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NHS Trust

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

# Background

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- 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.

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# 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

	Key Term	Alternate Term	Alternate Term	Alternate Term
<b>P</b> population	“pregnancy”	“Antenatal or prenatal”	“obstetric”	“Fetal”
<b>I</b> Intervention	“telesonography or teleultrasound or teleradiology”	“Double reading or reporting or review”	“Secondary review or reporting or review”	“Independent review or reporting or review”
<b>C</b> Comparison	ultrasound	sonography	Scanning	examination
<b>O</b> Outcome	“recall rate”	“Detection rate”	“discordance or agreement”	Anomaly or abnormality

# Methodology- Eligibility Criteria

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## Inclusion

- Asynchronous
- Synchronous
- Telesonography
- Obstetric ultrasound
- English language only papers
- Papers from last 10 years (2013-2023)
- Primary and systematic sources

## Exclusion

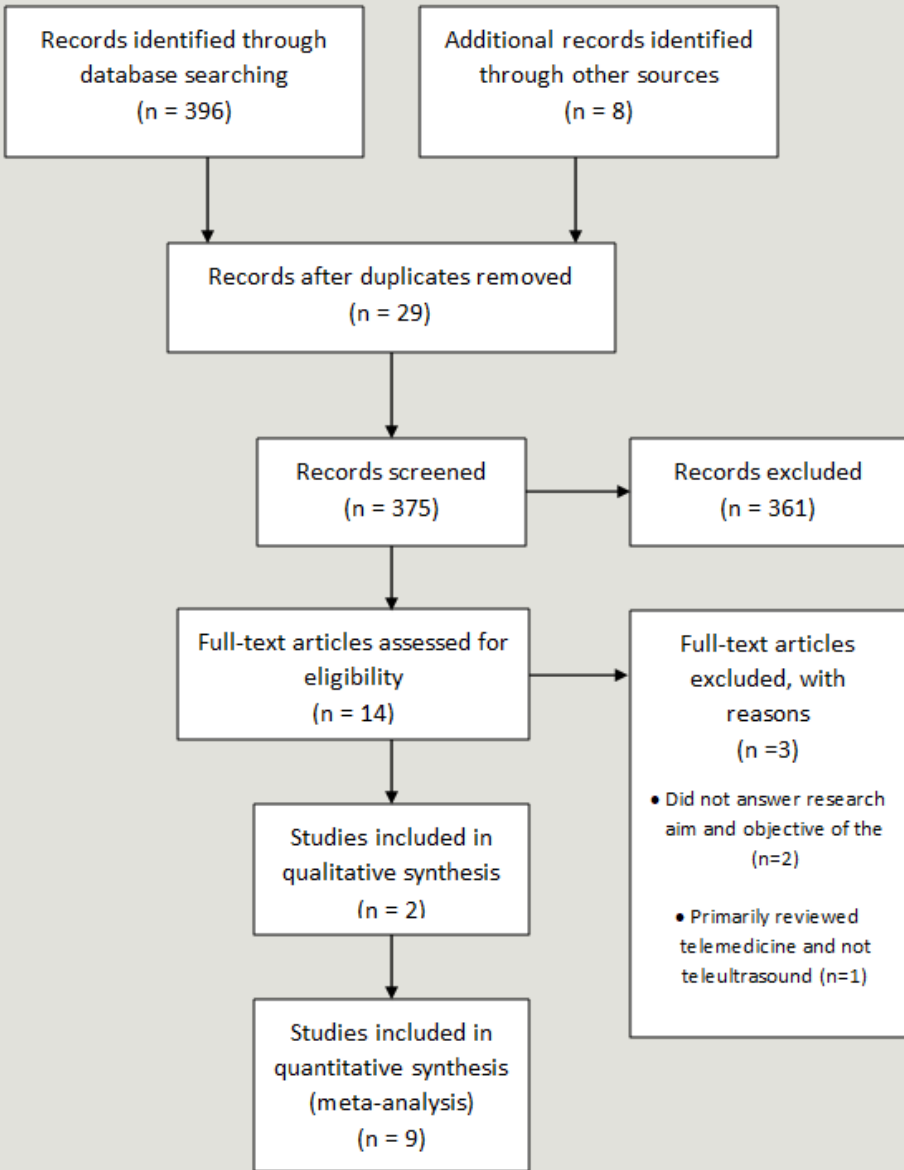
- Non-human subjects/ participants
- Robotic studies.
- Non- ultrasound
- Reviews
- Conference proceedings
- Dissertations/ thesis
- Letters

