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Hidden costs of diagnostic mistakes: A descriptive study of guilt, shame, and scapegoating among sonographers practising in the United Kingdom

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Radiography

Hidden Costs of Diagnostic Mistakes: A Descriptive Study of Guilt, Shame, and Scapegoating Among Sonographers Practising in the United Kingdom.

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Abstract:	Introduction Mistakes are part of ultrasound practice, but the emotional impact of mistakes on sonographers remains poorly understood. This study explored the emotional consequences of mistakes among UK sonographers and identified strategies to mitigate their effects. Methods A cross-sectional online survey was conducted in the UK from December 2024 to February 2025. Fifty-three sonographers were recruited through professional networks and member platforms. The survey, hosted on the JISC platform, included quantitative items and open-ended questions. Quantitative data were analysed using descriptive statistics and non-parametric tests in SPSS 28, while qualitative data were coded thematically using Braun and Clarke's framework in NVivo 12. Results Thirty-nine respondents reported at least one diagnostic-type error at some point in the past year. Mistakes occurred across all settings ($p = 0.107$) and experience levels ($p = 0.624$). Guilt (45.3%), shame (25%), and perceptions of scapegoating (33.3%) were common. Most participants (68%) reported receiving emotional support after making mistakes ($N = 52$; no response = 1). Coping strategies varied, though none were significantly associated with setting or experience ($p > 0.05$). Four themes emerged from qualitative analysis: workplace culture and interpersonal dynamics, emotional and psychological impact, reporting and learning from Mistakes, and recommended support and mitigation strategies. Conclusion Diagnostic mistakes are common and emotionally challenging for sonographers. Existing institutional responses are perceived as insufficient. A just culture that prioritises psychological safety, non-punitive reporting, prompt debriefing, and access to counselling supports staff wellbeing, retention, and patient safety. Implications for Practice Organisations must move beyond policy statements and provide confidential, non-punitive reporting pathways, easily accessible psychological support, and managers trained in empathetic communication to ensure responses to mistakes prioritise learning rather than fault.

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Title Page (with author details)

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Abstract

Introduction

Mistakes are part of ultrasound practice, but the emotional impact of mistakes on sonographers remains poorly understood. This study explored the emotional consequences of mistakes among UK sonographers and identified strategies to mitigate their effects.

Methods

A cross-sectional online survey was conducted in the UK from December 2024 to February 2025. Fifty-three sonographers were recruited through professional networks and member platforms. The survey, hosted on the JISC platform, included quantitative items and open-ended questions. Quantitative data were analysed using descriptive statistics and non-parametric tests in SPSS 28, while qualitative data were coded thematically using Braun and Clarke's framework in NVivo 12.

Results

Thirty-nine respondents reported at least one diagnostic-type error at some point in the past year. Mistakes occurred across all settings ($p = 0.107$) and experience levels ($p = 0.624$). Guilt (45.3%), shame (25%), and perceptions of scapegoating (33.3%) were common. Most participants (68%) reported receiving emotional support after making mistakes ($N = 52$; no response = 1). Coping strategies varied, though none were significantly associated with setting or experience ($p > 0.05$). Four themes emerged from qualitative analysis: workplace culture and interpersonal dynamics, emotional and psychological impact, reporting and learning from Mistakes, and recommended support and mitigation strategies.

Conclusion

Diagnostic mistakes are common and emotionally challenging for sonographers. Existing institutional responses are perceived as insufficient. A just culture that prioritises psychological safety, non-punitive reporting, prompt debriefing, and access to counselling supports staff wellbeing, retention, and patient safety.

Implications for Practice

Organisations must move beyond policy statements and provide confidential, non-punitive reporting pathways, easily accessible psychological support, and managers trained in empathetic communication to ensure responses to mistakes prioritise learning rather than fault.

Introduction

Ultrasound is widely used to diagnose and monitor various disease conditions.[1] Despite its advancements, ultrasound practice remains human-driven, which introduces a potential for error.[2] Diagnostic errors are broadly classified into perception, system, and cognitive errors.[3] This study focuses on cognitive errors and specifically uses the term "mistakes" to refer to flawed decisions that could have been prevented, rather than inadvertent slips or system-related failures.[4,5] This distinction is important because mistakes often arise from knowledge gaps, misjudgements, or cognitive biases, which can be addressed through training and support.[6]

The emotional impact of errors has been extensively studied among other health professionals.[2,7–10] However, sonographers remain largely overlooked. This is despite their work involving high levels of autonomy, time pressures, and limited peer oversight.[1] These events can evoke emotions such as guilt, shame, anxiety, ridicule, sadness, resilience, growth, and scapegoating.[11,12] This study focused on guilt, shame, and scapegoating because of their direct links to reduced incident reporting, long-term coping difficulties, and harm to professional wellbeing.[13]

Furthermore, existing research confirms that mistakes in ultrasound are common, yet how sonographers respond to these events emotionally or behaviourally remains unclear. This gap in understanding emphasises the need for targeted investigation. To address this, the study aims to explore the common mistake types in ultrasound practice, their emotional impact, and the coping and mitigation strategies to identify ways to support sonographers in reporting mistakes.

Methods

An online cross-sectional study was conducted in the UK from December 2024 to February 2025, hosted on JISC Online Surveys.[14] Ethical approval was obtained from [blinded]. Due to the sensitive nature of the questions, the researchers' contact details and psychological support resources were provided to participants experiencing psychological distress or other concerns. All responses were anonymous and securely stored, in accordance with General Data Protection Regulation standards.[15]

The questionnaire design was guided by themes identified in Fatima et al.'s study,[9] which examined the emotional impacts of errors and reporting behaviours among resident doctors. The authors initially reviewed validated psychometric scales for guilt and shame (e.g., the State Shame and Guilt Scale and the Guilt and Shame Proneness Scale). However, these were not used because they were designed for general or clinical populations rather than the sonography workplace. Instead, a bespoke, sonographer-specific guilt and shame construct was embedded within applied, practice-based scenarios to ensure ecological validity and relevance to sonographers' practice.

The questionnaire items were then refined through pilot testing with four sonographers and two sonography educators. Feedback led to minor adjustments, improving clarity and face validity.[16] An embedded mixed-methods design combined structured quantitative items (such as Likert scales measuring mistake frequency, emotional responses, and coping strategies) with open-ended qualitative questions from both the individual who made the mistake and those who reported peer errors. The questionnaire comprised 36 questions across nine sections (see Supplementary Appendix 1), allowing for a mix of quantitative data and qualitative insights.

Participants were recruited through convenience sampling through SoR member platforms, LinkedIn, X, and SurveyCircle. To be eligible, participants needed to hold an accredited postgraduate qualification in ultrasound and have been practising in the UK for at least one

year, either in the public or private sector. This ensured they possessed sufficient clinical experience and the capacity to have made and reflected on diagnostic mistakes. No incentives were offered to prevent bias.[17]

To reduce straight lining, all questions were optional.[18] As a result, some participants skipped items or selected "I don't know." Of the 53 participants recruited, seven incomplete responses were excluded from correlation analysis using pairwise deletion. Given that the missingness appeared random and limited in scope, this approach was deemed appropriate, allowing the use of all available data.[19]

Quantitative data were analysed in SPSS (version 28) using descriptive statistics, Spearman's rho, Kruskal-Wallis, and chi-square tests. Qualitative data from open-text responses were analysed using Braun and Clarke's six-step thematic analysis framework[20] in NVivo (version 12). Thematic saturation was assessed iteratively during coding,[21] with no new codes emerging after the analysis of the final 10 responses. Although member checking was not feasible due to time and logistical constraints, the analysis followed a transparent, iterative, and reflexive process.[22] Interpretations were grounded in the data, with an audit trail maintained to enhance analytical credibility and transparency.[23] Quantitative and qualitative findings were then integrated through a Joint display table, which facilitated triangulation and deeper interpretation.

