implementation of transvaginal ultrasound in an emergency department residency program: an analysis of resident interpretation. The Journal of emergency medicine. 2012;43(1):124-8.

64. Shah SP, Epino H, Bukhman G, Umulisa I, Dushimiyimana JMV, Reichman A, et al. Impact of the introduction of ultrasound services in a limited resource setting: rural Rwanda 2008. BMC international health and human rights. 2009;9:4.

65. Wang R, Reynolds TA, West HH, Ravikumar D, Martinez C, McAlpine I, et al. Use of a beta-hCG discriminatory zone with bedside pelvic ultrasonography. Annals of emergency medicine. 2011;58(1):12-20.

66. Wylie B, Mawindo P, Nyirenda O, Kuyenda R, Malenga A, Kalilani-Phiri L, et al. Accuracy of gestational dating in an observational pregnancy malaria cohort in Malawi: An ultrasound demonstration project. American Journal of Tropical Medicine and Hygiene. 2010;83(5 SUPPL. 1):287.

67. Adhikari S, Blaivas M, Lyon M. Diagnosis and management of ectopic pregnancy using bedside transvaginal ultrasonography in the ED: a 2-year experience. The American journal of emergency medicine. 2007;25(6):591-6.

68. Adler D, Mgalula K, Price D, Taylor O. Introduction of a portable ultrasound unit into the health services of the Lugufu refugee camp, Kigoma District, Tanzania. International journal of emergency medicine. 2008;1(4):261-6.

69. Kolbe N, Killu K, Coba V, Neri L, Garcia KM, McCulloch M, et al. Point of care ultrasound (POCUS) telemedicine project in rural Nicaragua and its impact on patient management. Journal of ultrasound. 2015;18(2):179-85.

70. Saul T, Lewiss RE, Rivera MDR. Accuracy of emergency physician performed bedside ultrasound in determining gestational age in first trimester pregnancy. Critical ultrasound journal. 2012;4(1):22.

71. Goodman A, Black L, Briggs S. Obstetrical care and women's health in the aftermath of disasters: the first 14 days after the 2010 Haitian earthquake. American journal of disaster medicine. 2014;9(1):59-65.

72. Ndiaye P, Aris FB, Diedhiou A, Wone I, Dia AT. [Annual assessement of a mobile ultrasonography service in the region of Ziguinchor, Senegal]. Bilan d'activite annuel de l'echographie en strategie avancee dans la region de Ziguinchor (Senegal). 2007;67(1):38-42.

73. Dimassi K, Douik F, Ajroudi M, Triki A, Gara MF. Ultrasound Fetal Weight Estimation: How Accurate Are We Now Under Emergency Conditions? Ultrasound in medicine & biology. 2015;41(10):2562-6.

74. Sibbald CA, Nicholas JL, Chapnick M, Ross N, Gandor PL, Waters WF, et al. Fetal brain ultrasound measures and maternal nutrition: A feasibility study in Ecuador. American journal of human biology : the official journal of the Human Biology Council. 2021;33(2):e23467.

75. Charlesworth M, van Zundert AAJ. Medical device regulation: the need for clinical vigilance and oversight. Anaesthesia. 2019;74(6):693-5.

FIGURES

Figure 1. PRISMA flowchart of screening process for scoping review

Figure 2. Studies classified by their main objective in using a portable ultrasound

to peer teriew only





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SUPPLEMENTARY TABLE S1. Search strategy for Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions(R) <1946 to July 29, 2021>, conducted on 29 July 2021

#	Query
1	exp Pregnancy/
2	exp Pregnancy Trimesters/
3	Prenatal Care/
4	exp Pregnancy Complications/
5	Pregnancy Outcome/
6	exp Pregnancy Tests/
7	Obstetrics/
8	Gestational Age/
9	exp Fetal Monitoring/
10	pregnan*.ti,ab,kf.
	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
11	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).ti,ab,kf.
12	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).ti,ab,kf.
12	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
15	centile* or crown-rump or limb-volume)).ti,ab,kf.
1.4	(gestation* age* or gestation* time* or "week* gestation*" or "week* of
14	gestation*").ti,ab,kf.
15	(trimester adj (growth* or development*)).ti,ab,kf.
16	((intrauterine or intra-uterine) adj (growth or development)).ti,ab,kf
17	or/1-16
18	exp Ultrasonography/
19	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
10	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).ti,ab,kf.
20	18 or 19
21	Point-of-Care Systems/

22(point-of-care or point-of-patient-care or point-of-service or point-of-need).ti,a23(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or composite or portable or POCUS).ti,ab,kf.2421 or 22 or 23	b,kf. ompact or
 (bedside or pocket-sized or handheld or hand-held or wireless or wire-less or combile or portable or POCUS).ti,ab,kf. 24 21 or 22 or 23 	ompact or
24 21 or 22 or 23	
25 20 and 24	
 (((ultrasound or ultra-sound or ultrason*) adj10 (portab* or hand held or handl of-care or mobile or POC or bedside or bed-side or pocket-sized or wireless or v rapid or emergency or compact)) or POCUS).ti,ab,kf. 	held or point- wire-less or
27 or/25-26	
28 17 and 27	
29 exp animals/ not humans/	
30 28 not 29	
31 limit 30 to yr="2000 -Current"	

 D-Current"

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SUPPLEMENTARY TABLE S2. Search strategy for Embase database via Ovid, conducted on 29 Jul	y
2021	

#	Query
1	fetus outcome/ or fetus risk/ or fetus weight/ or gestation period/ or gestational age/ or
	fetus control/
2	prenatal growth/ or fetus growth/ or fetal biophysical profile/ or prenatal development/ or
	fetus development/ or fetal well being/ or fetus maturity/ or fetus movement/
3	fetus disease/ or prenatal disorder/ or fetal malnutrition/ or fetus distress/ or fetus
	malformation/ or macrosomia/ or oligohydramnios/ or premature fetus membrane rupture/
	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
4	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).mp.
5	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).mp.
6	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
6	centile* or crown-rump or limb-volume)).mp.
7	(gestation* age* or gestation* time* or "week* gestation*" or "week* of gestation*").mp.
8	(trimester adj (growth* or development*)).mp.
9	((intrauterine or intra-uterine) adj (growth or development)).mp.
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11	"point of care ultrasound"/
	((point-of-care or point-of-patient-care or point-of-service or point-of-need) adj3 (US or
12	ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*)).mp.
	((bedside or pocket or pocket-size* or handheld or hand-held or wireless or wire-less or
13	compact or mobile or portable or POC) adj3 (US or ultraso* or scan* or ultra-sound* or
	ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or echograph* or
	sonogram* or sonograph* or doppler*)).mp.
14	pocus.mp.
15	11 or 12 or 13 or 14
16	10 and 15

