Understanding the facilitators and barriers to sonographers' research engagement: A systematic review

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Understanding the facilitators and barriers to Sonographers' Research Engagement: A Systematic Review

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Abstract

Introduction: Research engagement is central to evidence-based clinical ultrasound practice, and a component of advanced clinical practice pillars. Despite increasing policy emphasis and interventions, sonographers remain underrepresented in research activity. This systematic review aimed to identify the extent of sonographers' research interest and engagement, and to explore facilitators and barriers influencing research participation and utilisation.

Methods: A mixed-methods systematic review was conducted following the PRISMA 2020 guidelines and the Cochrane Handbook. Systematic searches were carried out across four key databases, supplemented by manual searches of relevant journals, to identify quantitative, qualitative, and mixed-method studies exploring sonographers' engagement in research. The Quality Assessment Tool for Studies with Diverse Designs (QATSDD) was used for critical appraisal. A results-based convergent synthesis was then performed to integrate the qualitative and quantitative findings.

Results: Seven studies (617 participants) met inclusion criteria. Sonographers demonstrate high awareness and interest in research (up to 68.5%), but only one-third were active researchers. Key barriers included lack of protected research time, limited research skill/experience, insufficient organisational and professional support, restricted funding access, and a perceived lack of authority to implement findings. Facilitators included career development goals, scientific curiosity, research-oriented leadership, peer support, and access to mentorship or formal training.

Conclusion: Institutional and professional efforts are needed to promote sonographers' research engagement. Enhanced mentorship/training, improved funding, embedding research into role specifications, and protected time are essential to bridge the interest–participation gap and build research capacity.

Implications for practice: Implementing targeted policy support and strategic initiatives—such as funding and training programmes for sonographer-focused research—can improve job satisfaction, increase engagement, and facilitate evidence-informed practice.

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Introduction

Research and clinical effectiveness are essential pillars of clinical governance underpinning multidisciplinary healthcare, contributing significantly to effective healthcare and staff satisfaction/welfare [1,2]. Medical imaging plays important roles in patient care, and ultrasound has notable advantages in diagnostic services [2,3]. Ultrasound practice and sonographers' roles have expanded alongside service demands, leading to increasing education and training needs [4]. Increasing emphasis on evidence-based practice requires the availability and utilisation of research evidence [4-6]; sonographers (non-medically trained ultrasound practitioners) are required to actively engage in research [7,8,11].

Research engagement among sonographers influences patient care, service delivery, professional development, and job satisfaction [1-8]. The Society and College of Radiographers and Health Education England identified research engagement as one of the four pillars of advanced practice [1,7,11], and health regulatory and professional bodies actively promote research culture through different programmes and guidelines [7,11,12]. However, research engagement by sonographers is below required levels, and is notably lower than other healthcare professionals [1,3-8]. Various responsible factors have been identified, most of them universal, but some are specific to different healthcare settings [2,4-10].

Special attention has been given to understanding the challenges faced by medical imaging professionals, including Sonographers with regards to research [2]. These are aimed at raising awareness and entrenching research engagement at the core of clinical practice [2-4]. Ideally, sonographers should be encouraged and supported to engage in research to ensure delivery of optimal quality care, through application of current best evidence [2,7]. There are however challenges and enablers to achieving this, which need to be fully understood [8].

Notwithstanding the documented need for research engagement by medical imaging staff, there are limited studies assessing sonographers' research engagement [1,2-15]. Available studies identified a similar trend to other healthcare professions, including more staff having an interest than those who are actively engaged in research [3-6,9,10,13-15]. Some notable barriers to sonographers included lack of protected time for research, poor organisational support, lack of research experience/skills and staff shortages [2-6,9-10]. Organisational support, training opportunities, multidisciplinary team support, positive research culture are among the noted facilitators [3-6,9-10,16].

The effects of these barriers and facilitators on sonographers' research engagement, require critical evaluation to identify how they can be managed effectively [1,5,6]. Multiple studies have suggested further analysis of the level of Sonographers' research engagement to understand how it can be improved, since such improvement can positively impact

patientcare, the healthcare organisations, the profession, and the individual sonographers [5-9,13,17].

This study aimed to systematically review available evidence on sonographers' research engagement, including their awareness/interest in research, the extent of research engagement, as well as the facilitators and barriers. These were examined to identify specific challenges and available opportunities for improving sonographers research engagement.

Methods

Due to the diversity of published articles on this topic, a mixed-methods systematic review was conducted to identify the level of Sonographers' research awareness/interest and to examine the facilitators and barriers to Sonographers' research engagement. This method allowed for the integration of both quantitative and qualitative evidence, thus providing a comprehensive understanding of the topic [22]. The review was conducted in accordance with the methodological principles set out in the Cochrane Handbook for Systematic Reviews [18] and adhered to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines [19] to ensure transparency and rigour.

Detailed inclusion/exclusion criteria, search terms, and quality appraisal methods were agreed to and applied by two reviewers (BE and OL). The detailed documentation and reproducible methodology ensured transparency, replicability, and methodological integrity [19,21].

The proposal for the study was developed and published on PROSPERO and is available at XXXXXXXXXXXXXXXXXXXXXXX.

This study involved the synthesis of secondary data from published literature; hence ethical approval was not required.

Inclusion criteria

To capture trends in Sonographers' training/scope of practice, role expansion and research engagement, the review included peer-reviewed primary research articles and academic publications (e.g., dissertations) published in English between January 2005 and May 2025. Studies (quantitative, qualitative and mixed-methods) that addressed Sonographers' research engagement, including level of awareness/interest, research activities, as well as facilitators and barriers to research engagement were included. Due to the small number of available publications, studies with small numbers of Sonographers as a subset of medical imaging professionals, and which specified these in the reports and discussion sections were also included.

Exclusion criteria

Studies were excluded if the primary focus was not related to Sonographers' research engagement (e.g. role expansion studies). Non-primary research articles were excluded along with non-English articles to ensure the inclusion of empirical evidence only and to avoid information loss due to translation errors.

Data Sources and Search Strategy

An initial scoping search identified keywords for the review. A comprehensive search was then conducted across four electronic databases holding substantial collections of health-related publications: Scopus, PubMed, ScienceDirect and CINAHL (Cumulative Index to Nursing and Allied Health Literature) using the identified keywords and search strategies adapted to the different databases. Google scholar was searched for Gray literature, a notable source of important information [23].

Indexed discipline-specific journals were also searched to enhance the breadth of the search and the chances of accessing high-quality studies. These included Radiography, Journal of Medical Imaging & Radiation Sciences (JMIRS), Journal of Medical Radiation Sciences (JMRS) and Ultrasound. The reference lists of selected articles, and relevant review articles were manually screened to identify additional studies.

The search strategy combined Boolean operators and free-text keywords. For example: "Sonographers" OR "Ultrasound radiographers" AND "Research" OR "Study" AND "Engagement" OR "Participation" OR "Utilization" OR "Evidence-Based Practice" AND "Facilitators" OR "Motivation" AND "Barriers" OR "Limitations" was adapted and used. The Search Terms were adapted for the indexing syntax and controlled vocabulary used by each database. Searches were conducted by one reviewer (BE) and covered the specified timeframe of January 2005 to May 2025.

Screening, Selection and Quality Appraisal Process

Search results were imported into Rayyan, a web-based platform designed to support systematic reviews [20]. Following removal of duplicates, remaining titles and abstracts were independently screened by two reviewers (BE and OL) for eligibility based on predefined inclusion criteria. Full texts of selected articles were reviewed for final inclusion. Disagreements between reviewers were resolved through discussion and arbitration by a third reviewer (CO). The results of the search and study selection steps are shown in the PRISMA flow diagram (Figure 1).

The Quality Assessment Tool for Studies with Diverse Designs (QATSDD), which is appropriate for appraising heterogeneous study types [22], was used to assess the methodological quality of the papers. This allowed simultaneous evaluation of qualitative, quantitative, and mixed-methods studies using 16 criteria scored on a 4-point scale. Each study's overall quality was

summarised based on scores from the tool (low, medium, or high). Discrepancies were resolved through team discussion.

Data Extraction and Synthesis

A structured data extraction form (Tables 1 and 2) was developed to capture essential information from each study, and to ensure consistency between reviewers. To ensure reliability, two reviewers independently extracted relevant data and cross-verified them at the end of the process [24-26].

Analysis and presentation

Results are presented using tables and figures and discussed with narrative explication. A results-based convergent synthesis was employed. Data from quantitative studies such as survey percentages on barriers and facilitators to sonographers' research engagement, were first narratively summarised [25,26]. Survey percentages were then mapped onto qualitatively derived themes through a deductive coding approach [27]. Themes related to the research interest/awareness, and recommendations on improving research engagement were also mapped and presented.

Thematic saturation and convergence across data types were assessed using a triangulation matrix to visualise convergence of key quantitative and qualitative findings and ensure the reliability of integrated insights [24,26]. High convergence suggests strong and consistent evidence. Moderate convergence reflects a partial alignment, and low convergence suggests emerging themes or areas needing further investigation (Figure 3). Table 2 summarises the strength of evidence per theme.

