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Supervised by and Second Reviewer

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BALANCING COST, DETECTION RATES, AND ACCEPTABILITY: THE ROLE OF SYNCHRONOUS & ASYNCHRONOUS TELEULTRASOUND IN OBSTETRIC

ULTRASOUND

Background

- Lack of access to good quality diagnostic healthcare can adversely affect both individuals and communities.
- Teleradiology is well-established.
- Detection rates for fetal anomalies vary significantly worldwide.
- Improved rates noted with access to an antenatal screening programme.
- Teleultrasound maybe a solution to improved access and remove barriers.

Aim & objectives

The role of asynchronous or synchronous teleultrasound in the obstetric ultrasound.

Impact on detection rates for fetal congenital anomalies.

Acceptability of teleultrasound.

Cost effectiveness of the modality.

Methodology

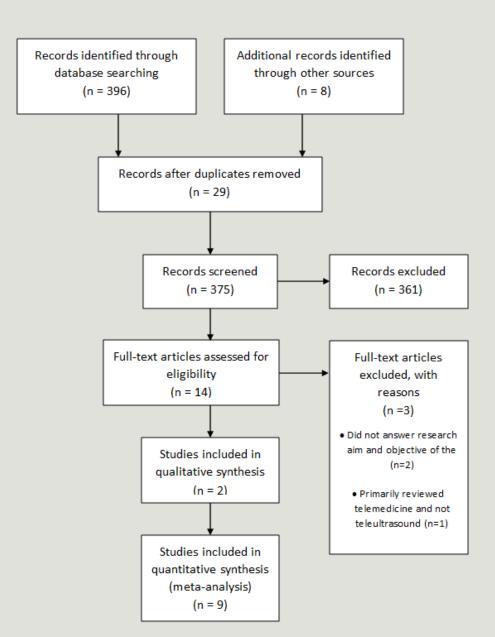
Rapid Review

- PICO- framework
- OVID Embase & OVID Medline OVID

D	Key Term	Alternate Term	Alternate Term	Alternate Term
P population	"pregnancy"	"Antenatal or prenatal"	"obstetric"	" Fetal"
Intervention	"telesonography or teleultrasound or teleradiology"	"Double reading or reporting or review"	"Secondary review or reporting or review"	"Independent review or reporting or review"
Comparison	ultrasound	sonography	Scanning	examination
O Outcome	"recall rate"	"Detection rate"	"discordance or agreement"	Anomaly or abnormality

Methodology- Eligibility Criteria

<u>Inclusion</u>	<u>Exclusion</u>		
 Asynchronous 	 Non-human subjects/ participants 		
 Synchronous 	 Robotic studies. 		
 Telesonography 	Non- ultrasound		
Obstetric ultrasound	 Reviews 		
 English language only papers 	 Conference proceedings 		
 Papers from last 10 years (2013-2023) 	 Dissertations/ thesis 		
 Primary and systematic sources 	• Letters		



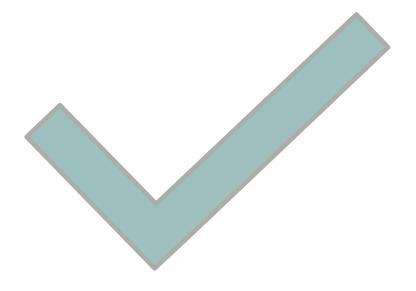
Methodology

Data Extraction and Analysis

Methodology

Quality Assurance

- JBI critical appraisal tool
- Two reviewers conducted the title screen
- Single reviewer performed the abstract and full text review
- Second reviewer assessed 10% of the full texts



JBI CRITICAL APPRAISAL CHECKLIST FOR TEXTUAL EVIDENCE: NARRATIVE (RECORD 1)

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The inclusion critaria focused on coadels of briefshaults, childred safety, cost-analysis.

JBI Checklist

IBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES (RECORD 8)

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JBI CRITICAL APPRAISAL CHECKLIST FOR TEXTUAL EVIDENCE: NARRATIVE (RECORD 9)

> urologic consultations, especially in rural areas, it saves patients' time and reduces the stress associated with travelling for consultations. The authors recognised the limitations of their research and suggested that additional studies were necessary to comprehensively understand the advantages of

talamarlicing in automatal care.