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17	ultrasound/
18	echography/ or a scan/ or b scan/ or doppler ultrasonography/ or gray scale echography/ or
10	real time echography/ or transvaginal echography/
10	echograph/ or cardiotocograph/ or doppler device/ or echocardiograph/ or ultrasound
15	scanner/
20	doppler echo/ or doppler probe/
21	duplex doppler ultrasonography/ or pulsed doppler ultrasonography/
22	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
~~~	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).mp.
23	17 or 18 or 19 or 20 or 21 or 22
24	portable equipment/
25	(point-of-care or point-of-patient-care or point-of-service or point-of-need).mp.
26	(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or compact or
20	mobile or portable or POCUS).mp.
27	24 or 25 or 26
28	10 and 23 and 27
29	fetus echography/ or nuchal translucency measurement/
30	fetal ultrasound monitor/ or fetal doppler/ or obstetric ultrasound transducer/
	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) adj3 (ultraso* or scan* or ultra-
31	sound* or ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler)).mp.
32	29 or 30 or 31
33	27 and 32
34	16 or 28 or 33
	pregnancy/ or adolescent pregnancy/ or first trimester pregnancy/ or mother fetus
	relationship/ or multiple pregnancy/ or second trimester pregnancy/ or third trimester
35	pregnancy/ or unplanned pregnancy/ or unwanted pregnancy/ or multiple pregnancy/ or
	quadruplet pregnancy/ or quintuplet pregnancy/ or superfetation/ or triplet pregnancy/ or
	twin pregnancy/
36	prenatal care/ or prenatal diagnosis/ or prenatal screening/ or noninvasive prenatal testing/
37	(pregnan* or superfetation or trimester* or first trimester* or first-trimester* or second
3/	trimester* or second-trimester* or third trimester* or third-trimester* or mid-trimester* or

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	expectant mother* or expectant female* or prenatal or pre-natal or antenatal or ante-
	natal).mp.
38	35 or 36 or 37
39	15 and 38
40	23 and 27 and 38
41	39 or 40
42	34 or 41
43	(exp animal/ or nonhuman/) not exp human/
44	42 not 43
45	limit 44 to yr="2000 -Current"

**SUPPLEMENTARY TABLE S3.** Search strategy for CINAHL database via EBSCO, conducted on 29 July 2021

#	Query
	(MH "Fetus") OR (MH "Fetal Heart") OR (MH "Placenta") OR (MH "Embryo") OR (MH "Fetal
	Membranes") OR (MH "Umbilical Cord") OR (MH "Umbilical Arteries") OR (MH "Umbilical
	Veins") OR (MH "Fetal Abnormalities") OR (MH "Fetal Diseases") OR (MH "Fetal Growth
1	Retardation") OR (MH "Fetal Macrosomia") OR (MH "Fetal Distress") OR (MH "Fetus") OR
	(MH "Fetal Weight") OR (MH "Fetal Development") OR (MH "Fetal Movement") OR (MH
	"Fetal Well-Being") OR (MH "Fetal Monitoring") OR (MH "Fetal Biophysical Profile") OR (MH
	"Fetal Monitoring, Electronic") OR (MH "Cardiotocography")
	((fetal or foetal or fetus* or foetus*) N3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
2	macrosomia or size* or sizing or anatom* or aneuploid* or "body proportion*" or
	proportion* or wellbeing or well-being or matur* or "organ matur*" or status* or
	movement* or assess* or nutrition* or malnutrition*))
3	((AGA or SGA or LGA or FGR or IUGR or small or large) N3 (fetus* or foetus*))
4	((fetal or foetal or fetus* or foetus*) N3 (percentile* or centile* or "z-score*" or "growth
4	centile*" or "crown-rump" or "limb-volume"))
5	("gestation* age*" or "gestation* time*" or "week* gestation*" or "week* of gestation*")
6	(trimester N1 (growth* or development*))
7	((intrauterine or "intra-uterine") N1 (growth or development))
8	1 or 2 or 3 or 4 or 5 or 6 or 7
9	(MH "Point-of-Care Testing")
	(("point-of-care" or "point-of-patient-care" or "point-of-service" or "point-of-need") N3 (US
10	or ultraso* or scan* or "ultra-sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*))
	((bedside or pocket or "pocket-size*" or handheld or "hand-held" or wireless or "wire-less"
11	or compact or mobile or portable or POC) N3 (US or ultraso* or scan* or "ultra-sound*" or
11	"ultra-sonogr*" or "ultra-sonic*" or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler*))
12	(pocus)
13	9 or 10 or 11 or 12

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14	8 and 13
15	(MH "Ultrasonography")
16	(MH "Ultrasound Technologists")
17	(MH "Ultrasonography, Doppler") OR (MH "Echocardiography, Doppler") OR (MH
	"Echocardiography, Doppler, Color") OR (MH "Echocardiography, Doppler, Pulsed") OR (MH
	"Ultrasonography, Doppler, Duplex") OR (MH "Ultrasonography, Doppler, Color") OR (MH
	"Ultrasonography, Doppler, Pulsed")
18	(ultraso* or scan* or "ultra-sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler)
19	15 or 16 or 17 or 18
20	(MH "Portable Equipment")
21	("point-of-care" or "point-of-patient-care" or "point-of-service" or "point-of-need")
22	(bedside or "pocket-sized" or handheld or "hand-held" or wireless or "wire-less" or compact
22	or mobile or portable or POCUS)
23	20 or 21 or 22
24	8 and 19 and 23
25	(MH "Ultrasonography, Prenatal") OR (MH "Nuchal Translucency Measurement")
	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) N3 (ultraso* or scan* or "ultra-
26	sound*" or "ultra-sonogr*" or "ultra-sonic*" or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler))
27	25 or 26
28	23 and 27
29	14 or 24 or 28
	(MH "Pregnancy") OR (MH "Pregnancy, High Risk") OR (MH "Pregnancy, Prolonged") OR (MH
	"Pregnancy, Multiple") OR (MH "Pregnancy, Quadruplet") OR (MH "Pregnancy, Quintuplet")
30	OR (MH "Pregnancy, Triplet") OR (MH "Pregnancy, Twin") OR (MH "Superfetation") OR (MH
50	"Pregnancy Trimesters") OR (MH "Pregnancy Trimester, First") OR (MH "Pregnancy
	Trimester, Second") OR (MH "Pregnancy Trimester, Third") OR (MH "Pregnancy,
	Unplanned") OR (MH "Pregnancy, Unwanted") OR (MH "Maternal-Fetal Exchange")
21	(MH "Obstetric Care") OR (MH "Prenatal Care") OR (MH "Prepregnancy Care") OR (MH
51	"Noninvasive Prenatal Testing")

32	(pregnan* or superfetation or trimester* or "first trimester*" or "first-trimester*" or