Results

Overview

Seven studies met inclusion criteria and were included: three quantitative [3, 4,10], two mixed [5, 6] methods, and two qualitative [9, 11]. These studies explored sonographers' research awareness and interest, level and method of research engagement, facilitators and barriers to research engagement and research utilization (Figure 2). All were multi-centre studies, with three conducted across multiple international healthcare systems ([4,5,10]; Table 1).

Five of the studies [3,4,9-11] included solely sonographers, with others [5,6] including other medical imaging professionals. The geographic heterogeneity (UK, Australia, Denmark, and Arab countries) introduces variation in healthcare jurisdictions, staffing levels, and professional expectations, which possibly influences the research engagement context.

Findings such as a lack of protected time for research and organisational culture barriers were consistent across regions, suggesting some global relevance [Table 1]. Generalisable themes such as protected research time and poor organisational research culture emerged, but specific contextual interpretation must be adapted to reflect organisational and national differences [6,9] (Table 2).

Demographics

Across the seven studies, 617 participants were included, aged between 23 to 69 years. The majority were female (n=430) and under 35 years old, reflecting a gendered, young workforce. Where specified, more participants worked full-time than part-time (n= 233 vs 130). Many held clinical positions within public, tertiary, or general hospitals (n=325). Fewer worked in private practice (n=49), and only a minority occupied academic or managerial roles (n=20). Professional experience was skewed toward the early and mid-career stages, with those possessing up to 10 years of experience forming the majority (n=222). Educational attainment varied from diploma-level to doctoral degrees, though a progressive increase in postgraduate qualifications (MSc/PhD) was noted across the study period [3,4,6] (Tables 1, Appendix A).

Research Awareness and Interest

Research awareness and interest were consistently high, with 68.5% of sonographers reporting interest in research engagement [3,4,10]. However, actual participation was markedly lower, with only around 33% actively involved in research activities, a ratio that has remained relatively stable over the past decade [3,4,6]; (Tables 1 & 4). Two studies [5,10] exclusively recruited research-active participants, limiting their generalisability to the broader sonography population.

Research engagement methods reported included participation in research teams, completion of education modules, submission of funding applications, literature reviews, and research utilisation in clinical decision-making [3-6,9-11]. None of the studies explicitly referenced formal research training as part of participants' engagement pathways (Table 4). The most common research-related tasks included performing research-focused scans, writing protocols, engaging in audits, authoring publications, and conference presentations (Table 4).

Barriers to Research Engagement

Challenges to research engagement were remarkably consistent across all studies. The most frequent barrier was the lack of protected time for research, cited by up to 63% of participants [3,4 9,10]. While this appears to have slightly improved in some contexts over time [4], it remains a dominant constraint [9-11]. Other challenges included lack of research skill or experience, inadequate organisational support, and poor departmental research culture [3-6,9-10]. Additional barriers were limited prioritisation of research by both individuals and organisations [5]; a lack of formal research training and mentorship [3,4,10,11]; indifferent or

unsupportive colleagues [4-6]; ethical approval burdens [5,9]; inaccessibility of funding [3,4,5,9]; and perceived lack of authority to lead projects or implement evidence-based changes [3] (Table 4).

Facilitators to Research Engagement

Research engagement facilitators were also consistent across all studies. These included the desire to solve clinical challenges and improve patient care [3,5,9], research-oriented leadership [3-6,11], protected time and flexible scheduling [3-6,9-11], access to training, mentorship [3-6,9-11], and peer support [3,5,9,11]. Others include established organisational and professional frameworks and research pathways [3-6,9,10], streamlined ethics and funding application procedures [5,9] and career progression models that reward research involvement [3-6,9-11] (Tables 3 & 4).

Discussion

Overview

Research engagement is fundamental to effective healthcare delivery and staff professional development [1-3,12,13]. However, Sonographers' research engagement remains limited due to a range of individual, structural and organisational barriers despite increasing expectations and supportive frameworks and obvious benefits to patients and staff [1-14].

This review highlighted a paucity of published literature on sonographers' research engagement as well as a consistent disparity between interest and actual research engagement [3-6,9-11]. Although up to 68.5% of sonographers expressed enthusiasm for research involvement, only one-third reported active participation in studies. This cut across countries and healthcare jurisdictions, indicating widespread fundamental challenges [3,4,10]. This engagement gap remains largely unchanged over the past decade, despite growing institutional and professional policy support for research integration into clinical roles [1,2,3,4,7,13]. While these are not unique to Sonographers, it underlines the need for increased individual dedication as well as professional and institutional promotion of strategies that empower staff to move from passive interest to active research engagement [1,2, 8, 13-15,18].

There were more European-based studies in this review, which may be indicative of the differences in education, practice, and role expansion for Sonographers [11, 16]. Respondents' age range (23-69 years) cut across different generations, work patterns (part-time and full-time), experience levels, educational qualifications; this may be responsible for the reported high research awareness/interest [3,10]. As clinical ultrasound practices evolve globally, role expansion, revised education curricula, and an increasing emphasis on evidence-based practice are expected to improve research engagement among sonographers [5,10-14,29]. Therefore, existing policies and interventional programs, such as

the Society and College of Radiography (SCoR) research strategies [7,29-32] should be evaluated for their impact and effectiveness [1].

Common research participation methods which could foster research interest and skills included completion of educational modules, as part of a research team, research funding applications, literature review, writing protocols, engaging in audit, authoring publications, and conference presentations [3-6,9-11]. In one study, 73% of respondents ~~in one study~~ reportedly applied research evidence in routine practice~~, but~~; however, another study noted that only 42% changed their practice due to research evidence [3,4]. Notably, none of the studies referenced formal research training in their engagement pathways. While these could be attributed to less research experience, confidence and lack of training opportunities, lack of organisational support and authority to implement research evidence are also important factors [1,3,5,10,33]. Effective leadership is therefore required to improve Sonographers' research participation and utilization [6].

Research Engagement Barriers

Lack of protected time for research was the most frequently cited research engagement barrier [3-6,9-11], consistent with results from other professions [14,29,35]. Time constraints however may represent deeper institutional issues such as less emphasis on research activities, with more resources devoted to clinical practice [1-3, 8,37-40]. Other barriers include poor organisational research culture, lack of peer support/mentorship, inadequate research skills/experience, lack of funding, complex ethical approval procedures, lack of organisational/professional support [2,31-38]. These are not unique to sonographers and could be addressed with existing strategies [8]. Although building research culture within ultrasound departments may seem a complex process, available evidence suggests that it is achievable with effort and supportive networks [5,32-36]. However, this is contingent upon individual motivation, research-oriented leadership/management, availability of funded opportunities and supportive institutional/professional frameworks and access to mentorship networks [1,6,8,32]. Therefore, reducing to sonographers' research engagement barriers should include individual, organisational, and professional concerted efforts.

Staff shortages and growing service demands contribute significantly to these constraints [2]. The pressing need for workforce and service expansion must not overshadow the importance of research, which is beneficial to patients and staff [7,11,36]. Addressing staffing deficits could relive clinical pressures and enable greater research engagement [2,8], and NHS Workforce Plans for medical imaging exemplify how such systemic improvements can be operationalised [33].

Relating to lack of authority to implement evidence-based changes in clinical practice, many sonographers believe that leadership in research need not to be the sole domain of medically qualified professionals [3,6]. Therefore, radiologists' influence should not deter

sonographers from contributing actively to research [3], as many aspects of sonography research such as staff wellbeing and professional development are not contingent on radiologist endorsement [31,40].

Research Engagement Facilitators

Sonographers' research engagement facilitators identified in this review can be broadly categorised into individual, organisational and structural dimensions [1]. These include intrinsic motivation to address clinical problems, access to professional networks, supportive leadership, formal research training, peer support, improved department research culture, simplified ethical processes, assistance with funding applications, and clear career pathways that value research involvement [3-6,9-11]. These facilitators are consistent with those observed in other medical professions [14,29,35,38], and enhancing these is crucial for cultivating a sustainable research culture, which is at the core of existing professional strategies and recommendations [1,5-7,11] (Table 3 and 4).

Al-Ghunaim et al. [9] noted that embedding research into sonographers' job plans, with protected time allocation significantly improves engagement. Although this study included only research sonographers, this assertion is valid and similar to the findings among radiographers [14,38,39]. Such initiatives allow for the development of mentorship pathways, professional networks and targeted training programmes and active research engagement [11,38,40,41]. Effective leadership and workforce management are also vital, with Pedersen et al. and Brage et al., highlighting the importance of peer and managerial support in various settings, as well as a departmental culture that values research, towards facilitating research engagement [4,11]. Gyimah [6], and McLean and Lewis [1] further emphasised that research-oriented leadership and professional support are key to implementing and sustaining evidence-based practice, underpinned by research engagement.

Addressing ultrasound workforce shortages can create conditions conducive to research training and supervision [2]. The Centre for Workforce Intelligence (CWFI) 2017 report outlined measures to inform short- and long-term workforce plans up to 2035, that will enable national and local workforce planners to plan training and resourcing of ultrasound workforce [42]. The goal to improve staff numbers, staff training and care quality requires efforts to also improve sonographers' engagement in research. This needs to aim beyond personal motivations, and must include institutional, regulatory, and professional strategies [1,2,7].