- Naturing on patiental benefits and pitfuls of remote reacturing devices for conditionages any ECTES bland glucosi levels, bland pressure, and arterestal altransant. including information from plot studies and small healthcore programs. Earlierman, from our a spollupe reduction is assumed over the par-IBI CRITICAL APPRAISAL CHECKLIST FOR Referred was builted interests up a possible for and \$1 time a design per-Some City (School) - congregation 196, all following largers translating make the coloring CASE SERIES (RECORD 10) the time wise and importance place and depth as Simple to Total specied as a technical collect analysis promoted and progress The billion following program accounts disposed programs have been disease. or a fulface and supplied, our complicit of because he defined have Arrive sare introduce insulant a solute site information for followings **IBI CRITICAL APPRAISAL CHECKLIST FOR** QUALITATIVE RESEARCH (RECORD 11) - Chical selebolist introduce year pero-marked, records, from Pattern and chinal algorithms were accepting of the armine. The study. united presented and wallest any positivity has endow offeren-IBI CRITICAL APPRAISAL CHECKLIST FOR think parents may led to a like that the stock of studies. SYSTEMATIC REVIEWS AND RESEARCH Occupantly in the design may be to incomplete data competition Committ Statisting recent for exclusively SYNTHESES Spinned wine Silvery Wild Addition IRECORD 121 Majority of Included studies disented by National Assessment to Assess 6th 20 restriction of full reservoirs to highly, so have of one-harmer marker, \$2. tion reporting terrori solding \$2.00 JBI CRITICAL APPRAISAL CHECKLIST FOR · Chatetricians/gynaecologists or appropriets sent spatio temporal image exerciation (SDC) datasets to Eyoto Profectural University of Medicine. CASE SERIES (RECORD 13) (KPUM) when congunital heart defect (CHD), firtal growth restrictors, of setracardiac structural abnormalities were suspected. Literature search to identify reports of telemedicine for prenatal prologic JBI CRITICAL APPRAISAL CHECKLIST FOR debi Use of the AEDM database to identify fetal urologic diagnoses CASE SERIES (RECORD 14) with diss Specific search terms for database queries 200.00 Identification of patients requiring urologic consultation by a case manflavorouse Hafta Elmi 111.0 Confirmation of diagnoses and management plans using medical records Consultations performed by board-certified pediatric prologists via tele Nader Z. Rabie et al. Year 2016 Record Num medicina Scheduling of consultations immediately following ultrasound visits. the liber Case manager involvement in updating the urologist and the database inches Recording of anomalies in the AFOM database and the proportion requir New of Majority of consultations conducted via telemodicine Approximately 14% of the recorded fetal anomalies were urologic, and 26 cases required urologic consultation. Telemedicine was used for 25 of the 26 urologic consultations, demonstrating its utility in prenatal care. Patients reported no negative feedback regarding the telemedicine consultations, indicating satisfaction with the process. - Retrospective nature of the study Lack of a control group Preliminary findings that require further studies Small distance between facilities may limit generalisability The study concludes that telemedicine is a beneficial in providing antenatal

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JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT

QUALITATIVE RESEARCH (RECORD 6)

STUDIES

(RECORD 7)

ANALYTICAL CROSS SECTIONAL STUDIES (RECORD 3)

STUDIES

(RECORD 5)

(RECORD 4)

265

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JBI CRITICAL APPRAISAL CHECKLIST FOR

ANALYTICAL CROSS SECTIONAL STUDIES

The paper emphasizes the feasibility medical inlevance, and exit effectiveness of using asynchronous into-expertise (WITE) for amorated diagnosis, highlighting to poterrial is confirming abnormalities, evaluating take profiles cooks and the applicabili-

The aim was to compare the interpretations of the samigraphies and specialists.

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Training of sirrographers at FM offices to fetal achosolitizations. Expension of fetal telemodicine program that to COVE 15

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Formsteading of the FM clinics to the telepholicine program.

distance of obstericians. The program was met with positive feeliback from partial parts, with 90.4% of participants indicating they sould recommend it is others.

Methods

Mixed methodology which evaluated the RDAX pilot progress.