Identification

Screening

Eligibility

Included



# Methodology

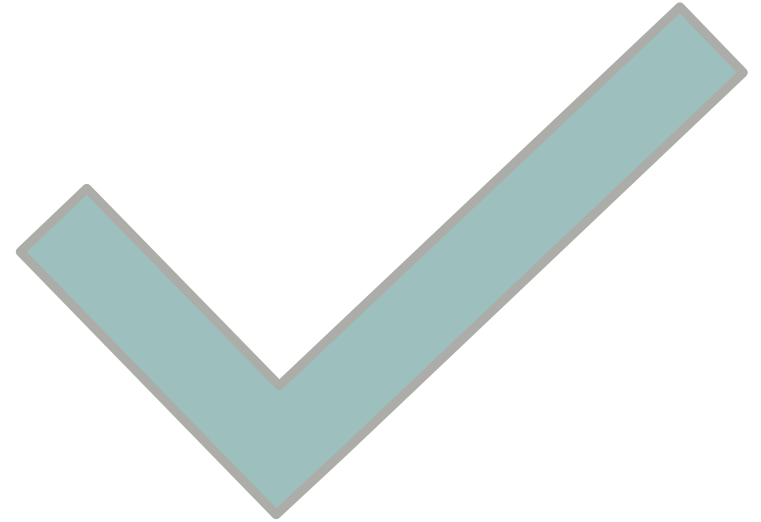
- Data Extraction and Analysis

# Methodology

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## ○ 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 Checklist

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

Narrative review, which included a systematic search of PubMed and MEDLINE databases using specific keywords related to antenatal care and telehealth, identifying a total of 2548 papers, of which 1123 were manually screened for inclusion. The inclusion criteria focused on models of telehealth, clinical safety, cost-analysis, and economic evaluation by antenatal care, with a focus on cases published by...

## JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES (RECORD 2)

- Retrospective study design.
- Inclusion criteria of antenatal care ultrasound scans.
- Inclusion criteria: ultrasound scans before 34th gestation, multiple gestation, or non-antenatal studies.
- Data collection was by a team of sonographers using telehealth either via...

### Conclusion:

Meets most for antenatal diagnosis but some sensitivity and accuracy in the published literature for an in situ ultrasound. Due to the antenatal sensitivity and accuracy of telehealth ultrasound to be able...

## JBI CRITICAL APPRAISAL CHECKLIST FOR ANALYTICAL CROSS SECTIONAL STUDIES (RECORD 3)

### Comments (including reason for exclusion)

#### Summary:

The paper emphasizes the feasibility, medical relevance, and cost-effectiveness of using asynchronous tele-ultrasound (ATU) for antenatal diagnosis, highlighting its potential in confirming abnormalities, reducing false positive rates, and its applicability...

The aim was to compare the interpretations of the sonographers and specialists, to identify potential missed diagnoses. An univariate analysis was performed to examine the missed diagnoses by scan type and region system, and a...

- Comparison of telemedicine study numbers during and before the pandemic.
- Training of sonographers as FM officers in fetal echocardiography.
- Expansion of fetal telemedicine program due to COVID-19.
- Videoconferencing for counselling.
- Participation of the FM clinics in the telemedicine program.

existence of obstetricians. The program was met with positive feedback from patients, with 90.4% of participants indicating they would recommend it to others.

### Methods:

Mixed methodology which evaluated the RUSA pilot program. Evaluation of healthcare professionals (HCPs), ultrasound ultrasound and patient satisfaction.