Emerging Trends and Future Opportunities

Notably, the repetition of key barriers and enablers across countries, healthcare jurisdictions and contexts highlight a widespread trend, rather than isolated national issues [1,4,5,9-11]. While these cannot be addressed by a common solution, it presents the opportunity to

develop wide-reaching strategies and the cross-application or readaptation of strategies from diverse settings.

As evidence-based practice has gained prominence in healthcare practice, there has been a marked increase in research activity across allied health professionals, which include research projects, conference presentations and peer-review publications and trainings [45,46]. Although this trend is not well established among Sonographers [8,10,11,46], there are existing professional and organisational strategies and policies in place which aim to achieve this, including journal subscriptions, conference access, mentorship support and funding opportunities [1,7,27,33-35,39,45]. Increasing numbers of Sonographers' hold advanced postgraduate qualifications [3-5,10], which bodes well for the future of research [5,7,16]. Furthermore, the integration of research as one of the four pillars of advanced practice is likely to reinforce this trend, especially if adequate attention is paid to it [8,13,29,37-41].

Notably, the lag between interest and actual research participation may suggest that institutional reforms have been insufficient, despite professional and regulatory frameworks that aim to improve research engagement [7,12,18,31]. Evaluation of the effectiveness of these policies/frameworks can determine their impact and how they can be better applied. Some initiatives have created dedicated research sonographer roles; however, their effectiveness requires robust evaluation at both local and national levels [1,2,8,27]. To further institutionalise research engagement, it might be helpful to incorporate research responsibilities into annual appraisal processes [38]. Ultimately, sonographers should be encouraged to explore and seize research engagement opportunities such as interprofessional collaborations and funding networks [2,34] to advance their skills, professional development, enhance job satisfaction, and improve patient care through effective engagement [1-5,16]. However, this responsibility should be distributed across individuals, institutions, and professional organisations [1].

Implications for Clinical Practice, Policy, and professional development

Structural shifts in ultrasound departments are required in terms of task prioritisation and resource allocation, to encourage research engagement [8]. Evidently, research engagement is not a discretionary pursuit but a requirement for good clinical practice, especially for advanced practice roles [12-14,39-39,44]. Hence, incorporating protected research time into Sonographers' job descriptions/plans, mandating research engagement in annual performance reviews/appraisal frameworks, creating research-lead roles and embedding research into departmental goals are important [38]. These can provide support and direction and encourage Sonographers' research participation and utilization [38,39].

Furthermore, while there may already be available funding and programmes to encourage research in the imaging disciplines [2,34], funding bodies should consider ring-fencing funding streams for under-represented professions like sonography [8]. Targeted initiatives such as

formal research mentoring programs, clinical-academic bridging fellowships, and intra/inter-departmental mentoring frameworks should be promoted to address both skill gaps and cultural inertia [1,18,45].

Rodrigues et al. noted workforce strain and service delivery pressures have deterrent effects on research participation in the imaging professions [2], therefore, interventional strategies, such as the NHS Diagnostic Workforce Plan and the Sonography workforce review of 2017 must be evaluated both for service capacity and for their influence on research engagement among sonographers [1,36,42].

Although higher educational qualifications (MSc, PhD) are rising amongst sonographers, they have not yet translated to increased research engagement [3,4,10]. Since Sonographers, as advanced practitioners, are expected to meet all pillars of advanced practice including research engagement [7,8,12], professional development frameworks should embed access to formal research mentorship programs, such as the SCoR Formal Radiography Research Mentoring (FoRRM) Scheme [1,45]. Continuous professional development (CPD) credits should be specifically tied to research activities for Sonographers, and funding and study leave should be offered for research training [1]. These practical reforms can potentially address the gap between research interest and research engagement, leading to a better trained and more satisfied sonography workforce.

Recommendations

Improvements in Sonographers research engagement require increased individual research initiatives, organisational frameworks/support [3-6,11], protected research time [3-6,9-11], training and mentorship programs [5,6,9-11] and reducing barriers such as poor research culture and lack of authority in initiating, leading and implementing research evidence [3,8]. Balancing clinical and research duties and including research engagement as part of job specification and research-oriented leadership are equally important toward building sustainable research capacity among sonographers [2,5,9] (Table 3). Adopting and periodically evaluating the impacts of interventions that improve education and workforce numbers can also improve research training and reduce staff shortages to allow more research-oriented practice [1,2,42].

Strengths and Limitations of the Review

To the best of our knowledge, this review appears to be the first known systematic review focused exclusively on sonographers' research engagement, integrating studies from diverse countries and healthcare systems. This study applied a rigorous mixed-method synthesis approach, following PRISMA and Cochrane guidelines [20,22], and the QATSDD tool to assess methodological quality across diverse designs [23]. Some of the studies used small sample sizes [5,9,11], however, the concept of information power, which focuses on gathering

sufficient data to answer the research question, and the topic being very specific, participants' knowledge or experience could allow for sample size to be smaller [9,47].

Limitations include the small number of studies (7) that met eligibility criteria, which may limit statistical generalisability. However, the consistency of the identified barriers and facilitators across studies lends credibility to the thematic synthesis and highlights core issues that are likely applicable across contexts. The exclusion of non-English publications may have introduced language and selection biases by excluding studies from some countries with active sonographers' research cultures. It may also have over-represented research-active individuals or settings with existing research culture, potentially underestimating disengagement in underserved areas [9]. Also, while attempts were made to use the most inclusive search terms, the ones used might have resulted in the omission of articles or publications that could have been included in the review. One reason for this may be the differences in the designations and scope of practice of sonographers globally.

Areas for Further Research

Although national and international guidelines aim to promote a culture of research within the medical imaging professions, little is known about the extent of sonographers' participation in such initiatives. Future research should evaluate engagement with these programmes and their impact on clinical practice and career progression of Sonographers.

Additionally, studies are needed to explore how interprofessional networks and collaborative models between clinical and academic departments can cultivate research readiness among newly qualified sonographers. Such partnerships may offer valuable pathways for embedding a research-minded ethos early in professional development.

Conclusion

Research engagement is integral to safe, effective, and progressive ultrasound practice. While interest remains high amongst sonographers, participation remains suboptimal due to personal, structural, and professional barriers. This review highlights notable barriers and actionable enablers, including trainings, mentorship, protected time, supportive leadership/management, and clearer career pathways, that can bridge the interest and engagement gap.

Professional and regulatory bodies should take a leading role in embedding research into the strategic vision for the sonography workforce, developing shared learning platforms and facilitating collaborative research. With targeted policy support, organisational leadership, and professional advocacy, sonographers can take a leading role in building a research-rich, evidence-informed workforce.

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Introduction

Research and clinical effectiveness are essential pillars of clinical governance underpinning multidisciplinary healthcare, contributing significantly to effective healthcare and staff satisfaction/welfare [1,2]. Medical imaging plays important roles in patient care, and ultrasound has notable advantages in diagnostic services [2,3]. Ultrasound practice and sonographers' roles have expanded alongside service demands, leading to increasing education and training needs [4]. Increasing emphasis on evidence-based practice requires the availability and utilisation of research evidence [4-6]; sonographers (non-medically trained ultrasound practitioners) are required to actively engage in research [7,8,11].

Research engagement among sonographers influences patient care, service delivery, professional development, and job satisfaction [1-8]. The Society and College of Radiographers and Health Education England identified research engagement as one of the four pillars of advanced practice [1,7,11], and health regulatory and professional bodies actively promote research culture through different programmes and guidelines [7,11,12]. However, research engagement by sonographers is below required levels, and is notably lower than other healthcare professionals [1,3-8]. Various responsible factors have been identified, most of them universal, but some are specific to different healthcare settings [2,4-10].

Special attention has been given to understanding the challenges faced by medical imaging professionals, including Sonographers with regards to research [2]. These are aimed at raising awareness and entrenching research engagement at the core of clinical practice [2-4]. Ideally, sonographers should be encouraged and supported to engage in research to ensure delivery of optimal quality care, through application of current best evidence [2,7]. There are however challenges and enablers to achieving this, which need to be fully understood [8].

Notwithstanding the documented need for research engagement by medical imaging staff, there are limited studies assessing sonographers' research engagement [1,2-15]. Available studies identified a similar trend to other healthcare professions, including more staff having an interest than those who are actively engaged in research [3-6,9,10,13-15]. Some notable barriers to sonographers included lack of protected time for research, poor organisational support, lack of research experience/skills and staff shortages [2-6,9-10]. Organisational support, training opportunities, multidisciplinary team support, positive research culture are among the noted facilitators [3-6,9-10,16].

The effects of these barriers and facilitators on sonographers' research engagement, require critical evaluation to identify how they can be managed effectively [1,5,6]. Multiple studies have suggested further analysis of the level of Sonographers' research engagement to understand how it can be improved, since such improvement can positively impact

patientcare, the healthcare organisations, the profession, and the individual sonographers [5-9,13,17].