Training of the officials professionals (ICSS), conducted of proposed more professional

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specialty saws, providing algorithmal benefits to Navilles, respecially during the pure

Comments (Including reason for exclusion)

- Retrospective case series design Institutional Review Board approval

teleultresound. Methods

Reason for exclusion: the study primarily reviewed telemedicine and not

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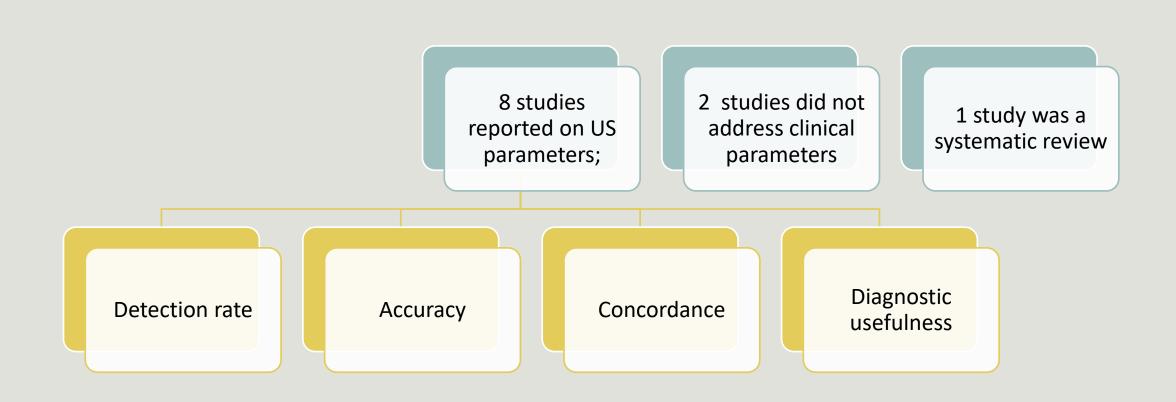
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Data Extraction

Author	Date	Study Type	Southy Location	Outcome Detection	Outcome Coro Saving	Database Asseptiability of Televitoscound (patient)	Datument Acceptability of Telesitranound (HCP)	Conclusion
Nate Z Rate	2017	Resupediar solunitally	tived Same	Conquestions on-stell5	Yac	Filtraporad	Nonsported	Smile sensitive and écoused of telephasis and reported when compared to on the sharound Potential our effectivement or patient, internols are as.
Plicaned Respect	2022	Analytical cours cectional challs	França	Higher	Year	Namepored	Norseported	Totestrament was legislic, needed release and con- oftension. Percentagious timing allowmables, multiding false parallel states, and has applicable, in other needed specialists.
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Kamal Jamal	oneo	Mined Methodologe	Éfriopie	Comparable to on site US	Vac	Yès	Yan	Playli level of agreement is the energy-ration of stages. Potents or preserved for reflect and as reduced transformation of contrast and engineering spatially of orthodoximal country beginning units. And engineering through diagnostic is demantice.
OLA II Seet.	2021	Prospentive Cohot Study	Unted Kingdom	Monegorad	Yes	Yes	Yes	Occurso but implement about of the release amount or one or an exist saving and reventions as able to both HCPs and placement.
Dwok D Bagayoko	20W	Color Study	Photo:	rossed.	Vec	Ver	Normpored	Deter diagnosis and nanagement of parients. Incressed appeal for district hough six leading to improve district hough six leading to improve district hough six leading to improve district house.
Berny F Dynn	2075	Care Seter	Burgi States	Hghe	Yes	Yes	Yes	Pacificated the delivery of feral cardiac retribut locally without comprehensing diagnostic quality occarient restribution. Significant reduction in surpolated costs for parameter.
Date British	2000	Qualitative	Liberard Fungahorn	Morreported	Vac	Yes	Hadisone concerns	Patients and directal reliefuldour were accepting of the review. The mody emphision of the tries in a reside method to accept respective railely and removely, sonagraphies did however those challenges, but acknowledged the benefit so their patients.
NoelDeton	2075	Spikenare: Please	Lineagi Scales	Comparable to on-site US	Nan-	Film-oponed	Norseponted	The recount descript constant arm - depth is unmailten of amegicables, but no condection of time the profite outcomes and impatences reported.
AliPhicule	2000	Care Sesso	Japan	Higher	Unclear	flarreported	Nameported	The answersh does not provide environ of exceptables, but reports on the province outcomes and experiences of patients, which infers economicables.