## JBI CRITICAL APPRAISAL CHECKLIST FOR ANALYTICAL CROSS SECTIONAL STUDIES (RECORD 4)

## JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES (RECORD 5)

## JBI CRITICAL APPRAISAL CHECKLIST FOR QUALITATIVE RESEARCH (RECORD 6)

## JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES (RECORD 7)

The paper reports on the successful implementation of a fetal ultrasound telehealth service in the UK. The aim was to explore the acceptability, safety, and quality of the service in the real world setting, with a focus on patient safety, staff workload, and patient satisfaction.

### Methods:

- The study involved conducting telemedicine consultations via secure video for fetal medicine (FM) consultation over a six-year period from October 2015.
- The project had two phases: (1) pilot and evaluation phase, (2) embedding and adoption phase.
- Patients were assessed for telemedicine suitability and medical-legal requirements were based on staff for guidance.
- Testing was performed to compare.
- Obstetric cases were performed using a 12-lead fetal echocardiogram with FM available providing guidance during the consultation.
- Clear reports were sent to the referring clinician after the telemedicine consultation.

### Included cases were:

with a confirmed or suspected fetal anomaly (like presence of open neural tube defects), suspected fetal death (due to the need for FM ultrasound).

### Results:

- A total of 267 telemedicine consultations were carried out during the first six months of the project, with an 80% uptake in the age of 34 weeks.
- The study and telemedicine were both deemed safe, and there were no clinical issues.
- Most of the women who used the service were pleased with their telemedicine consultation, and were considerably more satisfied with the antenatal care.
- Overall, the implementation was successful and well-received by both patients and staff, demonstrating its safety and acceptability in providing high quality patient care.

### Conclusion:

Small number of referrals from a single, small district and limits the generalizability of the findings. The study does not provide data on the accuracy of fetal diagnosis by telemedicine.

The study does not compare telemedicine and non-telemedicine image quality.

### Conclusion:

The implementation of the first ultrasound telemedicine service was regarded as highly successful, with improved consultation, reduced travel time and cost, and overall positive feedback from both patients and staff.

The service has the potential to be further enhanced and extended to other areas of specialist care, providing significant benefits to families, especially during the pandemic.

## JBI CRITICAL APPRAISAL CHECKLIST FOR CASE SERIES (RECORD 14)

Reviewer: Nader Z. Rabio et al. Date: 20-02-2024

Author: Nader Z. Rabio et al. Year: 2016. Record Number: 14.

Criteria	Yes	No	Not applicable
Were there clear criteria for inclusion in the case series?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was the condition specified in a standard, reliable form for all participants included in the case series?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was a valid tool used for identification of the condition for all participants included in the case series?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did the case series have consecutive inclusion of participants?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Did the case series have complete inclusion of participants?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Did the case series have complete exclusion of the participants in the study?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Did the case series have reporting of clinical outcomes of the participants?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were the outcomes or follow up results of cases clearly reported?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Was the descriptive reporting of the presenting characteristics (demographic information) clear?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was statistical analysis appropriate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include  Exclude  Seek further info

### Comments (including reason for exclusion)

Reason for exclusion: the study primarily reviewed telemedicine and not teleultrasound.

### Methods:

- Retrospective case series design.
- Institutional Review Board approval.

## JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES (RECORD 8)

Supporting and health system with portable ultrasound devices (US), for use in the home. The study was a retrospective analysis of data from the implementation of antenatal care and telehealth, identifying a total of 2548 papers, of which 1123 were manually screened for inclusion. The inclusion criteria focused on models of telehealth, clinical safety, cost-analysis, and economic evaluation by antenatal care, with a focus on cases published by...

### Conclusion:

in the UK. The findings suggest that telemedicine is a viable and cost-effective alternative to traditional antenatal care, and that it can be used to improve the quality of care for patients in rural areas. The findings also suggest that telemedicine can be used to improve the quality of care for patients in rural areas.

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

- Narrative review summarizing existing literature on possible health applications in antenatal care.
- Focusing on potential benefits and pitfalls of remote monitoring devices for cardiovascular health, blood glucose levels, blood pressure, and antenatal ultrasound.
- Including information from pilot studies and small healthcare programs.

### Conclusion:

Health care and research in telehealth (JBI) of telehealth.