	"second trimester*" or "second-trimester*" or "third trimester*" or "third-trimester*" or
	"mid-trimester"" or "expectant mother" or "expectant female" or prenatal or "pre-natal"
	or antenatal or "ante-natal")
22	30 or 31 or 32
22	Pregnancy terms
34	13 and 33
35	19 and 23 and 33
36	34 or 35
37	29 or 36
38	S29 or S36 - Limiters - Publication Year: 2000-2021
39	S29 OR S36 - Limiters - Publication Year: 2000-2021; Human

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**SUPPLEMENTARY TABLE S4.** Search strategy for Maternity and Infant Care database, conducted on 29 July 2021

#	Query
1	((fetal or foetal or fetus* or foetus*) adj3 (grow* or anomal* or abnormal* or malform* or
	disorder* or disease* or distress or biomet* or develop* or weight* or bodyweight* or
	macrosomia or size* or sizing or anatom* or aneuploid* or body proportion* or proportion*
	or wellbeing or well-being or matur* or organ matur*or status* or movement* or assess* or
	nutrition* or malnutrition*)).mp.
2	((AGA or SGA or LGA or FGR or IUGR or small or large) adj3 (fetus* or foetus*)).mp.
3	((fetal or foetal or fetus* or foetus*) adj3 (percentile* or centile* or z-score* or growth
	centile* or crown-rump or limb-volume)).mp.
4	(gestation* age* or gestation* time* or "week* gestation*" or "week* of gestation*").mp.
5	(trimester adj (growth* or development*)).mp.
6	((intrauterine or intra-uterine) adj (growth or development)).mp.
7	or/1-6
	((point-of-care or point-of-patient-care or point-of-service or point-of-need) adj3 (US or
8	ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler*)).mp.
	((bedside or pocket or pocket-size* or handheld or hand-held or wireless or wire-less or
9	compact or mobile or portable or POC) adj3 (US or ultraso* or scan* or ultra-sound* or
5	ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or echograph* or
	sonogram* or sonograph* or doppler*)).mp.
10	pocus.mp.
11	or/8-10
12	7 and 11
12	(ultraso* or scan* or ultra-sound* or ultra-sonogr* or ultra-sonic* or echogram* or
13	echoscope* or echosound* or echograph* or sonogram* or sonograph* or doppler).mp.
14	(point-of-care or point-of-patient-care or point-of-service or point-of-need).mp.
15	(bedside or pocket-sized or handheld or hand-held or wireless or wire-less or compact or
	mobile or portable or POCUS).mp.
16	or/14-15
17	7 and 13 and 16

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18	((fetal or foetal or fetus* or foetus* or prenatal or obstetric) adj3 (ultraso* or scan* or ultra-
	sound* or ultra-sonogr* or ultra-sonic* or echogram* or echoscope* or echosound* or
	echograph* or sonogram* or sonograph* or doppler)).mp.
19	16 and 18
20	12 or 17 or 19
21	(pregnan* or superfetation or trimester* or first trimester* or first-trimester* or second
	trimester* or second-trimester* or third trimester* or third-trimester* or mid-trimester* or
	expectant mother* or expectant female* or prenatal or pre-natal or antenatal or ante-
	natal).mp.
22	11 and 21
23	13 and 16 and 21
24	22 or 23
25	20 or 24
26	limit 25 to yr="2000 -Current"

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**SUPPLEMENTARY TABLE S5.** Search terms used to identify portable ultrasound devices via Google searches

Portable device specific	Ultrasound manufacturers and distributors
Portable ultrasound device	Ultrasound manufacturers
Handheld ultrasound device	Ultrasound distributors
Compact ultrasound device	Ultrasound companies
Wireless ultrasound device	Ultrasound developers
	Medical supplies manufacturers
	Medical supplies distributors
	Medical supplies companies
	Medical device companies
	Medical device developers

or opported in the second seco

SUPPLEMENTARY	<b>TABLE S6.</b> List of manufacturers' websites searched for portable devices
D.d	
Puttorfly	
Gonoral Floctric	
Hoolcorion	
Kented	
Konted	
Lequio	
Iviindray	
Phillips	
Primedic	
Samsung	
Siemens	
Signostics	
SONON	
Sonoscanner	
SonoScape	
SonoSite	
Sony	
Toshiba	
Whale imaging	

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**SUPPLEMENTARY TABLE S7.** Codes for each parameter extracted from eligible studies

Type of study	Population	Setting
Systematic review	Pregnant women - Ectopic pregnancy	Inpatient facility
Randomised controlled trial	Pregnant women - Vaginal	Outpatient facility
Cohort study - Prospective or retrospective	bleed	Both inpatient and outpatient facility
Cross-sectional study	Pregnant women – Trauma	Community
Case-control study	section	Home-based
Other primary research design	Pregnant women - High risk (multiple)	Population-based
~	Pregnant women - Pre-	Both outpatient and community
	Pregnant women – Malaria	Multiple
	Pregnant women – multiple	Other
	Pregnant women –	
	Schistosomiasis	l'elemedicine
	Pregnant women – all	
	Staff members – physicians	
	nurses/midwives	
	Staff members - medical students	1
	Staff members – combination	
Intervention	Stage of pregnancy	Classification of study objective
Abdominal ultrasound	Antenatal – unspecified	Fetal characteristics /
Transvaginal ultrasound	Antenatal - first trimester	Boutine scans or obconvation
Abdominal and Transvaginal	Antenatal - second trimester	Brognancy confirmation
	Antenatal - third trimester	

Transperineal ultrasound	Antenatal - second and third	Ectopic pregnancy
	trimester	
Training curriculum		Genetic screening
	Intrapartum	/_
Automated systems	Postpartum	Emergency / Trauma
Illtrasound modification	Postpartum	Placental abnormalities
	All periods	
Ultrasound protocol		Labour progress
	Multiple periods	
Tele-ultrasound		Training program
	Unspecified	
Health systems strengthening	Antenatal and Intrapartum	
0	Antenatal and Postpartum	
	Intrapartum and Postpartum	

¹Other primary research designs included pilot studies, diagnostic accuracy studies, or field investigation/implementation studies

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1					<b>C</b> 1.		
2	SUPPLEMEN	FARY TABLE S	8. Results of	online search	es of ultrasou	and manufact	urers