Results

Quantitative Findings

Participant Characteristics

Of the 53 participants recruited, each respondent had at least one missing response across the survey items. Therefore, response numbers and percentages are included where relevant. Most participants were between 30 and 39 years old (71.7%). A majority identified as male (67.9%), despite national data indicating that the profession is predominantly female.[24] Most

participants worked in the NHS (86.8%), with smaller groups working in private hospitals (9.4%) and dual sector (both public and private settings) (3.8%). Participants' years of experience varied, with the largest group having 16-20 years of experience (45.3%) (Table 1).

Frequency and Patterns of Mistakes

Results reveal that at least one diagnostic-type error was reported by 39 of 52 respondents (75%); 1 participant did not answer this item. Only 2% reported 10 or more mistakes (Figures 1 and 2). Spearman's correlation showed no significant relationship between years of experience and mistake frequency ($\rho = 0.074$, $p = 0.624$, $N = 46$) (Table 2). Similarly, the Kruskal-Wallis test found no statistically significant difference in mistake frequency across workplace settings ($\chi^2(2) = 4.68$, $p = 0.096$, $N = 46$) (Table 3).

The most frequent mistakes are system or information-related errors, which include failure to review patient history, laboratory data, or previous imaging results (38%) and scanning the wrong patient (38%). In contrast, skill-based mistakes involve errors such as artefact misinterpretation (13.6%), incorrect measurements (9.1%), failure to identify abnormalities based on gestational age (14.4%), and misidentification of anatomical structures (13.6%). Other mistakes ($n = 3$, 2.3%) included misdiagnoses, anatomical labelling mistakes, and reports misattributed to another patient (Figure 3). Spearman correlations between ease of reporting (defined as participants' perceived comfort or difficulty when disclosing mistakes) and the types of mistakes reported ($n = 52$) showed positive correlations for system or information-related errors and negative correlations for skill-based mistakes (Table 4)

Emotional Responses and Reporting Behaviour

Participant (45.3%) reported guilt, with 30% stating guilt influenced their professional performance "a great deal," while 9% of the respondents reported no effect. Two-thirds of

respondents (66%) indicated that guilt led them to overcompensate by being overly cautious in their interactions with patients and colleagues. Only 4% stated that they felt withdrawn due to guilt (Table 5). Shame was also prevalent, with 30% of sonographers reporting having experienced it sometimes, 23% often, and 25% always (Figure 4). Despite this, 54.7% openly discussed mistakes, while 30.2% delayed disclosure and 1.9% avoided disclosure. In addition, Scapegoating was reported by 34% of participants. Supervisory staff were frequently cited as the source by 32.4%, and a few (2.9 %) blamed themselves in open-text responses (Figure 5).

Reporting behaviour among respondents varied. Self-reporting was perceived as somewhat or very easy by 30.2% of respondents, while 41.4% found it somewhat difficult or very difficult, and 30.2% were neutral. When reporting peers' mistakes, 39.6% felt somewhat uncomfortable, 11.3% felt very uncomfortable, and 17% comfortable. The main drivers for self-reporting mistakes were impact on patient care (58.5%), adherence to professional guidance and practice (50.9%) and desire to improve (50.9%) and for reporting peer's mistake were the impact on patient care (73.6%), severity of the mistake (67.9%) and potential for detrimental outcomes (54.7%) (Table 6).

Coping Strategies and Sources of Support

Most respondents (68%) indicated having adequate support systems in place for coping with mistakes, with 78% of these relying on peer support, 55% on supervisors, and others (5%) on partners, yet 30% felt unsupported (Figures 6 and 7). A Chi-Square test of Independence showed no statistically significant differences between coping strategy and workplace setting ($N = 51$, $p > 0.05$, Table 7). Spearman correlations also revealed no significant correlations between experience level and coping strategies ($N = 52$, $p > 0.05$, Table 8).

Qualitative Findings

Thematic Analysis

Thematic analysis was performed using Braun and Clarke's method.[20] Qualitative analysis generated four overarching themes: (1) workplace culture and interpersonal dynamics, (2) emotional and psychological impact, (3) reporting and learning from mistakes, and (4) recommended support and mitigation strategies (Table 9). Each theme highlighted how mistakes shaped professional behaviour and workplace relationships. For example, participants described cultures of blame and scapegoating ("Within our Trust, it is commonplace for consultants to use sonographers as scapegoats…" P53), while others reflected on the impact of mistakes on confidence and professional identity ("Sometimes issues are blown out of proportion…" P35). Thematic findings are elaborated further in the discussion, where they are integrated with relevant literature.

Mixed Methods Integration

Quantitative and qualitative data were triangulated to identify convergence or divergence. For example, the lack of significant differences between mistake rates and experience from quantitative data supports the qualitative theme that even experienced sonographers struggle with mistakes. Similarly, quantitative data showed 68% had access to support systems, yet qualitative data showed that some perceived these systems as ineffective or absent. Quantitative data highlights overcompensation as adaptive behaviour while qualitative data reveal that emotional responses are shaped more by workplace culture than by mistake severity (Table 10).

Discussion

The proportion of sonographers (64%) reporting at least one diagnostic mistake in the past year aligns with international estimates of error recognition in diagnostic imaging, suggesting that emotional repercussions are pervasive across modalities.[25,26] This explains why even skilled professionals remain vulnerable to errors due to cognitive biases, time pressures, and system inefficiencies.[27] However, treating this as genuine consistency risks missing subtle variations that may be obscured by sample size or statistical limits. Nonetheless, baseline data from this study confirmed that ultrasound mistakes are likely widespread and multifactorial, with contributing factors reflected across the four thematic domains identified in the qualitative analysis.

Workplace Culture and Interpersonal Dynamics

Scapegoating was a significant concern among participants, with many being blamed by consultants, supervisors, peers, other professionals, patients, or families. These patterns align with findings by Zabari and Southern, and Ee, who associated blame cultures with decreased reporting and collaboration.[28,29] One participant's account explained, *"During my probation period, where they flagged everything as incompetence and shamed every effort by backstabbing me. This stereotyping and scapegoating seriously affected my mental health, and I could not cope anymore. I eventually exited the Trust after I was signed off to work alone (P12)".*

The quote above highlights a challenging probation period with implications for staff retention, which should be interpreted with caution. Although only a single explicit resignation was reported here, the emotional strain could heighten attrition risk for newly qualified sonographers (who are still consolidating skills and confidence) or those recently employed, undergoing onboarding processes and settling in their new environments, thereby exacerbating the current chronic staff shortages.[30]

Another participant explained, *"I missed an early pregnancy diagnosis and was made to feel very incompetent (P27),"* highlighting how emotional responses often centred on self-blame. Participant 53 added, *"Within our Trust, it is commonplace for consultants to use sonographers as scapegoats and to criticise and be unwilling to educate".* It is also postulated that some experiences of blame reflect interpersonal tensions rather than systemic scapegoating.[31] In fact, some experiences of blame may be a response to legitimate clinical concerns that are miscommunicated or misinterpreted. Yet, even when blame is only perceived, it can have lasting effects.