## JBI CRITICAL APPRAISAL CHECKLIST FOR CASE SERIES (RECORD 10)

Reviewer: Nader Z. Rabio et al. Date: 20-02-2024

- Retrospective case series design.
- Study approved as a retrospective cohort study.
- Study approved as a retrospective cohort study.

Conclusion: There was a significant reduction in associated costs for patients with telehealth being more than twice as expensive than traditional ultrasound.

The telehealth program accurately diagnosed congenital heart disease in 100% of cases and was able to detect all cases for delivery of care.

### Conclusion:

Health care and research in telehealth (JBI) of telehealth.

## JBI CRITICAL APPRAISAL CHECKLIST FOR QUALITATIVE RESEARCH (RECORD 11)

- Review case series included a robust data collection by follow-up telephone interviews.
- Clear inclusion criteria were pre-specified, recorded, implemented, and robust using qualitative data analysis software.

### Conclusion:

Patients and clinical obstetricians were accepting of the service. The study established that the telemedicine service was viable and led to many positive...

### Conclusion:

Health care and research in telehealth (JBI) of telehealth.

## JBI CRITICAL APPRAISAL CHECKLIST FOR SYSTEMATIC REVIEWS AND RESEARCH SYNTHESSES (RECORD 12)

### Comments (including reason for exclusion)

Method: Systematic review following PRISMA guidelines. Inclusion of 107 manuscripts in English, exclusion of non-English studies, 20...

- Inclusion of studies not reporting patient satisfaction in telehealth clinical outcomes may lead to a biased selection of studies.
- Heterogeneity in study designs may lead to incomplete data comparison.
- Superior evaluation of outcomes related to technical feasibility and usage quality without standardized measurements.
- Majority of included studies deemed to have a moderate to some risk of bias, impacting internal validity.

### Conclusion:

Health care and research in telehealth (JBI) of telehealth.

Obstetricians/gynecologists or sonographers sent spatio-temporal image correlation (STIC) datasets to Fyvie Prefectural University of Medicine (Fyvie) when congenital heart defect (CHD), fetal growth restrictions, or extracranial structural abnormalities were suspected.

Discontinued the success of immediate treatment intervention based on...

- Literature search to identify reports of telemedicine for prenatal urologic consultation.
- Use of the AFDM database to identify fetal urologic diagnoses.
- Specific search terms for database queries.
- Identification of patients requiring urologic consultation by a case manager.
- Confirmation of diagnoses and management plans using medical records.
- Consultations performed by board-certified pediatric urologists via telemedicine.
- Scheduling of consultations immediately following ultrasound visits.
- Case manager involvement in updating the urologist and the database.
- Recording of anomalies in the AFDM database and the proportion requiring consultation.
- Majority of consultations conducted via telemedicine.

### Results:

- Approximately 14% of the recorded fetal anomalies were urologic, and 26 cases required urologic consultation.
- Telemedicine was used for 25 of the 28 urologic consultations, demonstrating its utility in prenatal care.
- Patients reported no negative feedback regarding the telemedicine consultations, indicating satisfaction with the process.

### Limitations:

- Retrospective nature of the study.
- Lack of a control group.
- Preliminary findings that require further studies.
- Small distance between facilities may limit generalizability.

### Conclusion:

The study concludes that telemedicine is a beneficial in providing antenatal urologic consultations, especially in rural areas, it saves patients' time and reduces the stress associated with travelling for consultations. The authors recognized the limitations of their research and suggested that additional studies were necessary to comprehensively understand the advantages of telemedicine in antenatal care.

### Conclusion:

Health care and research in telehealth (JBI) of telehealth.