This study aimed to systematically review available evidence on sonographers' research engagement, including their awareness/interest in research, the extent of research engagement, as well as the facilitators and barriers. These were examined to identify specific challenges and available opportunities for improving sonographers research engagement.

Methods

Due to the diversity of published articles on this topic, a mixed-methods systematic review was conducted to identify the level of Sonographers' research awareness/interest and to examine the facilitators and barriers to Sonographers' research engagement. This method allowed for the integration of both quantitative and qualitative evidence, thus providing a comprehensive understanding of the topic [22]. The review was conducted in accordance with the methodological principles set out in the Cochrane Handbook for Systematic Reviews [18] and adhered to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines [19] to ensure transparency and rigour.

Detailed inclusion/exclusion criteria, search terms, and quality appraisal methods were agreed to and applied by two reviewers (BE and OL). The detailed documentation and reproducible methodology ensured transparency, replicability, and methodological integrity [19,21].

The proposal for the study was developed and published on PROSPERO and is available at XXXXXXXXXXXXXXXXXXXXXXX.

This study involved the synthesis of secondary data from published literature; hence ethical approval was not required.

Inclusion criteria

To capture trends in Sonographers' training/scope of practice, role expansion and research engagement, the review included peer-reviewed primary research articles and academic publications (e.g., dissertations) published in English between January 2005 and May 2025. Studies (quantitative, qualitative and mixed-methods) that addressed Sonographers' research engagement, including level of awareness/interest, research activities, as well as facilitators and barriers to research engagement were included. Due to the small number of available publications, studies with small numbers of Sonographers as a subset of medical imaging professionals, and which specified these in the reports and discussion sections were also included.

Exclusion criteria

Studies were excluded if the primary focus was not related to Sonographers' research engagement (e.g. role expansion studies). Non-primary research articles were excluded along with non-English articles to ensure the inclusion of empirical evidence only and to avoid information loss due to translation errors.

Data Sources and Search Strategy

An initial scoping search identified keywords for the review. A comprehensive search was then conducted across four electronic databases holding substantial collections of health-related publications: Scopus, PubMed, ScienceDirect and CINAHL (Cumulative Index to Nursing and Allied Health Literature) using the identified keywords and search strategies adapted to the different databases. Google scholar was searched for Gray literature, a notable source of important information [23].

Indexed discipline-specific journals were also searched to enhance the breadth of the search and the chances of accessing high-quality studies. These included Radiography, Journal of Medical Imaging & Radiation Sciences (JMIRS), Journal of Medical Radiation Sciences (JMRS) and Ultrasound. The reference lists of selected articles, and relevant review articles were manually screened to identify additional studies.

The search strategy combined Boolean operators and free-text keywords. For example: "Sonographers" OR "Ultrasound radiographers" AND "Research" OR "Study" AND "Engagement" OR "Participation" OR "Utilization" OR "Evidence-Based Practice" AND "Facilitators" OR "Motivation" AND "Barriers" OR "Limitations" was adapted and used. The Search Terms were adapted for the indexing syntax and controlled vocabulary used by each database. Searches were conducted by one reviewer (BE) and covered the specified timeframe of January 2005 to May 2025.

Screening, Selection and Quality Appraisal Process

Search results were imported into Rayyan, a web-based platform designed to support systematic reviews [20]. Following removal of duplicates, remaining titles and abstracts were independently screened by two reviewers (BE and OL) for eligibility based on predefined inclusion criteria. Full texts of selected articles were reviewed for final inclusion. Disagreements between reviewers were resolved through discussion and arbitration by a third reviewer (CO). The results of the search and study selection steps are shown in the PRISMA flow diagram (Figure 1).

The Quality Assessment Tool for Studies with Diverse Designs (QATSDD), which is appropriate for appraising heterogeneous study types [22], was used to assess the methodological quality of the papers. This allowed simultaneous evaluation of qualitative, quantitative, and mixed-methods studies using 16 criteria scored on a 4-point scale. Each study's overall quality was

summarised based on scores from the tool (low, medium, or high). Discrepancies were resolved through team discussion.

Data Extraction and Synthesis

A structured data extraction form (Tables 1 and 2) was developed to capture essential information from each study, and to ensure consistency between reviewers. To ensure reliability, two reviewers independently extracted relevant data and cross-verified them at the end of the process [24-26].

Analysis and presentation

Results are presented using tables and figures and discussed with narrative explication. A results-based convergent synthesis was employed. Data from quantitative studies such as survey percentages on barriers and facilitators to sonographers' research engagement, were first narratively summarised [25,26]. Survey percentages were then mapped onto qualitatively derived themes through a deductive coding approach [27]. Themes related to the research interest/awareness, and recommendations on improving research engagement were also mapped and presented.

Thematic saturation and convergence across data types were assessed using a triangulation matrix to visualise convergence of key quantitative and qualitative findings and ensure the reliability of integrated insights [24,26]. High convergence suggests strong and consistent evidence. Moderate convergence reflects a partial alignment, and low convergence suggests emerging themes or areas needing further investigation (Figure 3). Table 2 summarises the strength of evidence per theme.

Results

Overview

Seven studies met inclusion criteria and were included: three quantitative [3, 4,10], two mixed [5, 6] methods, and two qualitative [9, 11]. These studies explored sonographers' research awareness and interest, level and method of research engagement, facilitators and barriers to research engagement and research utilization (Figure 2). All were multi-centre studies, with three conducted across multiple international healthcare systems ([4,5,10]; Table 1).

Five of the studies [3,4,9-11] included solely sonographers, with others [5,6] including other medical imaging professionals. The geographic heterogeneity (UK, Australia, Denmark, and Arab countries) introduces variation in healthcare jurisdictions, staffing levels, and professional expectations, which possibly influences the research engagement context.

Findings such as a lack of protected time for research and organisational culture barriers were consistent across regions, suggesting some global relevance [Table 1]. Generalisable themes such as protected research time and poor organisational research culture emerged, but specific contextual interpretation must be adapted to reflect organisational and national differences [6,9] (Table 2).

Demographics

Across the seven studies, 617 participants were included, aged between 23 to 69 years. The majority were female (n=430) and under 35 years old, reflecting a gendered, young workforce. Where specified, more participants worked full-time than part-time (n= 233 vs 130). Many held clinical positions within public, tertiary, or general hospitals (n=325). Fewer worked in private practice (n=49), and only a minority occupied academic or managerial roles (n=20). Professional experience was skewed toward the early and mid-career stages, with those possessing up to 10 years of experience forming the majority (n=222). Educational attainment varied from diploma-level to doctoral degrees, though a progressive increase in postgraduate qualifications (MSc/PhD) was noted across the study period [3,4,6] (Tables 1, Appendix A).

Research Awareness and Interest

Research awareness and interest were consistently high, with 68.5% of sonographers reporting interest in research engagement [3,4,10]. However, actual participation was markedly lower, with only around 33% actively involved in research activities, a ratio that has remained relatively stable over the past decade [3,4,6]; (Tables 1 & 4). Two studies [5,10] exclusively recruited research-active participants, limiting their generalisability to the broader sonography population.

Research engagement methods reported included participation in research teams, completion of education modules, submission of funding applications, literature reviews, and research utilisation in clinical decision-making [3-6,9-11]. None of the studies explicitly referenced formal research training as part of participants' engagement pathways (Table 4). The most common research-related tasks included performing research-focused scans, writing protocols, engaging in audits, authoring publications, and conference presentations (Table 4).

Barriers to Research Engagement

Challenges to research engagement were remarkably consistent across all studies. The most frequent barrier was the lack of protected time for research, cited by up to 63% of participants [3,4 9,10]. While this appears to have slightly improved in some contexts over time [4], it remains a dominant constraint [9-11]. Other challenges included lack of research skill or experience, inadequate organisational support, and poor departmental research culture [3-6,9-10]. Additional barriers were limited prioritisation of research by both individuals and organisations [5]; a lack of formal research training and mentorship [3,4,10,11]; indifferent or

unsupportive colleagues [4-6]; ethical approval burdens [5,9]; inaccessibility of funding [3,4,5,9]; and perceived lack of authority to lead projects or implement evidence-based changes [3] (Table 4).

Facilitators to Research Engagement

Research engagement facilitators were also consistent across all studies. These included the desire to solve clinical challenges and improve patient care [3,5,9], research-oriented leadership [3-6,11], protected time and flexible scheduling [3-6,9-11], access to training, mentorship [3-6,9-11], and peer support [3,5,9,11]. Others include established organisational and professional frameworks and research pathways [3-6,9,10], streamlined ethics and funding application procedures [5,9] and career progression models that reward research involvement [3-6,9-11] (Tables 3 & 4).

Discussion

Overview

Research engagement is fundamental to effective healthcare delivery and staff professional development [1-3,12,13]. However, Sonographers' research engagement remains limited due to a range of individual, structural and organisational barriers despite increasing expectations and supportive frameworks and obvious benefits to patients and staff [1-14].