Only one participant reportedly internalised blame for mistakes in an open-ended response. Although limited support structures may exacerbate such responses, studies show that self-blame in healthcare can also stem from individual coping styles and professional culture, even when support is available.[10,32,33] The prominence of blame culture and scapegoating in the present accounts may, in part, reflect the focus of some survey items on responsibility and accountability. Some of these items may have encouraged participants to frame their experiences from the perspective of blame, even if these were not their only concerns. This fact demonstrates the importance of caution when interpreting frequency as a direct measure of prevalence, but it does not diminish the importance of blame culture and scapegoating as a reported issue. Furthermore, the authors propose that more qualitative research, favouring exploratory interviews, may yield a more balanced understanding.

Emotional and Psychological Impact

Participants discussed how guilt and shame affect their confidence, communication, and job performance. Although some tried to learn from these experiences, the emotional distress often overshadowed constructive reflection. For example, P35 quoted as *"sometimes issues are blown out of proportion and make me feel even more guilty",* explained how

disproportionate reactions intensified their guilt. This supports the idea that emotional responses are influenced by how others handle mistakes, not just the mistake itself or its severity.[34] This is further elucidated by P7, *"The impact of shame and guilt when making a mistake differs a lot depending on the type of mistake [made by peers] and its impact on patients' lives.*

Psychological shifts were common among those who reported persistent guilt. Among the respondents (45%) who always felt guilt, described overcompensation, becoming overly careful, and double-checking (Table 5), consistent with a previous study by Mahat et al.[10] While intended to prevent recurrence, this may paradoxically impair patient care. In fact, over-reporting can harm diagnostic accuracy and worsen patient experience, which causes a delay in clinical decision-making. From the available data, it remains unclear whether such caution, driven by guilt, actually improves safety or instead creates new risks (e.g., unnecessary referral, heightened patient anxiety, or greater healthcare resource use).

Participants also described communication changes after diagnostic mistakes. Some were unsure about how guilt influenced their communication, while others acknowledged withdrawal or intentional avoidance in professional conversations.[10] Based on the survey responses, we cannot determine whether a brief withdrawal facilitated self-reflection for sonographers or simply reduced engagement with peers.

Shame was similarly reported and often described in relation to visibility, being observed, criticised, or judged. For some participants, shame was fleeting; for others, it was persistent. Although the emotional profile of shame often overlapped with guilt, shame was more associated with public embarrassment and judgment. This distinction matters as shame usually metamorphoses into anxiety and related stigma, especially when exposure is public or episodes are repeated.[35]

Reporting Behaviour and Coping Strategies

Sonographers found it particularly easier to report system-related errors than mistakes involving core scanning skill or clinical judgement, which suggests that incidence reporting may be influenced by perceived accountability and peer judgement.[34] Participants were also more willing to report their own mistakes than those of colleagues, driven mainly by concern for patient care, adherence to professional standards, and the desire to improve.

Despite these emotional challenges, 98% of participants reported a willingness to disclose mistakes, which represents a positive shift compared to earlier studies where clinicians were reluctant to disclose errors due to fear of blame, litigation, or reputational damage.[33,36,37] Wawersik et al. explained further that most error reporting may be motivated by fear-based self-preservation rather than psychological safety.[38] The high rate of reporting among sonographers in this present study may reflect a similar motive and a strategy to avoid escalation if the mistake were later discovered. Social desirability bias may also influence responses,[39] raising the key question of whether compliance is motivated by genuine transparency or self-preservation amongst sonographers.

When reporting colleagues' mistakes, participants emphasised the impact on patient care and the severity of the mistake as the most critical considerations, which aligns with findings from Jaeb and Pecanac, who found that the severity of an incident often determines whether it is reported.[40] However, Saposnik et al. (2016) [27] disagreed, stating that perceptions of fairness and workplace relationships may outweigh clinical factors. Our data highlights these tensions where ethical duty conflicted with personal discomfort about reporting colleagues, evidenced in over 50% of participants indicating they felt somewhat uncomfortable or very uncomfortable in reporting peers (Table 6). One participant captured this unease well: *"Accusations based on factors that are not relevant to the case such as bias (gender, race etc). The defensive response lacks self-awareness of the person who made the mistake. It's often the same person and they then accuse the complainer of victimisation, which can prevent unsafe practice being flagged"* (P38). The study shows that this discomfort is often rooted in fear of

harming peer relationships, and this fear can have more influence on reporting behaviour than ethical or clinical considerations.[37,41]

Coping strategies largely relied on peer support, which is mainly viewed as helpful in the reduction of stigma, consistent with previous research.[42,43] Yet peer support may provide inconsistent support and be emotionally draining for those involved.[42,44] Participant 14 elucidated further: *"…the few they allowed me to work with were not supportive enough and would rather discuss my shortcomings outside with other colleagues, excluding me from such discussion".* This may explain the mixed experiences in the availability of support, quality, and how feedback was delivered, even within the same team.

A few participants (2%) cited partners as a key source of emotional support, which reflects the relevance of the social support theory.[45] In addition, self-reflection was widely adopted by 80% of participants, which may be related to blame cultures that discouraged openness and were replaced with internal reflection.[46] Some participants also viewed self-reflection positively as an opportunity for personal growth, agreeing with Artioli's findings.[47] Whether this practice fosters improvement or masks underlying insecurities remains uncertain.

A minority also described adaptive growth-oriented responses. Participant 38, for example, noted: *"For me, it's something I don't want to repeat, so I make an effort to get better at that thing. In the long term, I become a better sonographer"*. The authors interpret this as a positive attitude where a deliberate, learning focused response transforms an uncomfortable emotion into practice improvements rather than rumination.

In contrast, others observed maladaptive behaviours amongst peers; *"Sometimes it is not the impact on interactions with people, but on confidence to do that type of scan. Others show a tendency to either avoid that or over-worry, and that increases patient anxiety if they over-report (P41)"*. This highlights loss of confidence, avoidance, and over-reporting in the aftermath of error, which could be linked to structural gaps in workplace support systems.[48] A few participants preferred to forget mistakes entirely. Although perceived as efficient in the

short term, the "fix and forget" habit is usually linked to near misses or routine issues in healthcare and may reinforce silence and hinder learning from mistakes.[49]

Recommended Support and Mitigation Strategies

Managerial empathy was seen as valuable; however, some of the participants perceived it as insufficient, citing examples such as: *"It would be great if Managers are equipped with the necessary training to help provide this emotional support to staff in such cases" (P30)* and "*A reflective and empathetic boss [would help]" (P1)*. West et al. argued that while trust relies on compassion, follow-through is required in these events.[50] So when managers fail to address the root causes of staff distress or where fair systems for learning and accountability are inadequate, empathy alone can merely seem performative.[51]

One participant quoted "*An easily accessible psychological team within the Trust would help (P30)"*, suggesting that participants are aware of psychological services but doubt their accessibility. These reports of inaccessibility in the study could plausibly reflect a few factors, such as unclear referral routes, workload clashes, actual waiting times, or limited awareness of the service. However, our data did not identify these possible reasons, as we did not measure time to support. Pragmatically, psychological services could improve visibility and uptake through simple signposting and protected time for staff to attend when needed. Although previous research indicates that psychological services alone are rarely effective unless they are embedded within a broader institutional commitment.[52] Unfortunately, ongoing budget constraints have led to inadequate access to psychological support,[53] which aligns with participants' perception of inaccessibility.