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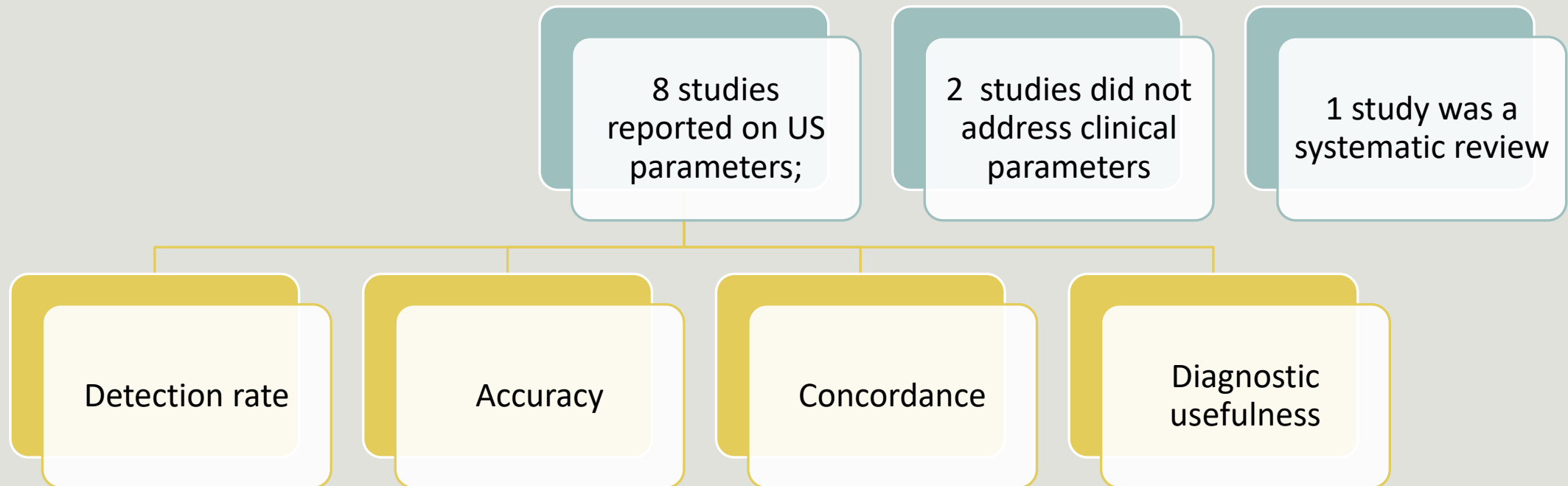
Health care and research in telehealth (JBI) of telehealth.





# Results

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# Results- Detection Rates

Study	Country	Reported
Rabie et al., (2017)	USA	<ul style="list-style-type: none"><li>• Sensitivity of 57.46% and specificity of 98.21%.</li><li>• Exclusion of ventricle septal defects (VSDs) data.</li><li>• Increased to 66.96% and specificity 98.22%.</li></ul>
Beldjerd et al., (2022)	France	<ul style="list-style-type: none"><li>• No fetal anomalies detected in 186/260 (71.5%/100%)</li><li>• Detected anomalies in 74/260 (28.5%/100%).</li><li>• 100% detection rate.</li></ul>
Kern-Goldberger et al., (2021)	USA	<ul style="list-style-type: none"><li>• 50 % increase in detections rates from 3.2% to 4.8%.</li></ul>
Schwartz et al., (2021)	USA	<ul style="list-style-type: none"><li>• 100% accuracy rate.</li></ul>
Cuneo et al., (2019)	USA	<ul style="list-style-type: none"><li>• 96% accuracy rate.</li></ul>
Mabuchi., (2020)	Japan	<ul style="list-style-type: none"><li>• 95% accuracy rate.</li></ul>
Jemal et al., (2022)	Ethiopia	<ul style="list-style-type: none"><li>• 100 scans randomly selected compared for concordance between HCPs and obstetricians.</li><li>• Concordance 79% to 100%.</li></ul>
Bagayoko et al, (2014)	Mali	<ul style="list-style-type: none"><li>• Diagnostically helpful in 92.6% of cases.</li></ul>



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

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- 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., (2022)	France	Savings of an average of 63% (€ 123.40) per patient. Average total cost per patient who used teleultrasound was € 74.45 compared to €195.02
Cuneo et al., (2019)	USA	Average of \$61 for evaluation by teleultrasound Compared with \$581 for evaluations at the distant centre.
Smith et al., (2021)	UK	Average cost of a total of approximately £439 for a woman to be accompanied by one person. 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

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“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)

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



# Acceptability (Work force)

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

# Acceptability (Work force)

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- **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

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**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

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