3 4	Manufacture	Model	Design	Country man	Facility requ	Battery life	No. of probe
5	Butterfly	Butterfly iQ+	Handheld de	Not disclosed	Mobile devic	>= 2 hours co	1
6	Chison	Eco 3 expert	Laptop style	China	Electricity plu	2.5 hours cor	7
7	Chison	Q5	Laptop style	Not disclose	Electricty plu	Not disclose	7
8	Chison	EBit30	Laptop style	China	Electricity plu	Not disclose	10
9 10	Chison	Eco 5	Laptop style	China	Electricity plu	2.5 hours cor	7
10	Chison	Eco 2	Laptop style	China	Electricity plu	2.5 hours cor	7
12	Chison	SonoBook 9	Laptop style	China	Electricity plu	2 hours conti	27
13	Chison	SonoBook 6	Laptop style	China	Electricity plu	2 hours conti	10
14	Chison	SonoBook 8	Laptop style	China	Electricity plu	2 hours conti	13
15 16	Chison	SonoTouch 3	Tablet device	China	Electricity plu	Not disclose	9
10	Chison	EBit50	Laptop style	China	Electricity plu	3 hours conti	10
18	Chison	EBit60	Laptop style	China	Electricity plu	2 hours conti	10
19	Chison	Eco 6	Laptop style	China	Electricity plu	1 hour "full c	8
20	Chison	SonoEve P5	Handheld de	China	Mobile devic	2.5 hours "di	1
21	Chison	Fco 1	Lanton style	China	Electricity plu	Not disclose	-
23	Clarius		Handheld de	Not disclose	Compatible r	60 minutes t	1
24		BILLE	Tablet device	Poland	Electrciity plu	2.5 hours cor	1
25	Edan	Acclarix AVA	Lapton style	China	Electricity plu	1 hour 15 mi	4
26	Edan	Acclarix AV9	Laptop style	China	Electricity pl	1 hours conti	0 1 E
27	Eudii			China			15
20	Edan		Laptop style	China	Electricity pit	a minutes c	11
30	Edan	050 Prime	Laptop style	China	Electricity pil	1.5 nours cor	11
31	Edan	DUS 60	Laptop style	China	Electricity pli	2 nours conti	6
32	GE Healthcai	Versana activ	Laptop style	Not disclose	Electricity plu	Not disclose	11
33 34	GE Healthcar	Nextgen Logi	Laptop style	Not disclose	Electricity plu	60 minutes t	14
35	GE Healthcar	Vscan Extenc	Handheld de	Not disclose	Electricity plu	60 minutes t	1
36	GE Healthcar	Vscan Air	Handheld de	Not disclose	Mobile devic	50 minutes t	1
37	GE Healthcar	Vscan Extend	Handheld de	Not disclose	Electricity plu	60 minutes t	1
38	Healcerion	Sonon 300C	Handheld dev	vice with wire	Electricity plu	3 hours conti	1
39 40	Interson	SiMPLi GP	USB probe w	Not disclose	Laptop/comr	Dependent o	1
41	Konted	C6	Laptop style	China	Electricty plu	Not disclose	4
42	Konted	Gen3 C10	Wireless ultr	China	Compatible r	3 hours conti	3
43	Konted	Gen4Pro	Wireless ultr	China	Compatible r	3.5 hours cor	4
44 45	Konted	C9	Laptop style	China	Electricity plu	Not disclose	6
45 46	Konted	C10 T	Wireless ultr	China	Compatible r	3 hours conti	3
47	Lequio	US 304A	Handheld dev	Japan	Compatible c	NA	1
48	Lequio	fST9500	Handheld de	Japan	Compatible c	NA	1
49	Lequio	US 304	Handheld de	Japan	Compatible c	NA	1
50 51	Mindrav	M7 premium	Laptop style	China	Electricity plu	Not disclose	9
52	Mindray	TE7	Tablet device	China	Electricity plu	Not disclose	11
53	Mindray	M9	Lanton style	China	Electricity plu	90 minutes t	10
54	Mindray	MF8	Lanton style	China	Electricity plu	Up to 8 hour	10
55	Mindray	TF5	Tablet device	China	Electricity plu	2 hours conti	14
56 57	Mindray	M6	Lanton style	China	Electricity pl	Not disclosed	12
58	Mindray	DP-10	Lanton style	China	Electricity pl	Not disclosed	۲0 10
59	Dhiling boolt	InnoSight	Handhold do	Taiwan	Electricity plu	an minutes +	U E
60	Dhilling hoolt			Taiwan	Electricity plu	40 minutes t	С 1
	rumps nealt	CV20	Laptop style	IdIWdII	Electricity pl	40 minutes C	ΔT

1						_
2	Phillips healt	Lumity	Handheld de	Taiwan	User-provide N/A	3
3 1	Primedic	Handyscan	Portable bloc	Not disclose	Electricity pli 5 hours perm	2
4 5	Promed grou	M6	Laptop style	China	Electrciity pli Not disclosed	
6	Promed grou	M8	Laptop style	China	Electricity pli Not disclosed	
7	Promed grou	M7 Plus	Laptop style	China	Electrciity pli 2 hours standby time	
8	Promed grou	M7	Laptop style	China	Electricity pli Not disclosed	
9	Ricso	Aurora A3	Laptop style	China	Electricity pli 2 hours	6
10 11	Ricso	Aurora A7	Laptop style	China	Electrciity pli 3 hours conti	6
12	Ricso	Aurora A1	Laptop style	China	Electricity pli Not disclosed	
13	Ricso	BX-220	Laptop style	China	Electricity plu Not disclosed	
14	Ricso	BX-330	Laptop style	China	Electricity plu Not disclose	6
15	Ricso	Aurora A5	Laptop style	China	Electricity plu Not disclose	6
10 17	Ricso	BX-550	Lanton style	China	Electricity plu 2 hours	6
18	Ricso	Illtramate II	Lanton style	China	Electricity plu 2 hours conti	6
19	Sameung		Lanton style	Not disclosed	Electricity pl/2 hours (wi	10
20	Samsung		Laptop style	Not disclosed	Electricity pl/2.5 hours conti	17
21			Tablet device	Not disclosed	Electricity pit's hours contr	17
22	SIFSUF	SIFULIRAS 4		Not disclosed	Electricity pit Not disclosed	
23	SIFSUF	SIFULIRAS 4		Not disclosed	Electricity pit Not disclosed	4.0
25	SIFSOF	SIFULIRAS 6	Laptop style	Not disclose	Electricity pil 2 nours	16
26	SIFSOF	SIFULIRAS 6	Laptop style	Not disclose	Electricity pli Not disclose	5
27	SIFSOF	SIFULTRAS 6	Laptop style	Not disclose	Electricity pli Not disclose	8
28 20	SIFSOF	SIFULTRAS 8	Laptop style	Not disclose	Electricity pli 8 hours	7
30	SIFSOF	SIFULTRAS 8	Laptop style	Not disclose	Electricity pli 8 hours	5
31	SIFSOF	SIFULTRAS 6	Laptop style	Not disclose	Electricity pli Not disclose	5
32	SIFSOF	SIFULTRAS7.	Tablet style (	Not disclose	Electricity plug for chargin	4
33	SIFSOF	SIFULTRAS 3	Handheld de	Not disclose	Mobile devic Dependent o 3 (in 1)	
34 35	Sonictec	Pocket Ultras	Wireless har	Not disclosed	Mobile devic 3 hours conti	5
36	Sonoque	C5PL	Handheld de	Not disclosed	Compatible r 3 hours conti	2
37	Sonoque	C6C	Handheld de	Not disclosed	Compatible r 3 hours	1
38	Sonoque	C4PL	Handheld de	Not disclosed	Compatible r 3 hours conti	2
39	Sonoque	C5C	Handheld de	Not disclosed	Compatible r 3 hours	1
40 41	Sonoque	C5	Handheld de	Not disclosed	Compatible r 3 hours	1
42	Sonoque	С3	Handheld de	Not disclosed	Compatible r 3 hours conti	1
43	SonoScanner	Orcheo Lite 1	Laptop style	Not disclosed	Electricity pli 1hr 30 minut	9
44	SonoScanner	Ondina	Laptop style	Not disclosed	Electricity pli 1hr 30 minut	8