A just culture was advocated for, with participants quoted, *"I believe that making mistakes is inevitable in the role of the Sonographer. Mistakes should be used as a learning experience to promote improvements and shared within the team, for shared learning and to promote*

discussion(P31)," and "*I would like to stress the need for continuous audit in improving the standards of healthcare (P32)"*. These quotes encourage a just culture and continuous structured debriefs to mitigate mistakes, thus aligning with Stehman et al.'s findings.[54] However, in the absence of meaningful leadership engagement, these may appear as tick-box exercises. Also, the sustainability of these strategies is contingent upon continued institutional funding and creating protected time.[7,50] Otherwise, valuable learning opportunities may become lost.

Implications for Practice and Research

Findings from this study challenge the assumption that increased caution always enhances safety. In fact, fear-based behaviours tend to impair rather than improve judgement. To mitigate these risks, institutions must foster a working culture where mistakes are openly acknowledged and constructively addressed. The concept of a just culture, which is based on balancing fairness, learning, and accountability, recognising that human errors happen in imperfect and complex systems[55] is widely supported here. While the principles are sound, translating them into everyday practice appears more complex.[56] Recent policy developments signal intent to strengthen staff support and fair accountability structures.[57,58] However, it remains uncertain whether these cultural initiatives have yet translated into consistent, meaningful practice across all settings.

For organisational learning to occur, reporting systems must be easy to use, genuinely anonymous, and free from punitive consequences. Sonographers have a professional duty to raise concerns about patient safety, a duty reinforced by national frameworks. These frameworks include the Care Quality Commission's requirements under the Health and Social Care Act 2008, the Freedom to Speak Up Review tasked with promoting open reporting, and the NHS England Raising Concerns (Whistleblowing) Policy, which protects and supports staff

who disclose concerns in the public interest.[59–61] However, these expectations are unlikely to be met in environments where staff anticipate retaliation or reputational harm, especially where the "guilty party" needs to be identified by the outside world.[56]

The NHS Resolution further recommends several strategies to support staff following adverse events, including access to peer support, open disclosure, and learning,[62] consistent with the findings of this study. However, the adoption of these policies remains uneven across healthcare settings,[63] which may reflect variability in organisational priorities, resourcing, or leadership commitment. In some settings, staff support is regarded as less important than operational targets or financial pressures.[53] Others may lack the infrastructure, training, or cultural readiness to implement these strategies meaningfully. Embedding these recommendations requires regular feedback loops that include the integration of managers, principal sonographers, and senior sonographers to ensure policy is not disconnected from practice.

Limitations

The convenience recruitment strategy may limit generalisability. The male-skewed profile may not have reflected the profession's usual gender mix and could influence the pattern of which experiences were reported. Furthermore, the paucity of sonographer-specific research meant comparisons often had to rely on wider healthcare literature. The absence of a zero-mistake option may have inflated error prevalence estimates. Also, a bespoke, profession-specific survey was used instead of a validated psychometric scale, which utilised primarily self-report data. While this ensured ecological validity and relevance to sonographers' practice, it limits direct comparability with studies that employed validated measures of guilt and shame. Although qualitative responses added depth, the use of a single questionnaire limited the chance to probe or clarify responses compared to interviews or focus groups. Notwithstanding the aforementioned, reflexivity was maintained through journaling and peer discussion to

reduce interpretive bias. Although the sonographer-specific focus addressed a research gap, obtaining views from radiologists and managers on sonographers' attitudes toward mistakes and errors, as well as a larger sample size with efforts made to reduce bias, is recommended.

Conclusion

Mistakes in ultrasound practice are prevalent in all workplace settings and experience levels. These events are often followed by guilt, shame, anxiety, a drop in confidence, defensive practices, or professional development. These emotional consequences are not personal struggles alone; they have direct implications for patient safety and can impact staff performance and retention, exacerbating the current chronic shortage of sonographers in the UK. The study revealed a structural mismatch between the support available and what sonographers actually access. Sonographers heavily rely on informal peer support networks. To mitigate the emotional impact of mistakes, sonographers require improved access to psychological support, compassionate communication from management, and a fair organisational culture that promotes learning rather than assigning blame.

This research highlights that protecting sonographers from emotional harm is integral to patient safety, staff wellbeing, and workforce retention. Organisations have opportunities to improve how mistakes are managed, benefitting both sonographers and patients. Recognising the problem is only the first step, and future research could explore the use of validated tools to assess sonographers' emotional responses. Real change depends on meaningful action, and without it, sonographers may continue to suffer silently, and patient care will remain vulnerable.

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Introduction

Ultrasound is widely used to diagnose and monitor various disease conditions.[1] Despite its advancements, ultrasound practice remains human-driven, which introduces a potential for error.[2] Diagnostic errors are broadly classified into perception, system, and cognitive errors.[3] This study focuses on cognitive errors and specifically uses the term "mistakes" to refer to flawed decisions that could have been prevented, rather than inadvertent slips or system-related failures.[4,5] This distinction is important because mistakes often arise from knowledge gaps, misjudgements, or cognitive biases, which can be addressed through training and support.[6]

The emotional impact of errors has been extensively studied among other health professionals.[2,7–10] However, sonographers remain largely overlooked. This is despite their work involving high levels of autonomy, time pressures, and limited peer oversight.[1] These events can evoke emotions such as guilt, shame, anxiety, ridicule, sadness, resilience, growth, and scapegoating.[11,12] This study focused on guilt, shame, and scapegoating because of their direct links to reduced incident reporting, long-term coping difficulties, and harm to professional wellbeing.[13]

Furthermore, existing research confirms that mistakes in ultrasound are common, yet how sonographers respond to these events emotionally or behaviourally remains unclear. This gap in understanding emphasises the need for targeted investigation. To address this, the study aims to explore the common mistake types in ultrasound practice, their emotional impact, and the coping and mitigation strategies to identify ways to support sonographers in reporting mistakes.

Methods

An online cross-sectional study was conducted in the UK from December 2024 to February 2025, hosted on JISC Online Surveys.[14] Ethical approval was obtained from [blinded]. Due to the sensitive nature of the questions, the researchers' contact details and psychological support resources were provided to participants experiencing psychological distress or other concerns. All responses were anonymous and securely stored, in accordance with General Data Protection Regulation standards.[15]

The questionnaire design was guided by themes identified in Fatima et al.'s study,[9] which examined the emotional impacts of errors and reporting behaviours among resident doctors. The authors initially reviewed validated psychometric scales for guilt and shame (e.g., the State Shame and Guilt Scale and the Guilt and Shame Proneness Scale). However, these were not used because they were designed for general or clinical populations rather than the sonography workplace. Instead, a bespoke, sonographer-specific guilt and shame construct was embedded within applied, practice-based scenarios to ensure ecological validity and relevance to sonographers' practice.