This review highlighted a paucity of published literature on sonographers' research engagement as well as a consistent disparity between interest and actual research engagement [3-6,9-11]. Although up to 68.5% of sonographers expressed enthusiasm for research involvement, only one-third reported active participation in studies. This cut across countries and healthcare jurisdictions, indicating widespread fundamental challenges [3,4,10]. This engagement gap remains largely unchanged over the past decade, despite growing institutional and professional policy support for research integration into clinical roles [1,2,3,4,7,13]. While these are not unique to Sonographers, it underlines the need for increased individual dedication as well as professional and institutional promotion of strategies that empower staff to move from passive interest to active research engagement [1,2, 8, 13-15,18].

There were more European-based studies in this review, which may be indicative of the differences in education, practice, and role expansion for Sonographers [11, 16]. Respondents' age range (23-69 years) cut across different generations, work patterns (part-time and full-time), experience levels, educational qualifications; this may be responsible for the reported high research awareness/interest [3,10]. As clinical ultrasound practices evolve globally, role expansion, revised education curricula, and an increasing emphasis on evidence-based practice are expected to improve research engagement among sonographers [5,10-14,29]. Therefore, existing policies and interventional programs, such as

the Society and College of Radiography (SCoR) research strategies [7,29-32] should be evaluated for their impact and effectiveness [1].

Common research participation methods which could foster research interest and skills included completion of educational modules, as part of a research team, research funding applications, literature review, writing protocols, engaging in audit, authoring publications, and conference presentations [3-6,9-11]. In one study, 73% of respondents reportedly applied research evidence in routine practice; however, another study noted that only 42% changed their practice due to research evidence [3,4]. Notably, none of the studies referenced formal research training in their engagement pathways. While these could be attributed to less research experience, confidence and lack of training opportunities, lack of organisational support and authority to implement research evidence are also important factors [1,3,5,10,33]. Effective leadership is therefore required to improve Sonographers' research participation and utilization [6].

Research Engagement Barriers

Lack of protected time for research was the most frequently cited research engagement barrier [3-6,9-11], consistent with results from other professions [14,29,35]. Time constraints however may represent deeper institutional issues such as less emphasis on research activities, with more resources devoted to clinical practice [1-3, 8,37-40]. Other barriers include poor organisational research culture, lack of peer support/mentorship, inadequate research skills/experience, lack of funding, complex ethical approval procedures, lack of organisational/professional support [2,31-38]. These are not unique to sonographers and could be addressed with existing strategies [8]. Although building research culture within ultrasound departments may seem a complex process, available evidence suggests that it is achievable with effort and supportive networks [5,32-36]. However, this is contingent upon individual motivation, research-oriented leadership/management, availability of funded opportunities and supportive institutional/professional frameworks and access to mentorship networks [1,6,8,32]. Therefore, reducing to sonographers' research engagement barriers should include individual, organisational, and professional concerted efforts.

Staff shortages and growing service demands contribute significantly to these constraints [2]. The pressing need for workforce and service expansion must not overshadow the importance of research, which is beneficial to patients and staff [7,11,36]. Addressing staffing deficits could relive clinical pressures and enable greater research engagement [2,8], and NHS Workforce Plans for medical imaging exemplify how such systemic improvements can be operationalised [33].

Relating to lack of authority to implement evidence-based changes in clinical practice, many sonographers believe that leadership in research need not to be the sole domain of medically qualified professionals [3,6]. Therefore, radiologists' influence should not deter

sonographers from contributing actively to research [3], as many aspects of sonography research such as staff wellbeing and professional development are not contingent on radiologist endorsement [31,40].

Research Engagement Facilitators

Sonographers' research engagement facilitators identified in this review can be broadly categorised into individual, organisational and structural dimensions [1]. These include intrinsic motivation to address clinical problems, access to professional networks, supportive leadership, formal research training, peer support, improved department research culture, simplified ethical processes, assistance with funding applications, and clear career pathways that value research involvement [3-6,9-11]. These facilitators are consistent with those observed in other medical professions [14,29,35,38], and enhancing these is crucial for cultivating a sustainable research culture, which is at the core of existing professional strategies and recommendations [1,5-7,11] (Table 3 and 4).

Al-Ghunaim et al. [9] noted that embedding research into sonographers' job plans, with protected time allocation significantly improves engagement. Although this study included only research sonographers, this assertion is valid and similar to the findings among radiographers [14,38,39]. Such initiatives allow for the development of mentorship pathways, professional networks and targeted training programmes and active research engagement [11,38,40,41]. Effective leadership and workforce management are also vital, with Pedersen et al. and Brage et al., highlighting the importance of peer and managerial support in various settings, as well as a departmental culture that values research, towards facilitating research engagement [4,11]. Gyimah [6], and McLean and Lewis [1] further emphasised that research-oriented leadership and professional support are key to implementing and sustaining evidence-based practice, underpinned by research engagement.

Addressing ultrasound workforce shortages can create conditions conducive to research training and supervision [2]. The Centre for Workforce Intelligence (CWFI) 2017 report outlined measures to inform short- and long-term workforce plans up to 2035, that will enable national and local workforce planners to plan training and resourcing of ultrasound workforce [42]. The goal to improve staff numbers, staff training and care quality requires efforts to also improve sonographers' engagement in research. This needs to aim beyond personal motivations, and must include institutional, regulatory, and professional strategies [1,2,7].

Emerging Trends and Future Opportunities

Notably, the repetition of key barriers and enablers across countries, healthcare jurisdictions and contexts highlight a widespread trend, rather than isolated national issues [1,4,5,9-11]. While these cannot be addressed by a common solution, it presents the opportunity to

develop wide-reaching strategies and the cross-application or readaptation of strategies from diverse settings.

As evidence-based practice has gained prominence in healthcare practice, there has been a marked increase in research activity across allied health professionals, which include research projects, conference presentations and peer-review publications and trainings [45,46]. Although this trend is not well established among Sonographers [8,10,11,46], there are existing professional and organisational strategies and policies in place which aim to achieve this, including journal subscriptions, conference access, mentorship support and funding opportunities [1,7,27,33-35,39,45]. Increasing numbers of Sonographers' hold advanced postgraduate qualifications [3-5,10], which bodes well for the future of research [5,7,16]. Furthermore, the integration of research as one of the four pillars of advanced practice is likely to reinforce this trend, especially if adequate attention is paid to it [8,13,29,37-41].

Notably, the lag between interest and actual research participation may suggest that institutional reforms have been insufficient, despite professional and regulatory frameworks that aim to improve research engagement [7,12,18,31]. Evaluation of the effectiveness of these policies/frameworks can determine their impact and how they can be better applied. Some initiatives have created dedicated research sonographer roles; however, their effectiveness requires robust evaluation at both local and national levels [1,2,8,27]. To further institutionalise research engagement, it might be helpful to incorporate research responsibilities into annual appraisal processes [38]. Ultimately, sonographers should be encouraged to explore and seize research engagement opportunities such as interprofessional collaborations and funding networks [2,34] to advance their skills, professional development, enhance job satisfaction, and improve patient care through effective engagement [1-5,16]. However, this responsibility should be distributed across individuals, institutions, and professional organisations [1].

Implications for Clinical Practice, Policy, and professional development

Structural shifts in ultrasound departments are required in terms of task prioritisation and resource allocation, to encourage research engagement [8]. Evidently, research engagement is not a discretionary pursuit but a requirement for good clinical practice, especially for advanced practice roles [12-14,39-39,44]. Hence, incorporating protected research time into Sonographers' job descriptions/plans, mandating research engagement in annual performance reviews/appraisal frameworks, creating research-lead roles and embedding research into departmental goals are important [38]. These can provide support and direction and encourage Sonographers' research participation and utilization [38,39].

Furthermore, while there may already be available funding and programmes to encourage research in the imaging disciplines [2,34], funding bodies should consider ring-fencing funding streams for under-represented professions like sonography [8]. Targeted initiatives such as

formal research mentoring programs, clinical-academic bridging fellowships, and intra/inter-departmental mentoring frameworks should be promoted to address both skill gaps and cultural inertia [1,18,45].

Rodrigues et al. noted workforce strain and service delivery pressures have deterrent effects on research participation in the imaging professions [2], therefore, interventional strategies, such as the NHS Diagnostic Workforce Plan and the Sonography workforce review of 2017 must be evaluated both for service capacity and for their influence on research engagement among sonographers [1,36,42].

Although higher educational qualifications (MSc, PhD) are rising amongst sonographers, they have not yet translated to increased research engagement [3,4,10]. Since Sonographers, as advanced practitioners, are expected to meet all pillars of advanced practice including research engagement [7,8,12], professional development frameworks should embed access to formal research mentorship programs, such as the SCoR Formal Radiography Research Mentoring (FoRRM) Scheme [1,45]. Continuous professional development (CPD) credits should be specifically tied to research activities for Sonographers, and funding and study leave should be offered for research training [1]. These practical reforms can potentially address the gap between research interest and research engagement, leading to a better trained and more satisfied sonography workforce.