45 46	SonoScanner	T-Lite	Tablet style (	Not disclosed	Electricity pli 3 hours conti	11
47	SonoScanner	Orcheo Lite	Laptop style	Not disclosed	Electricity pli 1hr 30 minut	8
48	SonoScanner	U-Lite	Tablet style (	Not disclosed	Electricity pli Not disclose (Not discl	osec
49	Sonoscape	ХЗ	Laptop style	China	Electricity pl 90 minutes c	11
50 51	Sonoscape	E3	Laptop style	China	Electricity pl 90 minutes c	11
52	Sonoscape	E2	Laptop style	China	Electricity pl 90 minutes c	11
53	Sonoscape	S2	Laptop style	China	Electricity pl. 60 minutes c	13
54	Sonoscape	S6	Laptop style	China	Electricity pl 90 minutes c	14
55	Sonoscape	59	Laptop style	China	Electricity pl. 90 minutes c	30
оо 57	Sonoscape	S8 Exp	Lapton style	China	Electricity pl 90 minutes c	22
58	Sonoscane	X5	Lapton style	China	Electricity pl 90 minutes c	 11
59	Sonoscape	F2 Pro	Lanton style	China	Electricity pl. 90 minutes c	<u></u> 11
60	Sonoscape	F1 Fyn	Lanton style	China	Electricity pl 90 minutes c	12
	Junuscape	LT LVh	Laptop style	China	Licentery pri 30 minutes t	10

1 2 3 4 5 6 7 8 9 10	Sonosite Sonosite Terason Terason Vave Vinno Vinno Vinno Vinno	Edge II M-Turbo uSmart 3200 uSmart 3300 Vave US A6 Q 8	Laptop style Laptop style Tablet device Laptop style Handheld dev Laptop style Handheld dev Laptop style	Not disclosed Not disclosed Not disclosed Not disclosed Not disclosed China China China	Electricity pli 2 hours Electrciity pli 2 hours Electrciity pli Not disclosed Electricty plu Not disclosed Compatible r 1 hours conti Electricity pli 90 minutes N Compatible I Not disclosed Electricity pli Not disclosed	13 11 16 15 1 Iot disclosed 3 Not disclosed
12	Vinno	5	Laptop style	China	Electricity pli Not disclose N	lot disclose
13	Vinno	6	Laptop style	China	Electricity pl 1 hour contir N	ID
14 15	Vinno	A5	Laptop style	China	Electricity pli Not disclose	5
16	Whale Imagi	Sigma P5	Laptop style	Not disclose	Electricity pli 3 hours conti	5
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54						

2			
3	Transducer o Imaging moc Fetal param (Weight (g)	Dimensions   Device/Scret Price (USD)	
4	Curved; phas M-mode, B-r "OB measuri 309	163 x 56 x 35 Lightening ده \$1	,999
6	1x convex; 2> B-mode; B/B Dedicated ot Not disclose	Not disclose Rotatable LE Not disclosed	
7	1x convex; 1> B-mode; 2B- Ob/Gyn mea Not disclose	e 304 x 406 x 115 inch high- Not disclosed	
8	1x convex; 3> 3D/4D, color Not reported 7500	) Not disclose(15-inch LED (Not disclosed	
9	1x convex; 2> B-mode; B/BOb/Gyn appl 6500	) 335 x 155 x 3 12-inch LED (Not disclosed	
10 11	1x convex; 2> B-mode; B/B Dedicated ok 6000	) Not disclose(12-inch LED (Not disclosed	
12	7x linear; 1x M-Mode, An, "Auto-NT me 5500	) 355 x 355 x 7 15-inch HD L \$28	,900
13	1x convex: 2> Color dopple Not reported 5400	) Not disclose(15"LED HD s( \$17	, .900
14	1.5 MHz-23   Not disclose Obstetric ap 5400	) Not disclose (15-inch LED I \$14	.600
15	Details uncle M-Mode: Col Ob/gvn appli 4500	) $254 \times 51 \times 3010.4$ -inch tou \$12	.400
16 17	1x convex: 2) B-mode: 2Br Ob/Gyn appl 7500	) Not disclose (15-inch LED ( \$11	100
18	1x  convex; 2y D  induc; 2D  ob/Gyn appl 7500	) Not disclose (15-inch LED ( \$10	400
19	1x convex; 2x 2b, 3b, 4b ob, Gyn appi 7300	) 330 x 330 x 112 inch LED $($	,400
20	1x convex, 2/B mode; 2B retar biometric 5500	$530 \times 330 \times 112$ include $120$ $30$	,400
21	1x convex 3. B mode, R/R Ob/gup appli	$\frac{1}{100 \times 172 \times 740} \text{ set s device} \qquad \qquad$	,205
22	Convex, 23 B-mode, 64 B Ob/gyn appil 0550	164 x 78 x 26 Dependent e	,500
23	1. convex probe B-mode; con Obsternic car 392	210 x 280 x (12 inch LED LNet disclosed	,900
25	1x convex; 1) B ivide; B+B Not disclose( 4000	7 310 X 280 X C 12-INCH LED I NOU disclosed	
26	2x linear; 1x B-mode; M-r Ob/gyn appli 8250	7/0 x 388 x 4 15.6° nign re \$2/	,000
27	4x convex; 4> B-mode; cold fetal biometi 9250	388 x 407 x / 15.6 inch IFI \$23	,550
28 29	2x curved; 1x B-mode B; N Obstetric pre 8500	) 350 x 370 x 2 15 inch TFT-I \$9	,376
30	Wide range B-mode; M-r Ob/Gyn mea 7800	) 331 x 220 x 3 12.1" high re \$9	,195
31	1x convex; 1> B, 2B, 4B, B+ Ob/gyn appli 7100	330 x 220 x 3 12.1" TFT-LC \$5	,999
32	3x phased; 3: Not disclose: "Automate a 5000	Not disclose (15.3 inch hig Not disclosed	
33	2x convex; 1> B-mode; M-r Ob calcs and 5200	) 70 x 340 x 34 15-inch LCD ( \$18	,100
34 35	Phased; linea B-mode; M-r Not disclosed DU: 321P: 1	<b>2 DU: 168 x 76</b> Comes with \$4	,995
36	Curved; Line: B-mode; colc Not dsiclose: 205	5 131 x 64 x 31 Bluetooth co \$4	,495
37	Phased B-mode; M-r Not disclose( DU: 321P: 8	5 DU: 168 x 76 Comes with \$2	,995
38	3.5MHz B-mode Obstetric pre 390	) 78 x 38 x 229 Dependent o \$5	,300
39	Curved array B-W mode Customised   110	) 150 x 62 CDependent o Not disclosed	
40 41	1x convex; 1> B&W mode: Ob/gyn appli 4500	) 360 x 360 x 9 15 inch LCD ( Not disclosed	
42	1x linear; 1x Not disclose Ob/gyn appli 308	3 156 x 60 x 24 Dependent o Not disclosed	
43	1x convex; 1> B, B/M, colo Ob/gyn appli 270	) 156 × 60 × 2( Dependant o \$1,000 - \$1,900	J
44	1x convex; 1> B, B/B, B/M, Ob/gyn appli Not disclose	x 400 x 394 x 115 inch LCD ( \$5	,000
45 46	1x linear; 1x B, B/M, colo Ob/gyn appli 227	' 157 x 70 x 3C Dependent o \$1	,699
40	2.8/3.3/4.0 NB mode: B BOb-Gy prest € 265	5 143 x 79 x 3C Dependent o Not disclosed	
48	2.8/3.3/4.0 MHz convex Ob-Gy preste 265	5 144 x 79 x 3C Dependent o Not disclosed	
49	3.5MHz conv B mode: B BOb-Gy prester 170	) 140 x 85 Dependent o Not disclosed	
50	Details uncle Pulse Wave I Ob/gvn mea Not disclose	Not disclose (15" high resc Not disclosed	
51	3x convex (in B-mode: M-r Obstetrics na 8200	) 97 x 295 x 38 15 inch high-Not disclosed	
53	3x convex (in B-mode; M-r Obstetrics p: 6500	) 362 x 390 x 515 6 inch LEC Not disclosed	
54	1x convex (In B-mode; M-r Obstetrics pc 0500	302 x 364 x 415 6 inch LEE Not disclosed	
55	Details uncle Not discloser Ob/gun most Not discloser	$r_{1}$ 522 x 504 x 4 15.0 men Let Not disclosed	