The questionnaire items were then refined through pilot testing with four sonographers and two sonography educators. Feedback led to minor adjustments, improving clarity and face validity.[16] An embedded mixed-methods design combined structured quantitative items (such as Likert scales measuring mistake frequency, emotional responses, and coping strategies) with open-ended qualitative questions from both the individual who made the mistake and those who reported peer errors. The questionnaire comprised 36 questions across nine sections (see Supplementary Appendix 1), allowing for a mix of quantitative data and qualitative insights.

Participants were recruited through convenience sampling through SoR member platforms, LinkedIn, X, and SurveyCircle. To be eligible, participants needed to hold an accredited postgraduate qualification in ultrasound and have been practising in the UK for at least one

year, either in the public or private sector. This ensured they possessed sufficient clinical experience and the capacity to have made and reflected on diagnostic mistakes. No incentives were offered to prevent bias.[17]

To reduce straight lining, all questions were optional.[18] As a result, some participants skipped items or selected "I don't know." Of the 53 participants recruited, seven incomplete responses were excluded from correlation analysis using pairwise deletion. Given that the missingness appeared random and limited in scope, this approach was deemed appropriate, allowing the use of all available data.[19]

Quantitative data were analysed in SPSS (version 28) using descriptive statistics, Spearman's rho, Kruskal-Wallis, and chi-square tests. Qualitative data from open-text responses were analysed using Braun and Clarke's six-step thematic analysis framework[20] in NVivo (version 12). Thematic saturation was assessed iteratively during coding,[21] with no new codes emerging after the analysis of the final 10 responses. Although member checking was not feasible due to time and logistical constraints, the analysis followed a transparent, iterative, and reflexive process.[22] Interpretations were grounded in the data, with an audit trail maintained to enhance analytical credibility and transparency.[23] Quantitative and qualitative findings were then integrated through a Joint display table, which facilitated triangulation and deeper interpretation.

Results

Quantitative Findings

Participant Characteristics

Of the 53 participants recruited, each respondent had at least one missing response across the survey items. Therefore, response numbers and percentages are included where relevant. Most participants were between 30 and 39 years old (71.7%). A majority identified as male (67.9%), despite national data indicating that the profession is predominantly female.[24] Most

participants worked in the NHS (86.8%), with smaller groups working in private hospitals (9.4%) and dual sector (both public and private settings) (3.8%). Participants' years of experience varied, with the largest group having 16-20 years of experience (45.3%) (Table 1).

Frequency and Patterns of Mistakes

Results reveal that at least one diagnostic-type error was reported by 39 of 52 respondents (75%); 1 participant did not answer this item. Only 2% reported 10 or more mistakes (Figures 1 and 2). Spearman's correlation showed no significant relationship between years of experience and mistake frequency ($\rho = 0.074$, $p = 0.624$, $N = 46$) (Table 2). Similarly, the Kruskal-Wallis test found no statistically significant difference in mistake frequency across workplace settings ($\chi^2(2) = 4.68$, $p = 0.096$, $N = 46$) (Table 3).

The most frequent mistakes are system or information-related errors, which include failure to review patient history, laboratory data, or previous imaging results (38%) and scanning the wrong patient (38%). In contrast, skill-based mistakes involve errors such as artefact misinterpretation (13.6%), incorrect measurements (9.1%), failure to identify abnormalities based on gestational age (14.4%), and misidentification of anatomical structures (13.6%). Other mistakes (n = 3, 2.3%) included misdiagnoses, anatomical labelling mistakes, and reports misattributed to another patient (Figure 3). Spearman correlations between ease of reporting (defined as participants' perceived comfort or difficulty when disclosing mistakes) and the types of mistakes reported (n = 52) showed positive correlations for system or information-related errors and negative correlations for skill-based mistakes (Table 4)

Emotional Responses and Reporting Behaviour

Participant (45.3%) reported guilt, with 30% stating guilt influenced their professional performance "a great deal," while 9% of the respondents reported no effect. Two-thirds of

respondents (66%) indicated that guilt led them to overcompensate by being overly cautious in their interactions with patients and colleagues. Only 4% stated that they felt withdrawn due to guilt (Table 5). Shame was also prevalent, with 30% of sonographers reporting having experienced it sometimes, 23% often, and 25% always (Figure 4). Despite this, 54.7% openly discussed mistakes, while 30.2% delayed disclosure and 1.9% avoided disclosure. In addition, Scapegoating was reported by 34% of participants. Supervisory staff were frequently cited as the source by 32.4%, and a few (2.9 %) blamed themselves in open-text responses (Figure 5).

Reporting behaviour among respondents varied. Self-reporting was perceived as somewhat or very easy by 30.2% of respondents, while 41.4% found it somewhat difficult or very difficult, and 30.2% were neutral. When reporting peers' mistakes, 39.6% felt somewhat uncomfortable, 11.3% felt very uncomfortable, and 17% comfortable. The main drivers for self-reporting mistakes were impact on patient care (58.5%), adherence to professional guidance and practice (50.9%) and desire to improve (50.9%) and for reporting peer's mistake were the impact on patient care (73.6%), severity of the mistake (67.9%) and potential for detrimental outcomes (54.7%) (Table 6).

Coping Strategies and Sources of Support

Most respondents (68%) indicated having adequate support systems in place for coping with mistakes, with 78% of these relying on peer support, 55% on supervisors, and others (5%) on partners, yet 30% felt unsupported (Figures 6 and 7). A Chi-Square test of Independence showed no statistically significant differences between coping strategy and workplace setting ($N = 51$, $p > 0.05$, Table 7). Spearman correlations also revealed no significant correlations between experience level and coping strategies ($N = 52$, $p > 0.05$, Table 8).

Qualitative Findings

Thematic Analysis

Thematic analysis was performed using Braun and Clarke's method.[20] Qualitative analysis generated four overarching themes: (1) workplace culture and interpersonal dynamics, (2) emotional and psychological impact, (3) reporting and learning from mistakes, and (4) recommended support and mitigation strategies (Table 9). Each theme highlighted how mistakes shaped professional behaviour and workplace relationships. For example, participants described cultures of blame and scapegoating ("Within our Trust, it is commonplace for consultants to use sonographers as scapegoats…" P53), while others reflected on the impact of mistakes on confidence and professional identity ("Sometimes issues are blown out of proportion…" P35). Thematic findings are elaborated further in the discussion, where they are integrated with relevant literature.

Mixed Methods Integration

Quantitative and qualitative data were triangulated to identify convergence or divergence. For example, the lack of significant differences between mistake rates and experience from quantitative data supports the qualitative theme that even experienced sonographers struggle with mistakes. Similarly, quantitative data showed 68% had access to support systems, yet qualitative data showed that some perceived these systems as ineffective or absent. Quantitative data highlights overcompensation as adaptive behaviour while qualitative data reveal that emotional responses are shaped more by workplace culture than by mistake severity (Table 10).