Strengths and Limitations of the Review

To the best of our knowledge, this review appears to be the first known systematic review focused exclusively on sonographers' research engagement, integrating studies from diverse countries and healthcare systems. This study applied a rigorous mixed-method synthesis approach, following PRISMA and Cochrane guidelines [20,22], and the QATSDD tool to assess methodological quality across diverse designs [23]. Some of the studies used small sample sizes [5,9,11], however, the concept of information power, which focuses on gathering sufficient data to answer the research question, and the topic being very specific, participants' knowledge or experience could allow for sample size to be smaller [9,47].

Limitations include the small number of studies (7) that met eligibility criteria, which may limit statistical generalisability. However, the consistency of the identified barriers and facilitators across studies lends credibility to the thematic synthesis and highlights core issues that are likely applicable across contexts. The exclusion of non-English publications may have introduced language and selection biases by excluding studies from some countries with active sonographers' research cultures. It may also have over-represented research-active individuals or settings with existing research culture, potentially underestimating disengagement in underserved areas [9]. Also, while attempts were made to use the most inclusive search terms, the ones used might have resulted in the omission of articles or publications that could have been included in the review. One reason for this may be the differences in the designations and scope of practice of sonographers globally.

Areas for Further Research

Although national and international guidelines aim to promote a culture of research within the medical imaging professions, little is known about the extent of sonographers' participation in such initiatives. Future research should evaluate engagement with these programmes and their impact on clinical practice and career progression of Sonographers.

Additionally, studies are needed to explore how interprofessional networks and collaborative models between clinical and academic departments can cultivate research readiness among newly qualified sonographers. Such partnerships may offer valuable pathways for embedding a research-minded ethos early in professional development.

Recommendations

Improvements in Sonographers research engagement require increased individual research initiatives, organisational frameworks/support [3-6,11], protected research time [3-6,9-11], training and mentorship programs [5,6,9-11] and reducing barriers such as poor research culture and lack of authority in initiating, leading and implementing research evidence [3,8]. Balancing clinical and research duties and including research engagement as part of job specification and research-oriented leadership are equally important toward building sustainable research capacity among sonographers [2,5,9] (Table 3). Adopting and periodically evaluating the impacts of interventions that improve education and workforce numbers can also improve research training and reduce staff shortages to allow more research-oriented practice [1,2,42].

Conclusion

Research engagement is integral to safe, effective, and progressive ultrasound practice. While interest remains high amongst sonographers, participation remains suboptimal due to personal, structural, and professional barriers. This review highlights notable barriers and actionable enablers, including trainings, mentorship, protected time, supportive leadership/management, and clearer career pathways, that can bridge the interest and engagement gap.

Professional and regulatory bodies should take a leading role in embedding research into the strategic vision for the sonography workforce, developing shared learning platforms and facilitating collaborative research. With targeted policy support, organisational leadership, and professional advocacy, sonographers can take a leading role in building a research-rich, evidence-informed workforce.

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1. Ethics approval and consent to participate

Ethical approval was not sought for the present study because the study involved the use of secondary data, hence ethical approval was not required and was not obtained.

2. Funding

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3. Conflicts of interest

The authors declare that there are no conflicts of interest.

4. Availability of data

Data required for this study may be made available by the author(s) upon reasonable request.

5. Author contributions

BE OL: Conceptualisation, Methodology, Software
BE, OL: Data curation, Writing- Original Draft preparation
BE, OL, CUO, AO, CH: Visualisation, Investigation
OL: Supervision
BE, OL, CUO, CH, AO, IE: Writing-Reviewing and Editing

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7. Generative AI use

Not applicable.

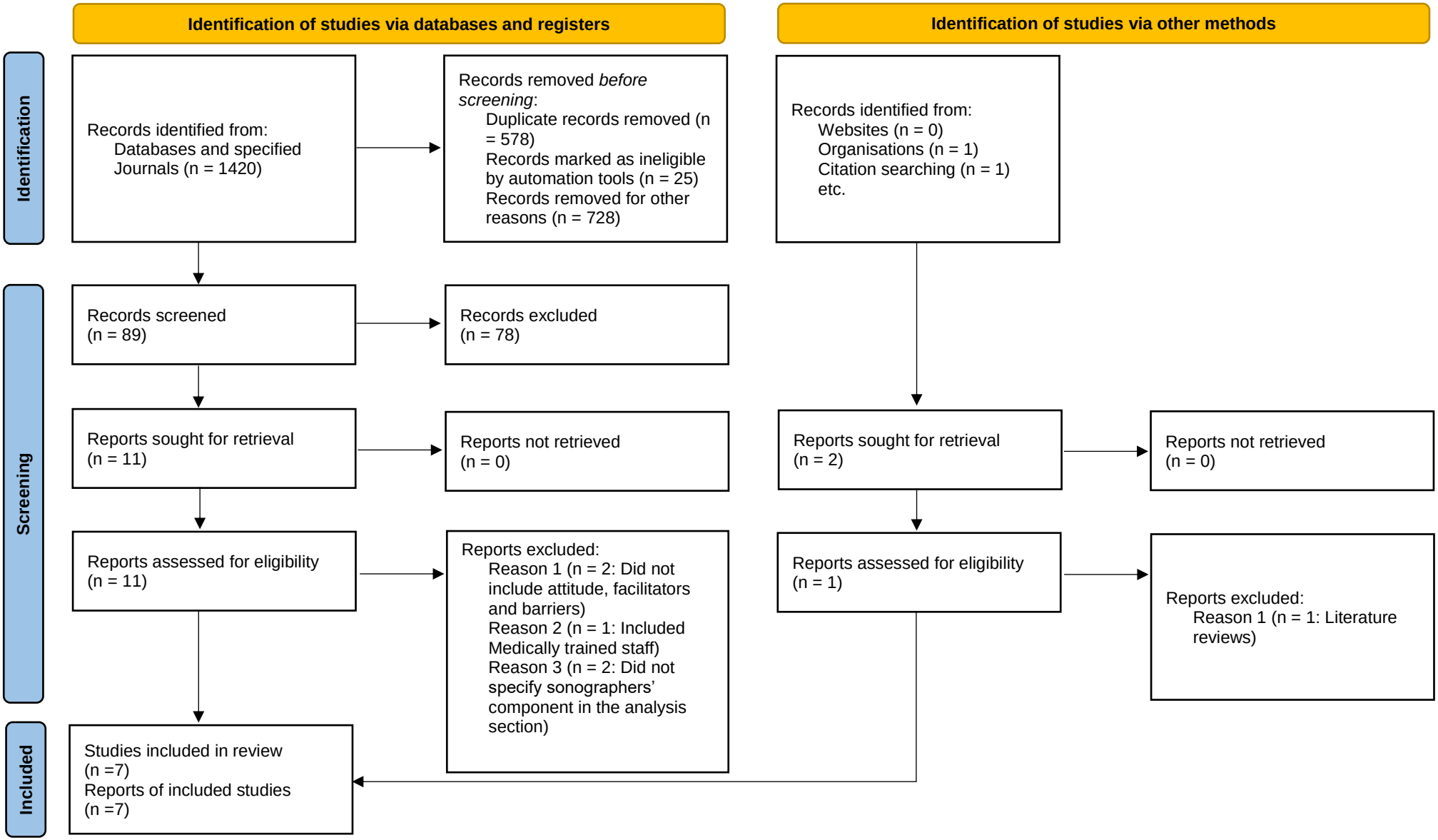

Figure 1: PRISMA 2020 flow diagram of the systematic review process[48].