56	Sy curred: 2y B /M/DW/ 9: L Ob/gym meet 550	$\frac{1}{2} \sum_{i=1}^{n} \frac{1}{2} \sum_{i=1}^{n} \frac{1}$	
57 58	1x convoy 2x D/ W/rvv & r UD/gyll IIIed: 5,500		,000
59	Ix convex; Z) B-mode; B/B ivieasureme 5500   2v convext lin 2D: M mode; E-table is not BU 2400	7 TOT X 230 X 312.1 IIICH LEL \$1	,700
60	2x curved; IIr 2D; IVI-mode; Fetal biomet <b>DU: 2460</b>	UU: 32U X 22 COMES WITH \$16	,948
	Unclear of ty 2D; M-mode; OB/GYN clin 6,170	1 413 X 394 X 3 15-inch LCD ( \$20	,000

1				45	Course and the last	ć= 200
2	curved; linea 2D; Col	or dor 4-measurem	136 114	x 45	Compatible V	\$5,380
3 4	3.5/5.0 MHz dual fre	equent Not disclobed	2000 115	x 190 x 1	5 inch IFI LC Not	disclosed
5	unsure of ho B, B B,	, 4B, E Obstetric pa( No	t disclose(Not	disclose	15-inch LED (Not	disclosed
6	Unsure of all B/W, c	olor d Obstetrics ar No	t disclose(Not	disclose	15 inch LCD s Not	disclosed
7	Not disclose (B, B   B,	4B, B Obstetric pac	6500 330	x 150 x 3	12.1 inch LEE Not	disclosed
8	unsure of ho B, B   B,	4B, E Obstetric pac	6500 Not	: disclose(	15-inch LED SNot	disclosed
9	1x convex; 2> B/W	Ob/gyn appli No	t disclose( Not	disclosed	12-inch LED ( Not	disclosed
10	1x convex; 1> B-mode	e; C-m Not disclose( Not	t disclose( Not	disclosed	15-inch LED (Not	disclosed
12	Not disclose( B/W	Not disclose( Not	t disclose Not	disclosed	12-inch LED ( Not	disclosed
13	Not disclose( B/W	Not disclose( Not	t disclose( Not	disclosed	10-inch CRT : Not	disclosed
14	1x convex: 2> B/W	Not disclose	6000 Not	disclosed	12-inch LCD (Not	disclosed
15	1x convex: 2) color de	oppler Ob/gvn appli	5500 138	thick	12-inch   FD   Not	disclosed
16 17	1x  convex: $2x  B/W$	Oh/gyn appli	3500 Not	disclosed	10 4-inch TF ⁻ Not	disclosed
18	1x convex: 2x Not dis	closer Obstetric par	2500 Not	disclosed	12-inch   FD ( Not	disclosed
19	2x curved: 2x Not dis	closer Obsterne par	t disclosov Not		15 inch I CD ( Not	disclosed
20	Ax curved, Ex 2D Ima	ging r Obstatrics m			15 Inch LCD ( Not	disclosed
21	"Proord room Not die	ging i Obstetrits in closer Ob/gra appli Not			12 2 Juch Toy Not	disclosed
22	Broard rang Not dis	closer Ob/gyn appli No		. disclose(	13.3 Inch Tol Not	disclosed
25 24	Broard rang Not dis	close(Ob/gyn appli	2000 Not	alsclose(	13.3 Inch I ol Not	disclosed
25	Multiple opti Not dis	close(Ob/gyn appli	5400 Not	disclose(	Not disclose(	\$19,500
26	1x convex; 1> B, B B,	, 4B, EOb/gyn appli No	t disclose(Not	disclose	Not disclose	\$9,877
27	1x convex; 2> B, B B,	, 4B, EOb/gyn appli No	t disclose(Not	disclose	15 Inch LCD §	\$9 <i>,</i> 877
28	1x convex; 1> B,B/B,I	VI,B/N Obstetrics pa	7000 380	x 212 x 3	15-inch LCD (	\$8,999
29 30	1x convex; 1> 2D,B/N	1,PDI,IOb/gyn appli	6000 370	) × 382 × 9	15 inch LCD (	\$8,889
31	1x convex; 1> B, B   B,	, 4B, E Ob/gyn appli No	t disclose( Not	disclose	15 Inch LED §	\$7 <i>,</i> 455
32	1x convex; 1> B, BB,	M, CD Ob/gyn appli No	t disclose( Not	: disclose(	12 inch color	\$6,589
33	1x convex; 1> Not dis	close(Not disclose(	90	125	Dependent o	\$2 <i>,</i> 895
34	1x convex; 1> Not dis	close(Not disclose(	280 Not	disclosed	Dependent o Not	disclosed
35 36	1x convex/ca B, B/M	, Colo OB Measure	240 157	x 66 x 22	Dependent o	\$4,400
37	1x convex B, B/M	, Colo OB Measure	240 157	x 66 x 22	Dependent o	\$3,500
38	1x convex/ca B, B/M	, COL( OB Measure	240 155	x 70 x 20	Dependent o	\$3,200
39	1x convex B. B/M	. Colo OB Measure	240 155	x 70 x 20	Dependent o	\$2,490
40	1x convex B. B/M	OB Measure	240 154	x 70 x 19	Dependent o	\$2.190
41 47	1x convex B-mode	e: B/NOB Measure	240 155	x 70 x 20	Dependent o	\$1,190
43	2x convex: 2x B-mode	e M-r Ob/Gyn annl Noi	t disclose(Not	disclosed	Not disclose Not	disclosed
44	2x convex: 2x B-mode	e: M-r Ob/Gyn appl tto	4600 370	x 290 x 7	15-inch full E Not	disclosed
45	Range from Pulsed	Wave Obstetric and	1000 253	v 17/ v 1	10-inch HD tr Not	disclosed
46	2x convex: 2x B-mode	• M-r Ob/Gyn appl	5500 420	v 270 v S	15-inch HD L	
47 48	Not disclose Color d	e, M-1 Ob/ Gyn appl opplo: Ob/Gyn appl Not	t disclosov Not		7 inch HD to	\$30,000 ¢7 0/15
49	1 Linoar 1 P Mod	oppierob/Gynappi No	t discloser Not			disclosod
50	1x Linear, 1x D-Wood	e(2D Ob/Gymmea Not)			15.0 HD LCL NOL	disclosed
51	1x Linear, 1x D-Wood				15.0 HD LCL NOL	disclosed
52	IX Linear, IX B-IVIOU	e (2D Ob/Gyn mea No			15.6 HULLL NOU	disclosed
55 54	Wide range - B-IVIOd	e (2D Ob/Gyn mea	13,000 230	X 350 X 1	15" HD LED V NOT	disclosed
55	Wide range - B-Mode	e (2D Ob/Gyn mea	7,900 230	x 350 x 1	15" HD LED V Not	disclosed
56	wide range - B-Mode	e (2D) Ob/Gyn mea	7,800 357	x 392 x 1	15" HD LED \ Not	disclosed
57	Wide range B-Mode	e (2D Ob/Gyn mea	7,800 357	x 392 x 1	15" HD LED \ Not	disclosed
58 50	1x linear; 2x B/ 2B/	4B/ NOb/Gyn mea	4500 378	x 61 x 34	15.6 inch Wi \$9,0	00 - \$15,000
60 60	1x Linear, 1x B/ 2B/	4B/ N Ob/Gyn mea No	t disclose Not	disclose	15.6" High R	\$8,995
20	10 listed as "B-mode	e; 2B- Ob/Gyn mea	6500 378	x 352 x 1	15.6 inch LCE	\$7,363

1			
2	Types not dir 2D; M-mode; Yes, includin	4600 330 x 315 x 6 12.1 inch dis	\$29 <i>,</i> 000
3	Types not dir 2D; M-mode; Yes, includin	3900 299 x 274 x 7 10.4 inch dis	\$10,100
4	5x linear; 3x 2D (B-Mode) Obstetric me	2230 230 x 327 x 3 11.6 inch LCE	\$22,000
5	5x linear: 2x 2D (B-Mode) Obstetric me	6700 89 x 396 x 38 15" Backlit P	\$18.751
0 7	Not disclose B-mode: colr Ob/Gyn mea	340 169 x 54 x 38 Dependent o Not dis	closed
8	Not disclose Not disclose Obstetrics m Not	t disclose Not disclose 15.6 inch LEE Not dis	closed
9	1x convoy: 1x Not disclose: Obstetrics ni Not	t discloser Not discloser 19.0 men EEE Not dis	closed
10	Net discloser Net discloser Obstetile applied	t discloser Not discloser Dependent o Not dis	closed
11	we to 22MU Not disclose: Ob/gyn appli Not	2 500 Net discloser Not discloser Net discloser Net dis	closed
12	up to 23MH Not discloser Ob/gyn appli		ciosed
13	Not obviousl' B-mode; M-r Obstetric me	3800 340 x 387 x 715.6 Inch hig	\$20,169
15	Unclear of al Not disclose Obstetric api Not	t disclose(Not disclose(Not disclose(	Ş14 <i>,</i> 900