Discussion

The proportion of sonographers (64%) reporting at least one diagnostic mistake in the past year aligns with international estimates of error recognition in diagnostic imaging, suggesting that emotional repercussions are pervasive across modalities.[25,26] This explains why even skilled professionals remain vulnerable to errors due to cognitive biases, time pressures, and system inefficiencies.[27] However, treating this as genuine consistency risks missing subtle variations that may be obscured by sample size or statistical limits. Nonetheless, baseline data from this study confirmed that ultrasound mistakes are likely widespread and multifactorial, with contributing factors reflected across the four thematic domains identified in the qualitative analysis.

Workplace Culture and Interpersonal Dynamics

Scapegoating was a significant concern among participants, with many being blamed by consultants, supervisors, peers, other professionals, patients, or families. These patterns align with findings by Zabari and Southern, and Ee, who associated blame cultures with decreased reporting and collaboration.[28,29] One participant's account explained, *"During my probation period, where they flagged everything as incompetence and shamed every effort by backstabbing me. This stereotyping and scapegoating seriously affected my mental health, and I could not cope anymore. I eventually exited the Trust after I was signed off to work alone (P12)".*

The quote above highlights a challenging probation period with implications for staff retention, which should be interpreted with caution. Although only a single explicit resignation was reported here, the emotional strain could heighten attrition risk for newly qualified sonographers (who are still consolidating skills and confidence) or those recently employed, undergoing onboarding processes and settling in their new environments, thereby exacerbating the current chronic staff shortages.[30]

Another participant explained, *"I missed an early pregnancy diagnosis and was made to feel very incompetent (P27),"* highlighting how emotional responses often centred on self-blame. Participant 53 added, *"Within our Trust, it is commonplace for consultants to use sonographers as scapegoats and to criticise and be unwilling to educate".* It is also postulated that some experiences of blame reflect interpersonal tensions rather than systemic scapegoating.[31] In fact, some experiences of blame may be a response to legitimate clinical concerns that are miscommunicated or misinterpreted. Yet, even when blame is only perceived, it can have lasting effects.

Only one participant reportedly internalised blame for mistakes in an open-ended response. Although limited support structures may exacerbate such responses, studies show that self-blame in healthcare can also stem from individual coping styles and professional culture, even when support is available.[10,32,33] The prominence of blame culture and scapegoating in the present accounts may, in part, reflect the focus of some survey items on responsibility and accountability. Some of these items may have encouraged participants to frame their experiences from the perspective of blame, even if these were not their only concerns. This fact demonstrates the importance of caution when interpreting frequency as a direct measure of prevalence, but it does not diminish the importance of blame culture and scapegoating as a reported issue. Furthermore, the authors propose that more qualitative research, favouring exploratory interviews, may yield a more balanced understanding.

Emotional and Psychological Impact

Participants discussed how guilt and shame affect their confidence, communication, and job performance. Although some tried to learn from these experiences, the emotional distress often overshadowed constructive reflection. For example, P35 quoted as *"sometimes issues are blown out of proportion and make me feel even more guilty",* explained how

disproportionate reactions intensified their guilt. This supports the idea that emotional responses are influenced by how others handle mistakes, not just the mistake itself or its severity.[34] This is further elucidated by P7, *"The impact of shame and guilt when making a mistake differs a lot depending on the type of mistake [made by peers] and its impact on patients' lives.*

Psychological shifts were common among those who reported persistent guilt. Among the respondents (45%) who always felt guilt, described overcompensation, becoming overly careful, and double-checking (Table 5), consistent with a previous study by Mahat et al.[10] While intended to prevent recurrence, this may paradoxically impair patient care. In fact, over-reporting can harm diagnostic accuracy and worsen patient experience, which causes a delay in clinical decision-making. From the available data, it remains unclear whether such caution, driven by guilt, actually improves safety or instead creates new risks (e.g., unnecessary referral, heightened patient anxiety, or greater healthcare resource use).

Participants also described communication changes after diagnostic mistakes. Some were unsure about how guilt influenced their communication, while others acknowledged withdrawal or intentional avoidance in professional conversations.[10] Based on the survey responses, we cannot determine whether a brief withdrawal facilitated self-reflection for sonographers or simply reduced engagement with peers.

Shame was similarly reported and often described in relation to visibility, being observed, criticised, or judged. For some participants, shame was fleeting; for others, it was persistent. Although the emotional profile of shame often overlapped with guilt, shame was more associated with public embarrassment and judgment. This distinction matters as shame usually metamorphoses into anxiety and related stigma, especially when exposure is public or episodes are repeated.[35]

Reporting Behaviour and Coping Strategies

Sonographers found it particularly easier to report system-related errors than mistakes involving core scanning skill or clinical judgement, which suggests that incidence reporting may be influenced by perceived accountability and peer judgement.[34] Participants were also more willing to report their own mistakes than those of colleagues, driven mainly by concern for patient care, adherence to professional standards, and the desire to improve.

Despite these emotional challenges, 98% of participants reported a willingness to disclose mistakes, which represents a positive shift compared to earlier studies where clinicians were reluctant to disclose errors due to fear of blame, litigation, or reputational damage.[33,36,37] Wawersik et al. explained further that most error reporting may be motivated by fear-based self-preservation rather than psychological safety.[38] The high rate of reporting among sonographers in this present study may reflect a similar motive and a strategy to avoid escalation if the mistake were later discovered. Social desirability bias may also influence responses,[39] raising the key question of whether compliance is motivated by genuine transparency or self-preservation amongst sonographers.

When reporting colleagues' mistakes, participants emphasised the impact on patient care and the severity of the mistake as the most critical considerations, which aligns with findings from Jaeb and Pecanac, who found that the severity of an incident often determines whether it is reported.[40] However, Saposnik et al. (2016) [27] disagreed, stating that perceptions of fairness and workplace relationships may outweigh clinical factors. Our data highlights these tensions where ethical duty conflicted with personal discomfort about reporting colleagues, evidenced in over 50% of participants indicating they felt somewhat uncomfortable or very uncomfortable in reporting peers (Table 6). One participant captured this unease well: *"Accusations based on factors that are not relevant to the case such as bias (gender, race etc). The defensive response lacks self-awareness of the person who made the mistake. It's often the same person and they then accuse the complainer of victimisation, which can prevent unsafe practice being flagged"* (P38). The study shows that this discomfort is often rooted in fear of

harming peer relationships, and this fear can have more influence on reporting behaviour than ethical or clinical considerations.[37,41]

Coping strategies largely relied on peer support, which is mainly viewed as helpful in the reduction of stigma, consistent with previous research.[42,43] Yet peer support may provide inconsistent support and be emotionally draining for those involved.[42,44] Participant 14 elucidated further: *"…the few they allowed me to work with were not supportive enough and would rather discuss my shortcomings outside with other colleagues, excluding me from such discussion".* This may explain the mixed experiences in the availability of support, quality, and how feedback was delivered, even within the same team.

A few participants (2%) cited partners as a key source of emotional support, which reflects the relevance of the social support theory.[45] In addition, self-reflection was widely adopted by 80% of participants, which may be related to blame cultures that discouraged openness and were replaced with internal reflection.[46] Some participants also viewed self-reflection positively as an opportunity for personal growth, agreeing with Artioli's findings.[47] Whether this practice fosters improvement or masks underlying insecurities remains uncertain.