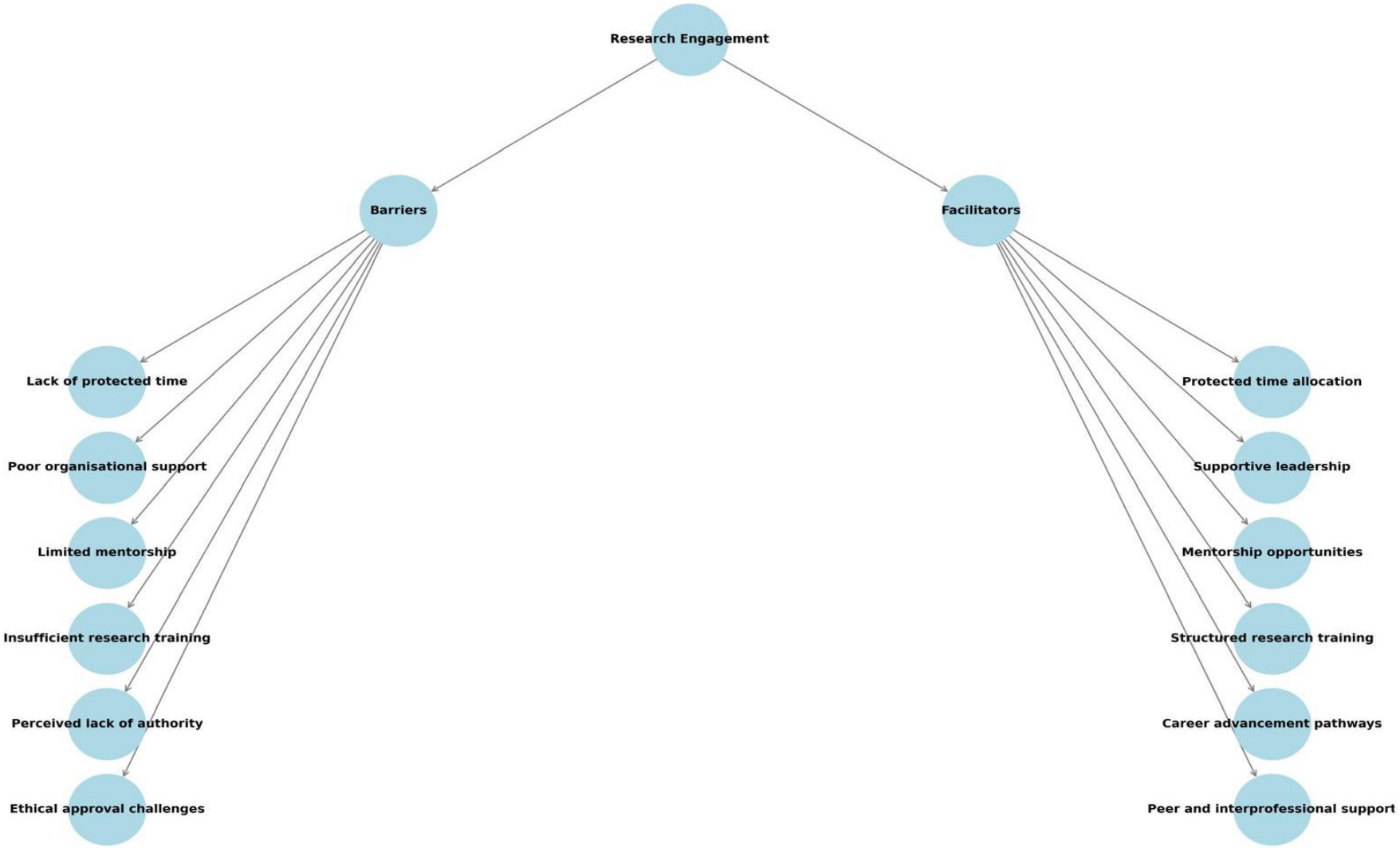

Figure 2: Thematic Map of Barriers and Facilitators to Sonographers' Research Engagement. The synthesis suggests that increasing research-enabling initiatives, particularly those offering protected time, structured training and supportive leadership, could significantly enhance sonographers' research engagement.

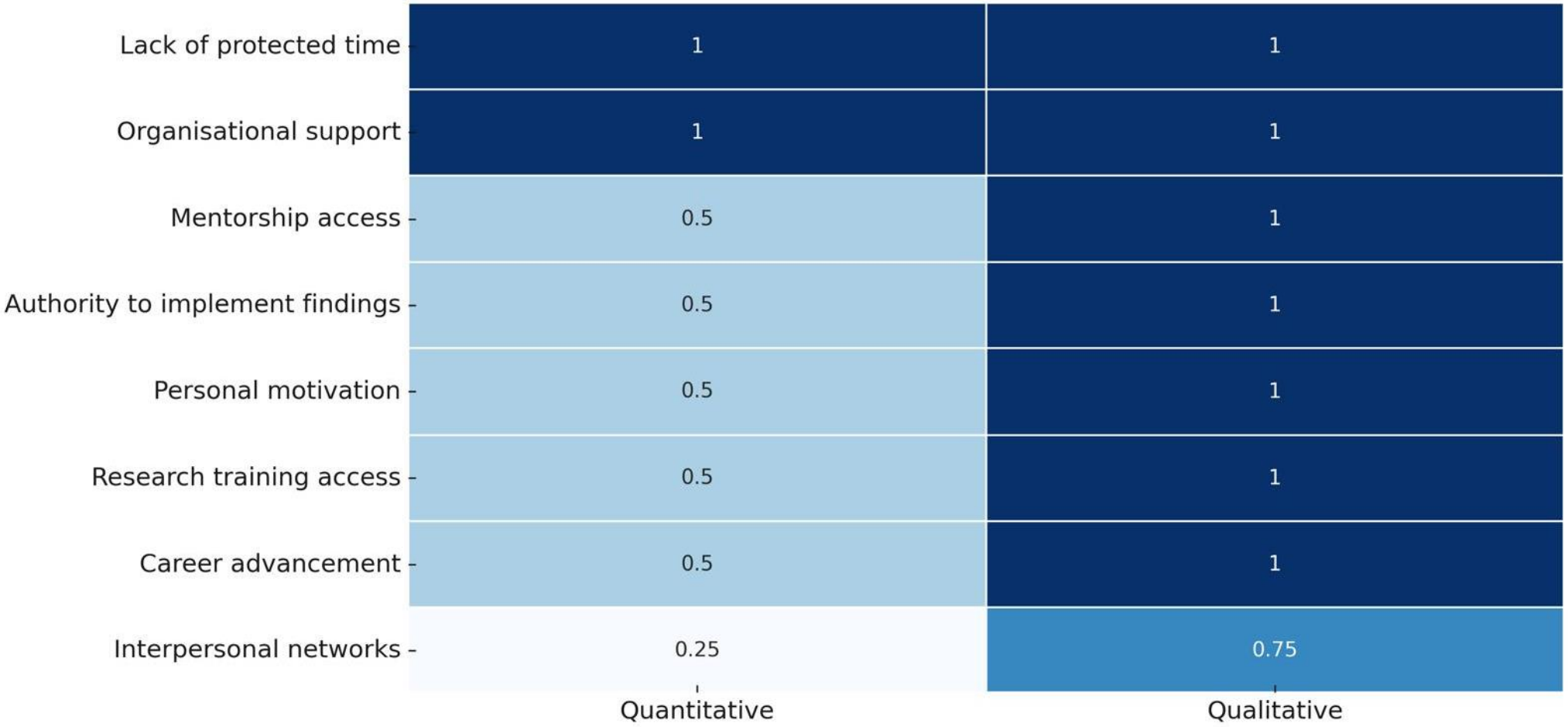

Figure 3: Triangulation Matrix of Convergence of Evidence for Key Themes.

Table(s)

NO	Authors & year of publication	Country	Study design	Setting (Private/Public)	Sample size	Gender	Age range	Years of experience (post qualification)	Qualification(s)	Work type (full-time/part-time/ clinical academic role/ clinical managerial role)	Type of study (multicentre/ single/ international)	Findings	Quality assessment score
1	Elliott et al. (2009)	UK	Quantitative	Public	218	Male (13) Female (205)	NA	NA	PGD (196), PgCert, Msc(21) and PhD(1)	Full time (155); Part-time (53)	Multicentre	Most sonographers are interested in research, 33.5% currently and 60% previously. Many are actively utilising research findings in practice. Research involvement reasons include being part of a team, for qualification, personal interest and for improved patient care. However, well-structured organisational support will be required to improve research culture among Sonographers.	28
2	Gyimah (2018)	UK	Mix-method	Public	61	NA	NA	<5 - >22	DMU (4), BSc (3), PgC/D (42) MSc (10), PhD (2)	Clinical	Multicentre	Most are keen on research. But a limited by existing barriers including time, organizational support and professional support. Need to encourage research utilization.	32
3	Lewis et al. (2025)	Australia	Mix-method	Public	15(3)	NA	NA	NA	NA	Clinical	Multicentre	Involved research active personnel with high level of research interest. Driven by motivating factors including desire to solve clinical problems. Most were able to overcome challenges to embrace research.	
4	Pedersen et al. (2024)	Worldwide	Quantitative	Public	165	Male (39) Female (120).	20-69	<5 - >25 years	Short courses to PhD. PGD (19), MSc (103) PhD (8)	Fulltime (78) Part-time (86)	Multicentre	32% of the participants had performed research, 68.5 % interested in research. Limited number have published research.	28
5	Al-Ghunaim et al. (2024)	UK	Qualitative	Public	12	Male (8) Female (4)		NA	NA	Education. Clinical and Clinical-Academic	Multicentre	Sonographers are interested in research but face some barriers. Motivation for engaging in research activity was mainly internal. Barriers and facilitators were external, including time, information and interpersonal networks	28
6	Abuzaid et al., (2025	Arab Countries (4)	Quantitative	Public	138	Male (45) Female (93)	31-70	1-5years (~82%)	No formal course ((9.4%) Short course (21%), BSc (34.8% and MSc (34.8%)	NA	Multicentre	High interest in research motivated by increased job satisfaction and career development goals. Faced with challenges of time, lack of support/mentorship, lack or experience and skills. Mentorship programs, support system and training programs can improve research engagement.	28
7	Brage et al (2025)	Denmark	Qualitative (Focused group)	Public	8	Male (3), Female (5)	19-50+	Average: 8years	NA	Clinical and academics (numbers not specified)		A strong interest to engage in research, drive by motivation to improve practice and personal development. Limited by low research experience /skill, insufficient support/priority on research, and challenges with staffing and time factors.	26

Table 1: Study Characteristics and Quality Assessment Showing Summary of the included studies involving 7 studies, (3 quantitative, 2 Qualitative and 2 mixed methods) that met the inclusion criteria. All included studies were high quality studies.