Record Number	Article Title	Study Location	Primary Author	Year	DOI	JHI Critical Appraisal Tool	Include Exclude
1.	Telehealth in antenutal care: recent insights and advances	Australia	Jessica Atkinson	2023	https://dx.dm.nng/16.1186/s12916-629-00042-g	http://nfs my.Surepoint.com/personal/hufs.elmi.iifo.net/200_mems/Ib*s 20shes/14/74 or fts/2016/2004-rations/2016-rates/dus	×
1	Televitropound: How Accurate Are We? United		Noder Z. Bable	2017	https://dv.dm.umg/10.3002/jum.3.4304	httas://dx my.sherapon.txm/personal/hafaa.elm.ntsnet/bocamerra/874 26.he-354/Nesse#s207430fGebot%/03nahriduss	
l.	Asynchronous tole expertise (ASTE) for prevatal diagnosts to feasible and cost saving: Results of a French case study	France	Mhaned Belderd	2022	https://dx.doi.org/10.1371/jeuros/pres.0209477	Mtsei/inte. mp.shurupom.com/personyl/habs.elm.into.net/Toi;uments/filths 20ches8at/Resedit 2018/2018-0048-002-yvs8-20asteneths 20thehyl Alois	Ø
4.	Examining ultrasound diagnostic performance improvement with sublisation of material- <u>detal</u> medicine tell-indepretation.	United States	Adina II. Kem- Goldberger	2021	https://doi.org/16.1011/01.001.000001.001.1.100000	https://doi. mp.dwogoom.com/personal/beha-elm.nbs_net/frommom/.ftms 20ch.exhit/fromdHX20Rx20AnanricalRx20CrassR20GestendRx 20thalpi.flocx	Ø
5,	Expanding Access to <u>field Telecartitology</u> Oving the COVID-19 Parsheria:	United States	Bryanna N. Schwartz	2021	https://doi.org/201.1005/tms2029.0500	https://who. mp.champort.hm/perconst/habs.ahm.ide.nst/fibr.macris/fibr/ 20chastat.fibracids/2016/06/06/06/06/06/diss	☑
ñ.	Implementation and evaluation of a pilot antenstal ultrasound imaging programme using tale-ultrasound in Ethopia	Plugha	Kemul Jemai	3022	https://do.doi.org/10.1177/53976388771183-96	https://de- mp.sherepoint.com/personal/hefs.edm.ph.net/bacements/88% 20thocksts/Necret/C09%20Gualtative/C094anarchi.nes	Ø
7.	Implementation of a fetal obsecuend telemedicine service: women's views and family costs	United Kingdom	VMXI. Smith	2021	Preparat/No. dris preg/30, 3486/54, 2004-029-02532-4	https://mis ny.shampoint.ram/parsonal/hafsa.atmi.php.net/Sociamoints/36th 20ches/stat/hessa districts/hittingpertnets/hit shorts/misualy) dasa	☑
1	Medical and economic benefits of felehealth in low- and avidifi- income countries: results of a study in four district hospitals in Multi	Mali	Check 0, Baggyota	2014	https://doi.org/30.1386/2472.6968.14.51.59	https://doi. me.championt.com.pamsinal/beha.elm.uhu.ndr.becommth/liths 20c/sekks/Neurodh/1008.00c.shorts/2003.dq.dq.e	
u.	Mobile health applications for prenatal assessment and monitoring.	Belgium/Linted Kargilan	Wifried Systems	2019	https://de.doi.org/10.7174/100161762/MAA110220140005	https://who. mp.chaepport.com/personal/balss.elon.idu.set/Documents/little 20cheokst/Meton#6.099/20thprothek3/Merodes.disc	×
16.	Risk Stratification of <u>Fetal</u> Cardiac Anomalies in an Underserved Population Using Yelecardiology.	United States	Bettino F. Cuneri	2019	https://dc.htm.mg/36.30017A21G.0000000000071562	https://doi- tos.abumpotif.com/personal/hafus.nbm.nbs.net/document/10% 20chockat/Russel#s1010%10/casek10bonset_dock	☑
11.	Service user and staff acceptance of total ultrasound talementions.	United Engloss	blems Salmens	1020	https://dx.doi.org/10.1177/2013107610939529	https://dbs my.charupoint.com/personal/halta.edmi_phs_net/Tocaments/85% 20cheshiel.blesset(0.011%30Daalingtock/308exemph_dmi	☑
12.	Tule-Littracound in Resource-Limited Settings: A Systematic Review.	United States	Noul Britton	2019	https://do.doi.org/10.3486/faultr.2020.00044	https://els- my.durupioti.com/jumpout/hatta.else.ulu-net/Sociement/1896 20ches646/Necorfix DD 196700/cdematick200eees/.duca	Ø
13.	Telediagnosis system for congenital heart disease in a Japanese prefecture.	Japan	Aki Mabuchi	1020	https://dx.dui.org/50.1807/s18996-829-81820-y	https://drip my.sharupomt.com/personal/halta elmi nts. net/Soc.umerts/Att% 20ches/shat/Rescarts/2013/shat/aer%20tomesi_docs	Ø
14.	Prenatal diagnosis and telemedicine consultation of <u>fetal</u> onologic disorders.	United States	Nader Z. Rable	3016	https://do.doi.org/16.1177/1197643932529506	httm://sh- m.chu-escirt.tam/personal/hafts_elm;.ubu_re2/Socamens/Jiffs_ 20cfscokist/Record#1014930f_asm20tames(30cs	×