16	1x linear; 1x 2D (B) Mode Ob/Gyn appl	6350 390 x 320 x 7 15-inch HD S Not dis	closed
17			
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19 20			
20 21			
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34 25			
35 36			
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2						
3	Software rec Warranty	Storage on d R	eal-time gr	<b>Transabdom</b> i [•]	Transvaginal /	Adjustable a
4	Apple iOS 13 1 year manut	Unlimited clo	TRUE	TRUE	FALSE	FALSE
5	In-built softy Not disclosed	8GB memory	TRUE	TRUE	TRUE	TRUE
7	"Built in soft Not disclosed	Built in mem	TRUE	TRUE	TRUE	TRUE
8	In-built softy Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
9	In-built softy Not disclose	8GB memory	TRUE	TRUE	TRUE	TRUE
10	In-built softy Not disclosed	8GB memory		TRUE	TRUE	TRUE
11 12	In-huilt softw 3 year warra		TRUE	TRUE	TRUE	TRUE
12	In-built softw Not disclose	Not disclosed		TRUE		TRUE
13	In-built softw Not disclosed			TRUE	TRUE	TRUE
15	In-built softwille to 2 years		TRUE	TRUE	TRUE	TRUE
16	In-built softv Up to 2 year	16GB HDD	IRUE	TRUE	IRUE	TRUE
17	In-built softy Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
18	In-built softy Not disclosed	320GB SSD	TRUE	TRUE	TRUE	TRUE
19 20	In-built softv 90-day warra	320gb storag	TRUE	TRUE	TRUE	TRUE
21	Appears to o 2 year warra	User's device	TRUE	TRUE	FALSE	TRUE
22	In-built softv Not disclosed	Built in mem	TRUE	TRUE	TRUE	TRUE
23	iOS: iOS 11 c 3 year warra	Dependent o	TRUE	TRUE	TRUE	TRUE
24	In-built softv 2-year manu	60GB interna	TRUE	TRUE	TRUE	FALSE
25 26	In-built softy Not disclosed	16GB memo	TRUE	TRUE	TRUE	TRUE
20	System come Not disclosed	120GB SSD s	TRUE	TRUE	TRUE	TRUE
28	System com(2 year warra	500gb intern	TRUE	TRUE	TRUE	TRUE
29	In-huilt softw 3-year warra	504MR built-	TRUE	TRUE	TRUE	TRUE
30	In-built softy Not disclose	504MB built.	TRUE	TRUE	TRUE	TRUE
31	In-built softw 5 year manuf		TDUE	TRUE		TRUE
32 33	Mindows®16 E waar manuf	230GB 33D			TRUE	TRUE
34	Vindows [®] ICS year manu		TRUE	TRUE	TRUE	TRUE
35	Product com 3 year manu	Data stored I		TRUE	FALSE	TRUE
36	Android phor 3 year manu	Up to 500 ex	TRUE	TRUE	FALSE	TRUE
37	Product com 3 year manuf	Data stored i	TRUE	FALSE	FALSE	TRUE
38	Device is con Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
39 40	OS: Window: Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
41	In-built softv Not disclosed	Not disclose	TRUE	TRUE	TRUE	TRUE
42	Android; iOS; Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
43	iOS app avai Not disclosed	Dependent o	TRUE	TRUE	TRUE	TRUE
44	In-built softy Not disclosed	500GB HDD	TRUE	TRUE	TRUE	TRUE
45 46	Android; iOS Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
47	Compatible \ Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
48	Compatible \ Not disclosed	Dependent o	TRUE	TRUE	FALSE	TRUE
49	Compatible \ Not disclose	Dependent o	TRUE	TRUE	FALSE	TRUE
50	Product com Not disclosed	320GB hard		TRUE	FALSE	TRUE
51	Product com 5-year warra	System hard	TRUE	TRUE	TRUE	TRUE
52 53	Product com 5-year warra	System hard		TRUE	TRUE	TRUE
54	Product com 5-year warra	System hard		TRUE	TRUE	TRUE
55	Product com S-year warra	System naru	TRUE	TRUE	TRUE	TRUE
56	Product cominot disclosed		IKUE	IKUE		IKUE
57	Product com 5-year warra		IRUE			
50 59	Product com Not disclosed	system hard	TRUE	TRUE	TRUE	FALSE
60	Product com Up to 5 years	128G of inte	TRUE	TRUE	TRUE	TRUE
	System come Not disclosed	Internal stora	TRUE	TRUE	TRUE	TRUE

1					
2	Android 5.0 c 3 year manul Internal stora	TRUE	TRUE	FALSE	TRUE
3 ⊿	In-built softv Not disclose(Minimum 20	TRUE	TRUE	TRUE	TRUE
4 5	System comeNot disclosee Internal hard	TRUE	TRUE	TRUE	TRUE
6	System comeNot discloseeStorage not e	TRUE	TRUE	TRUE	TRUE
7	System come Not disclose 64GB SSD; C	TRUE	TRUE	TRUE	TRUE
8	System come Not disclose Internal hard	TRUE	TRUE	TRUE	TRUE
9 10	System come Not disclose Built-in 60GE	TRUE	TRUE	TRUE	TRUE
10	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
12	System comeNot disclosee Built storage	TRUE	FALSE	FALSE	TRUE
13	System come Not disclose Not disclose	TRUE	FALSE	FALSE	TRUE
14 15	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
15 16	System come Not disclose (Not disclose)	TRUE	TRUE	TRUE	TRUE
17	System come Not disclose Not disclose	TRUE	TRUE	TRUE	TRUE
18	System come Not disclosee 32GB SSD	TRUE	TRUE	TRUE	TRUE
19	Not disclose (Not disclose (Not disclose)	TRUE	TRUE	TRUE	TRUE
20 21	"Samsung M1 year manul Maximum 2,	TRUE	TRUE	TRUE	TRUE
21	Product com 12 months m Not disclose	TRUE	TRUE	FALSE	TRUE
23	Product com 12 months r Not disclose	TRUE	TRUE	FALSE	TRUE
24	Product com 12 months rr "Large Image	TRUE	TRUE	TRUE	TRUE
25	Product com 12 months m Not disclosed	TRUE	TRUE	TRUE	TRUE
20 27	Product com 12 months m "Freeze/real	TRUE	TRUE	TRUE	TRUE
28	Product com 12 months myideo storage	TRUE	TRUE	TRUE	TRUE
29	Product com 12 months m Storage amo	TRUE	TRUE	TRUE	TRUE
30	Product com 12 months rr "Hardisk US	TRUE	TRUE	TRUE	TRUE
31 32	Product com 12 months rr "Large volur	TRUE	TRUE	TRUE	TRUE
33	Requires wir 12 months in Dependant o	TRUE	TRUE	FALSE	TRUE
34	Compatible v 2 year manut Dependent o	TRUE	TRUE		FALSE
35	iOS compatible 12 year manu Dependent o		TRUE	EVICE	
36	iOS compatil 2 year warra Dependent o		TRUE		TRUE
37 38	iOS compatil 2 year warra Dependent o	TDUE	TRUE	FALSE	TRUE
39	iOS compatil 2 year warra Dependent o			FALSE	
40	iOS compatil 1 year warra Dependent o		TRUE	FALSE	
41	iOS compatil 1 year warra Dependent o		TRUE	FALSE	TRUE
42 43	In built softy. Not disclosed Not disclosed		TRUE		TRUE
44	In-built softw Not disclose( Not disclose(	TRUE	TRUE	TRUE	TRUE
45	In-built softw Not disclose(251 GB SSD;	TRUE	TRUE		TRUE
46	In-built softw Not disclose(>40,000 Ima)	TRUE	TRUE	TRUE	TRUE
47	In-built softw Not disclose( 250 GB SSD;	TRUE	IRUE	TRUE	TRUE
40 49	In-built softw Not disclose Up to 10,000	TRUE	FALSE	FALSE	TRUE
50	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
51	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
52	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
53 54	System come 2 years distri 320 GB inter	TRUE	TRUE	TRUE	TRUE