A minority also described adaptive growth-oriented responses. Participant 38, for example, noted: *"For me, it's something I don't want to repeat, so I make an effort to get better at that thing. In the long term, I become a better sonographer"*. The authors interpret this as a positive attitude where a deliberate, learning focused response transforms an uncomfortable emotion into practice improvements rather than rumination.

In contrast, others observed maladaptive behaviours amongst peers; *"Sometimes it is not the impact on interactions with people, but on confidence to do that type of scan. Others show a tendency to either avoid that or over-worry, and that increases patient anxiety if they over-report (P41)"*. This highlights loss of confidence, avoidance, and over-reporting in the aftermath of error, which could be linked to structural gaps in workplace support systems.[48] A few participants preferred to forget mistakes entirely. Although perceived as efficient in the

short term, the "fix and forget" habit is usually linked to near misses or routine issues in healthcare and may reinforce silence and hinder learning from mistakes.[49]

Recommended Support and Mitigation Strategies

Managerial empathy was seen as valuable; however, some of the participants perceived it as insufficient, citing examples such as: *"It would be great if Managers are equipped with the necessary training to help provide this emotional support to staff in such cases" (P30)* and "*A reflective and empathetic boss [would help]" (P1)*. West et al. argued that while trust relies on compassion, follow-through is required in these events.[50] So when managers fail to address the root causes of staff distress or where fair systems for learning and accountability are inadequate, empathy alone can merely seem performative.[51]

One participant quoted "*An easily accessible psychological team within the Trust would help (P30)"*, suggesting that participants are aware of psychological services but doubt their accessibility. These reports of inaccessibility in the study could plausibly reflect a few factors, such as unclear referral routes, workload clashes, actual waiting times, or limited awareness of the service. However, our data did not identify these possible reasons, as we did not measure time to support. Pragmatically, psychological services could improve visibility and uptake through simple signposting and protected time for staff to attend when needed. Although previous research indicates that psychological services alone are rarely effective unless they are embedded within a broader institutional commitment.[52] Unfortunately, ongoing budget constraints have led to inadequate access to psychological support,[53] which aligns with participants' perception of inaccessibility.

A just culture was advocated for, with participants quoted, *"I believe that making mistakes is inevitable in the role of the Sonographer. Mistakes should be used as a learning experience to promote improvements and shared within the team, for shared learning and to promote*

discussion(P31)," and "*I would like to stress the need for continuous audit in improving the standards of healthcare (P32)"*. These quotes encourage a just culture and continuous structured debriefs to mitigate mistakes, thus aligning with Stehman et al.'s findings.[54] However, in the absence of meaningful leadership engagement, these may appear as tick-box exercises. Also, the sustainability of these strategies is contingent upon continued institutional funding and creating protected time.[7,50] Otherwise, valuable learning opportunities may become lost.

Implications for Practice and Research

Findings from this study challenge the assumption that increased caution always enhances safety. In fact, fear-based behaviours tend to impair rather than improve judgement. To mitigate these risks, institutions must foster a working culture where mistakes are openly acknowledged and constructively addressed. The concept of a just culture, which is based on balancing fairness, learning, and accountability, recognising that human errors happen in imperfect and complex systems[55] is widely supported here. While the principles are sound, translating them into everyday practice appears more complex.[56] Recent policy developments signal intent to strengthen staff support and fair accountability structures.[57,58] However, it remains uncertain whether these cultural initiatives have yet translated into consistent, meaningful practice across all settings.

For organisational learning to occur, reporting systems must be easy to use, genuinely anonymous, and free from punitive consequences. Sonographers have a professional duty to raise concerns about patient safety, a duty reinforced by national frameworks. These frameworks include the Care Quality Commission's requirements under the Health and Social Care Act 2008, the Freedom to Speak Up Review tasked with promoting open reporting, and the NHS England Raising Concerns (Whistleblowing) Policy, which protects and supports staff

who disclose concerns in the public interest.[59–61] However, these expectations are unlikely to be met in environments where staff anticipate retaliation or reputational harm, especially where the "guilty party" needs to be identified by the outside world.[56]

The NHS Resolution further recommends several strategies to support staff following adverse events, including access to peer support, open disclosure, and learning,[62] consistent with the findings of this study. However, the adoption of these policies remains uneven across healthcare settings,[63] which may reflect variability in organisational priorities, resourcing, or leadership commitment. In some settings, staff support is regarded as less important than operational targets or financial pressures.[53] Others may lack the infrastructure, training, or cultural readiness to implement these strategies meaningfully. Embedding these recommendations requires regular feedback loops that include the integration of managers, principal sonographers, and senior sonographers to ensure policy is not disconnected from practice.

Limitations

The convenience recruitment strategy may limit generalisability. The male-skewed profile may not have reflected the profession's usual gender mix and could influence the pattern of which experiences were reported. Furthermore, the paucity of sonographer-specific research meant comparisons often had to rely on wider healthcare literature. The absence of a zero-mistake option may have inflated error prevalence estimates. Also, a bespoke, profession-specific survey was used instead of a validated psychometric scale, which utilised primarily self-report data. While this ensured ecological validity and relevance to sonographers' practice, it limits direct comparability with studies that employed validated measures of guilt and shame. Although qualitative responses added depth, the use of a single questionnaire limited the chance to probe or clarify responses compared to interviews or focus groups. Notwithstanding the aforementioned, reflexivity was maintained through journaling and peer discussion to

reduce interpretive bias. Although the sonographer-specific focus addressed a research gap, obtaining views from radiologists and managers on sonographers' attitudes toward mistakes and errors, as well as a larger sample size with efforts made to reduce bias, is recommended.

Conclusion

Mistakes in ultrasound practice are prevalent in all workplace settings and experience levels. These events are often followed by guilt, shame, anxiety, a drop in confidence, defensive practices, or professional development. These emotional consequences are not personal struggles alone; they have direct implications for patient safety and can impact staff performance and retention, exacerbating the current chronic shortage of sonographers in the UK. The study revealed a structural mismatch between the support available and what sonographers actually access. Sonographers heavily rely on informal peer support networks. To mitigate the emotional impact of mistakes, sonographers require improved access to psychological support, compassionate communication from management, and a fair organisational culture that promotes learning rather than assigning blame.

This research highlights that protecting sonographers from emotional harm is integral to patient safety, staff wellbeing, and workforce retention. Organisations have opportunities to improve how mistakes are managed, benefitting both sonographers and patients. Recognising the problem is only the first step, and future research could explore the use of validated tools to assess sonographers' emotional responses. Real change depends on meaningful action, and without it, sonographers may continue to suffer silently, and patient care will remain vulnerable.

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Author Declaration:

Ethics approval and consent to participate

Ethical approval for this study was obtained from Sheffield Hallam University Research Ethics Committee (UREC2/33000005).
Full details of approval processes for postgraduate dissertation projects are available here: https://www.shu.ac.uk/research/excellence/ethics-and-integrity/approvals2

Informed consent was obtained for anonymised patient information to be published in this article.