Results



Results- Detection Rates

Study	Country	Reported			
Rabie et al., (2017)	USA	Sensitivity of 57.46% and specificity of 98.21%.			
		Exclusion of ventricle septal defects (VSDs) data.			
		Increased to 66.96% and specificity 98.22%.			
Beldjerd et al., (2022)	France	 No fetal anomalies detected in 186/260 (71.5%/100%) 			
		• Detected anomalies in 74/260 (28.5%/100%).			
		• 100% detection rate.			
Kern-Goldberger et al., (2021)	USA	• 50 % increase in detections rates from 3.2% to 4.8%.			
Schwartz et al., (2021)	USA	100% accuracy rate.			
Cuneo et al., (2019)	USA	96% accuracy rate.			
Mabuchi., (2020)	Japan	95% accuracy rate.			
Jemal et al., (2022)	Ethiopia	100 scans randomly selected compared for concordance between HCPs and obstetricians.			
		Concordance 79% to 100%.			
Bagayoko et al, (2014)	Mali	Diagnostically helpful in 92.6% of cases.			







Patient acceptability was generally high.

Patients expressed satisfaction with the service.

They appreciated the reduced travel times and associated costs.

Results-Acceptability (Patient)

Results- Cost Saving

- The studies reported cost effectiveness for patients.
 - Based on the average cost saved;
 - Travel
 - Accommodation
 - Time off work

Results-Cost Saving

Study	Country	Reported
Beldjerd et al.,	France	Savings of an average of 63% (€ 123.40) per patient.
(2022)		Average total cost per patient who used teleultrasound was € 74.45 compared to €195.02
Cuneo et al.,	USA	Average of \$61 for evaluation by teleultrasound
(2019)		Compared with \$581 for evaluations at the distant centre.
Smith et al.,	UK	Average cost of a total of approximately £439 for a woman to be accompanied by one person.
(2021)		Reduced travel time - 20 minutes journey for teleultrasound patient.
		Compared with 230 minutes journey time for in person visit to the FM centre.
Bagayoko et al, (2014)	Mali	Saved average costs- 12380 XOF (25 USD) to a maximum of 35000 XOF (70 USD).

Results- Patient Opinions

"The mere fact of asking me to go to Bamako for a test worsens considerably my illness. Therefore, this project is a miracle" (Bagayoko et al, 2014).

Women expressed overall content and were happy with the flexibility the service offered (Jemal et al., 2022).

Women were happy and expressed surprise, as they were not aware of the service and thought it was a "great idea" (Smith et al., 2021).

However, some women were anxious about the new service, though it might have been more about the anticipated outcome of the scan.

it might have been more about the anticipated outcome of the scan.

Acceptability (Work force)

- Geographical differences.
- Sonographers in USA
 - Positive impact and reported professional improvements in confidence and clinical abilities.

Acceptability (Work force)

- Healthcare Professionals (HCPs) in Ethiopia and Mali.
 - Optimism
 - Hope
 - General satisfaction with the training offered and the teleultrasound service.

Acceptability (Work force)

UK Sonographers

- More complex with multiple layers related to professional identity.
- Some apprehension related to a different way of working.
- Though, appreciated the benefits of the service and what it had to offer to their patients.

Conclusion

Has the potential to enhance antenatal care.

Can be utilised in other areas of ultrasound.

However, due to the scarcity of strong evidence caution should be exercised.

Recommendation

Longitudinal, larger, multicentre studies that are randomised and controlled.

Guidance and governance is needed to standardise the reporting of findings, as well as implementation and dissemination the of future research.



Questions & Answers