55	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
56	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
57	System come 2 years distri 500GB interr	TRUE	TRUE	TRUE	TRUE
58 50	System come Not disclose (SSD hard driv	TRUE	TRUE	TRUE	TRUE
60	System come Not disclose 500GB interr	TRUE	TRUE	TRUE	TRUE
	System come Not disclose 500GB interr	TRUE	TRUE	TRUE	TRUE

2	In-built softv 5-year manu Available, bu	TRUE	TRUE	TRUE	TRUE
3	In-built softv 5-year manu Available, bu	TRUE	TRUE	TRUE	TRUE
4	Windows 10 Not disclsoe(480GB SSD	TRUE	TRUE	TRUE	TRUE
5	Windows 10 Not disclsoe( 1TB SSD	TRUE	TRUE	TRUE	TRUE
7	Not disclose Unlimited w; Dependent o	TRUE	TRUE	FALSE	TRUE
8	Product com Not disclose Not disclose	TRUE	FALSE	FALSE	TRUE
9	Compatible r Not disclose Dependant o	TRUE	TRUE	FALSE	TRUE
10	Product com Not disclose Not disclose	TRUE	FALSE	FALSE	TRUE
11	Product com Not disclose Not disclose	TRUE	FALSE	FALSE	TRUE
12	Software in- Not disclose: Available bu	TRUE	TRUE	FALSE	TRUE
14	Product com Not disclose( Not disclose)		TRUE		TDUE
15	In built softy Not discloser Not discloser	TDUE		TRUE	TDUE
16	III-built solt Not disclose(250GB 55D	IRUE	IRUE	IRUE	IRUE
17 18					
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3 ∕	Freeze-fram	Obstetric pro	e Capacity to p	Regular maii
- 5	TRUE	TRUE	TRUE	FALSE
6	TRUE	TRUE	TRUE	FALSE
7	TRUE	TRUE	TRUE	FALSE
8	TRUE	TRUE	FALSE	FALSE
9 10	TRUE	TRUE	TRUE	FALSE
10	TRUE	TRUE	TRUE	FALSE
12	TRUE	TRUE	TRUE	FALSE
13	TRUE	FALSE	TRUE	FALSE
14	TRUE	TRUE	TRUE	FALSE
15	TRUE	TRUE	TRUE	FALSE
10 17	TRUE	TRUE	FALSE	FALSE
18	TRUE	TRUE	TRUE	FALSE
19	TRUE		TRUE	FALSE
20	TRUE	TRUE	TRUE	FALSE
21			TDUE	FALSE
22 23	TRUE	TRUE	TRUE	FALSE
23	TRUE	IRUE	TRUE	FALSE
25	TRUE	FALSE	TRUE	FALSE
26	IRUE	IRUE	TRUE	FALSE
27	TRUE	TRUE	TRUE	FALSE
28 20	TRUE	TRUE	TRUE	FALSE
29 30	TRUE	TRUE	TRUE	FALSE
31	TRUE	TRUE	TRUE	FALSE
32	TRUE	TRUE	TRUE	FALSE
33	TRUE	TRUE	TRUE	FALSE
34 25	TRUE	TRUE	TRUE	FALSE
35 36	TRUE	TRUE	TRUE	FALSE
37	TRUE	TRUE	TRUE	FALSE
38	TRUE	TRUE	TRUE	FALSE
39	TRUE	TRUE	TRUE	FALSE
40	TRUE	TRUE	TRUE	FALSE
41 47	TRUE	TRUE	TRUE	FALSE
43	TRUE	TRUE	TRUE	FALSE
44	TRUE	TRUE	TRUE	FALSE
45	TRUE	TRUE	TRUE	FALSE
46	TRUE	TDUE	TDUE	
47 48	TRUE	TRUE	TRUE	FALSE
49	TRUE	TRUE	TRUE	FALSE
50	TRUE	TRUE	TRUE	FALSE
51	IRUE	IRUE	TRUE	FALSE
52	TRUE	TRUE	TRUE	FALSE
53 54	TRUE	TRUE	TRUE	FALSE
5 <del>4</del> 55	TRUE	TRUE	TRUE	FALSE
56	TRUE	TRUE	TRUE	FALSE
57	TRUE	TRUE	TRUE	FALSE
58	FALSE	TRUE	TRUE	FALSE
59 60	TRUE	TRUE	TRUE	FALSE
00	TRUE	TRUE	TRUE	FALSE

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1				
2	TRUE	TRUE	TRUE	FALSE
3	TRUE	FALSE	TRUE	FALSE
4	TRUE	TRUE	TRUE	FALSE
5	TRUE	TRUE	TRUE	FALSE
6	TRUE	TRUE	TRUE	
/	TRUE	TRUE	TRUE	FALSE
0 0	TRUE	TRUE	IRUE	FALSE
10	TRUE	TRUE	TRUE	FALSE
11	TRUE	FALSE	TRUE	FALSE
12	TRUE	FALSE	TRUE	FALSE
13	TRUE	FALSE	FALSE	FALSE
14	TRUE	FALSE	FALSE	FALSE
15 16	TRUE	TRUE	TRUE	FALSE
17	TRUE	TRUE	FALSE	FALSE
18	TRUE	TRUE	FALSE	FALSE
19	TRUE	TRUE	TRUE	FALSE
20	TRUE	TRUE	TRUE	FALSE
21	TRUE	TRUE	EALSE	FALSE
22			EALSE	
24	TRUE	TRUE		FALSE
25	TRUE	TRUE		FALSE
26	TRUE	TRUE	FALSE	FALSE
27	TRUE	TRUE	TRUE	FALSE
28	TRUE	TRUE	TRUE	FALSE
30	TRUE	TRUE	TRUE	FALSE
31	TRUE	TRUE	TRUE	FALSE
32	TRUE	TRUE	TRUE	FALSE
33	TRUE	FALSE	FALSE	FALSE
34	FALSE	FALSE	FALSE	FALSE
35 36	TRUE	TRUE	TRUE	FALSE
37	TRUE	TRUE	TRUE	FALSE
38	TRUE	TRUE	TRUE	FALSE
39	TRUE	TRUE	TRUE	FALSE
40	TRUE	TRUE	TRUE	FALSE
41	TRUE	TRUE	TRUE	FALSE
43	TRUE	TRUE	TRUE	TRUE
44	TDUE	TDUE		TRUE
45				
46	TRUE	TRUE		
4/	TRUE	TRUE	TRUE	
40	TRUE	TRUE	TRUE	FALSE
50	TRUE	TRUE	TRUE	FALSE
51	TRUE	TRUE	TRUE	FALSE
52	TRUE	TRUE	TRUE	FALSE
53	TRUE	TRUE	TRUE	FALSE
54 55	TRUE	TRUE	TRUE	FALSE
56	TRUE	TRUE	TRUE	FALSE
57	TRUE	TRUE	TRUE	FALSE
58	TRUE	TRUE	TRUE	FALSE
59	TRUE	TRUE	TRUE	FALSE
60	TRUE	TRUE	TRUE	FALSE

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2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE FALSE FALSE FALSE TRUE FALSE TRUE	FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE	
18     19     20     21     22     23     24     25     26     27     28     29     30     31     32     33     34     35     36					
37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54					

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	TION ITEM PRISMA-ScR CHECKLIST ITEM						
TITLE							
Title	1	Identify the report as a scoping review.	1				
ABSTRACT							
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2				
INTRODUCTION							
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4				
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	4				
METHODS							
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	5				
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5-6				
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6				
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	SF1				
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6				
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6-7				
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6-7				
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA				



SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #				
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7				
RESULTS	RESULTS						
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7				
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9				
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA				
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-12				
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	9-12				
DISCUSSION	DISCUSSION						
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	16				
Limitations	20	Discuss the limitations of the scoping review process.	16				
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	18				
FUNDING							
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	19				

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

⁺ A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

[‡] The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

*From:* Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.