Themes	Studies reporting	Strength of Evidence	Key Evidence/Reference

Lack of protected time/less emphasis on research.	7/7	Strong	Reported by all the studies as a barrier; up to 63% in Elliott et al.
Organisational /professional support/culture	6/7	Strong	Recurring in Gyimah, Lewis et al., Al-Ghunaim, Pedersen et al., Gyimah, Abdulzaid et al and Brage et al.
Mentorship/Colleague support absence	5/7	Moderate -strong	Identified as limiting in Al-Ghunaim, Lewis et al., Gyimah, Elliot et al, and Pedersen et al.
Positive attitude toward research	7/7	Strong	Reported by all studies with >60% interest
Lack of Research experience/Skill	6/7	Moderate	Reported as a barrier by Elliot et al., Pedersen et al., Lewis et al., Gyimah
Lack of authority to implement changes	4/7	Moderate	Elliott et al., Gyimah, Pedersen et al, Brage et al
Access to formal research training and funding	7/7	Strong	Reported by all the studies as a facilitator
Interprofessional and interpersonal support	4/7	Moderate	Highlighted by Al-Ghunaim, Pedersen, Gyimah, Lewis
Career progression and scientific curiosity as motivations	7/7	Strong	Motivator in Elliott, et al., Gyimah, Al-Ghunaim, Lewis et al., Pedersen et al., and Abuzaid et al., Brage et al

Table 2: Strength of Evidence Per Theme Table for systematic review.

NO	Author	Numbe	Level of	Level of	Participation method	Overall research engagement

		r of participants	**research awareness**	**participation**		
1	Elliott et al (2009)	165	Very high (89%). Majority have a positive attitude towards research	33% currently involved in research and 60% previously involved in research	73% utilize research in practice; Working as part of a research team, and Qualification requirement; personal development initiatives.	Most research engagement is as part of a team, for Qualifications, personal development and to improve patient care. 42.2% have made changes in practice due to being involved in research, 72.9% by reading research articles and 16.5% have implemented research findings.
2	Gyimah (2018)	87	High	NA	NA	Sonographers may want to be involved in research-related activities, but the right mechanisms to facilitate it are lacking; They understand the need of research, are generally interested in research; utilise research, but face significant barriers
3	Lewis et al. (2025)	15(3)	Moderate, but higher than in the general profession	All have conducted research activities but, with the least Participation being in applying for research funding	All have actively conducted research, including designing and completing different types of research studies, clinical audits, literature reviews and applying for funding.	All are actively involved in research, and are keen to continue, as part of solving professional problems, audits and for career development.
4	Pedersen et al. (2024)	165	High	32% has performed research; 68.5% willing to be more involved in research	Qualification requirement, Regular basis, local and international collaboration. Majority read research publications.	Majority engage in research, most as part of a qualification requirement (49.4%). Most common method was performing research scans (42.4%)
5	Al-Ghunaim et al. (2024)	18	High	All undertake research in clinical ultrasound practice.	Clinical ultrasound research; Funding application, Presentation and peer-review publications.	Current and Prospective researchers in clinical ultrasound. All participants have research experience beyond the basics.
6	Abuzaid et al. (2025	138	High	76.1% involved in research, with 36.2% spending less than 1 hour per day on research activities.	Reading scientific papers, (43.5%), Quantitative research projects (50%), Oral presentations.	High interest in research. While many read research papers, only 38.4% had access to scientific articles. Majority (73.2%) have not published or disseminated research findings in any form.
7	Brage et al (2025)	8	High	NA	NA	Generally interested in research but lacking in experience and support. Will benefit from structured support, trainings and career development pathways.

Table 3: Research Participation/utilization/Findings: Summarises the level of research interest, level and method of research participation, and overall research engagement by Sonographers in the studies reviewed.

NO	**Author**	**Common Research tasks**	**Research barriers**	**Research facilitators**	**Recommendations**

1	Elliott et al (2009) (Engagement and Utilization)	Research team membership, Personal research, Reviewing literature and publishing research articles	Lack of knowledge/Skills; Lack of time (62.9%); lack of support from colleagues; Lack of authority to implement research findings; lack of organisational support	Desire to identify and solve clinical problem; Career progression; organisation and colleagues' support.	More research education/training programs; Strong organisational support to create time and research productive environment; Support from other health professionals.
2	Gyimah (2018) (Research) Utilisation)	Reviewing literature, writing protocol, Writing and presenting research reports; publishing research, applying for funding	Time constraints; Lack of research awareness, lack of skill, Lack of support from colleagues and doctors; Lack of authority; Work-place culture; lack of knowledgeable colleague.	Research Oriented leadership; Dedicated research times; encouragement and provision of research related opportunities to all sonographers	Research-driven leadership is needed; measures to make time for research related activities should be devised; Research seminars and symposiums can be utilised to improve the research skills; an element of research (uptake or utilisation) could be incorporated into the yearly appraisal. This would also help to identify areas where individuals are lacking in research skills and provide the needed assistance.
3	Lewis et al. (2025) Research engagement.	Reviewing literature, writing protocol, Writing and presenting research reports; publishing research, applying for funding	Lack of mentors. Competing clinical and research demands; Lack of protected time for research; Poor organisational support; Lack of confidence and experience; complicated ethic approval process; Lack of financial support	Personal motivation to solve clinical problems, Access to mentors/mentoring programs; Career advancement.	Identify and encourage staff with interest in research. Establish and encourage research culture in the departments.
4	Pedersen et al. (2024). Attitudes towards research and research utilization.	Research scan (42%); Research writing (32.1) Independent researcher (32.1%) Supervisor (12.1%	Lack of time (43%) Work/life balance (33.3%) Lack of administrative support (26.7) Lack of research skills (21.8%)	Chance to solve identified problems (65.5%) Opportunity to develop new skills (61.2%) Improved job satisfaction (59.4%) Career Advancement (49.7%)	Sonographers need support from peers and managers to effectively engage in research. It is important to develop research culture in ultrasound
5	Al-Ghunaim et al. (2024). Facilitators and Barriers to undertaking research in practice	100% are currently active in research.	Data collection; Applying for ethical approval; Challenges assessing training and mentorship; Lack of inter-professional support; Lack of adequate research training background; Funding challenges. Lack of time; Less prioritization of research.	Personal scientific curiosity; Desire for achievement. Formal training/education opportunities; mentors; Interpersonal networks; Supportive colleagues/collaborators/networks; Streamlined ethical approval process; allocated time	Sonographers should be encouraged to engage in research as part of their job plan, with the protected time and support to achieve this. Research engagement among sonographers can be improved by organisations addressing the barriers hindering this and improving facilitation.
6	Abuzaid et al (2025)	Reading scientific paper, Individual and collaborative (mostly quantitative 69.5%), Research presentations and publications	Lack of support and guidance (67%), lack of time (33%), lack of research skill and fear of getting it wrong (21% and 17% respectively).	Opportunity for increased job satisfaction and career advancement.	There is need to overcome key barriers to research engagement, including through structured mentorship programs, creation of dedicated research time and access to training and resources.
7	Brage et al. (2025) Research motivations and barriers.	NA	Lack of protected time for research, staff shortages, Low priority on research, limited experience/skills and insufficient support.	Organisational support, effective communication, access supportive networks, research funding, mentorship opportunities and encouraging research culture in the departments.	Sonographers are highly interested in research but need encouragement, and support to engage in research. Such support will include trainings, provision of mentoring programs, research funding, dedicated research time and improved staffing and research culture in the departments.

Table 4: Research activities/ Facilitators and Barriers/Recommendations: Summarizes the Common research activities, Barriers and Facilitators of and the recommendations to improve Sonographers Research engagement

NB:

1. Type of workplace: Public, Private, Primary, secondary or tertiary Healthcare setting.

2. Work Type: Clinical, Academic, Clinical-Academic and others.

3. Level of Research Awareness: To be considered basic if noted a stated for a participant.

NO	Author(s)	Age range	Years of experience (post qualification)			Qualification(s)			Work type (full-time/part-time/ clinical academic role/ clinical managerial role)			Type of workplace		
			0-10	11-19	20-above	PgD	MSc	PhD	Clinical	Clinical Academic	Manager	Private	DGH	TH/MTH
1	Elliott et al (2009)	NA	NA			196	21	1	NA	NA	NA	5	110	90
2	Gyimah (2018)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Lewis et al (2025)	NA	NA	NA	NA	NA	15	NA	15	NA	NA	NA	NA	NA
4	Pedersen et al (2024)	23-69	76	55	29	19	103	8		20		47	46	71
5	Al-Ghunaim et al (2024)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	Abuzaid et al (2025)	19-50+	138	- NA	- NA	34.8 %	34.8 %	NA	138	NA	NA	NA	NA	NA
7	Brage et al (2025)	48 (average)	8(Average)	NA	NA	NA	NA	NA	NA	NA	NA	All work in public settings	All work in public settings	All work in public settings

Appendix A: Participants' Characteristic: Majority of the participants were young and female and worked in Public Healthcare systems. There is an increasing trend in the number of higher education qualifications.

NA: Not Available; DGH: District General Hospital; TH/MTH: Teaching Hospital