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Conflicts of interest

The authors declare that they have no competing interests

Availability of data

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

Author contributions

EU: Conceptualisation, Methodology, Software

EU: Data curation, Writing- Original Draft preparation

EU, CH: Visualisation, Investigation

CH, CE: Supervision

EU, CO: Software, Validation

EU, CH, CE, CO: Writing- Reviewing and Editing

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Generative AI use

None to declare

Figures

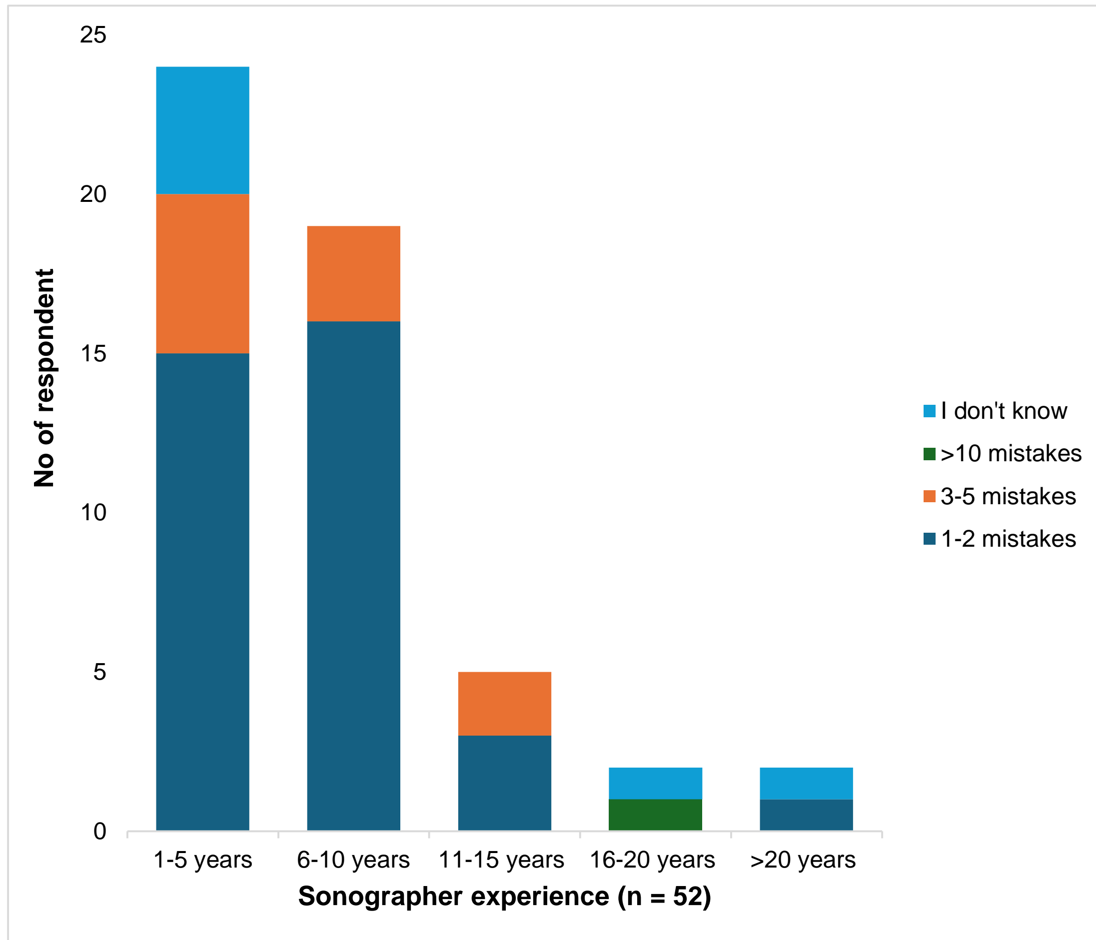

Figure 1: Mistake Frequency by Sonographer Experience

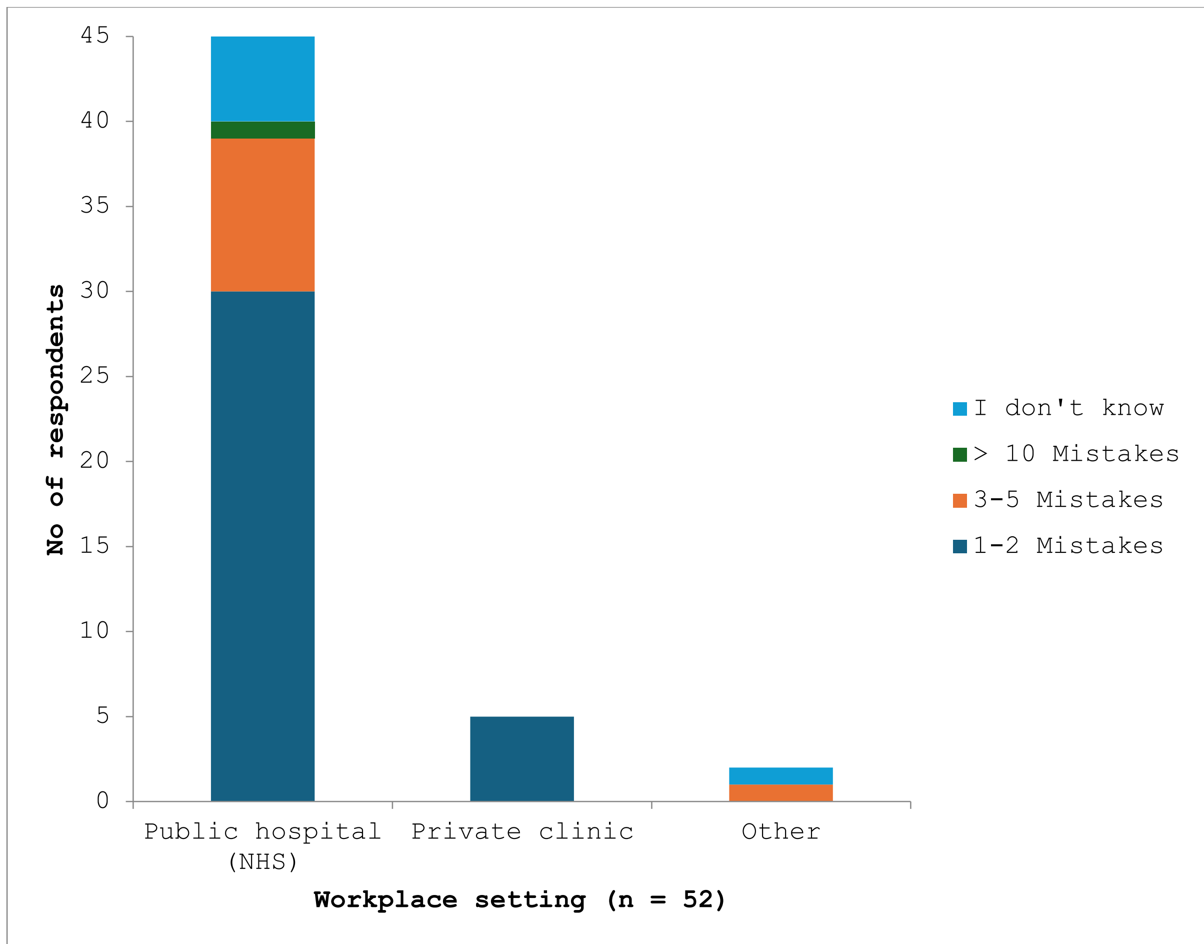

Figure 2: Distribution of self-reported mistake frequency within NHS, private, and other settings. Other (work in the dual sector)

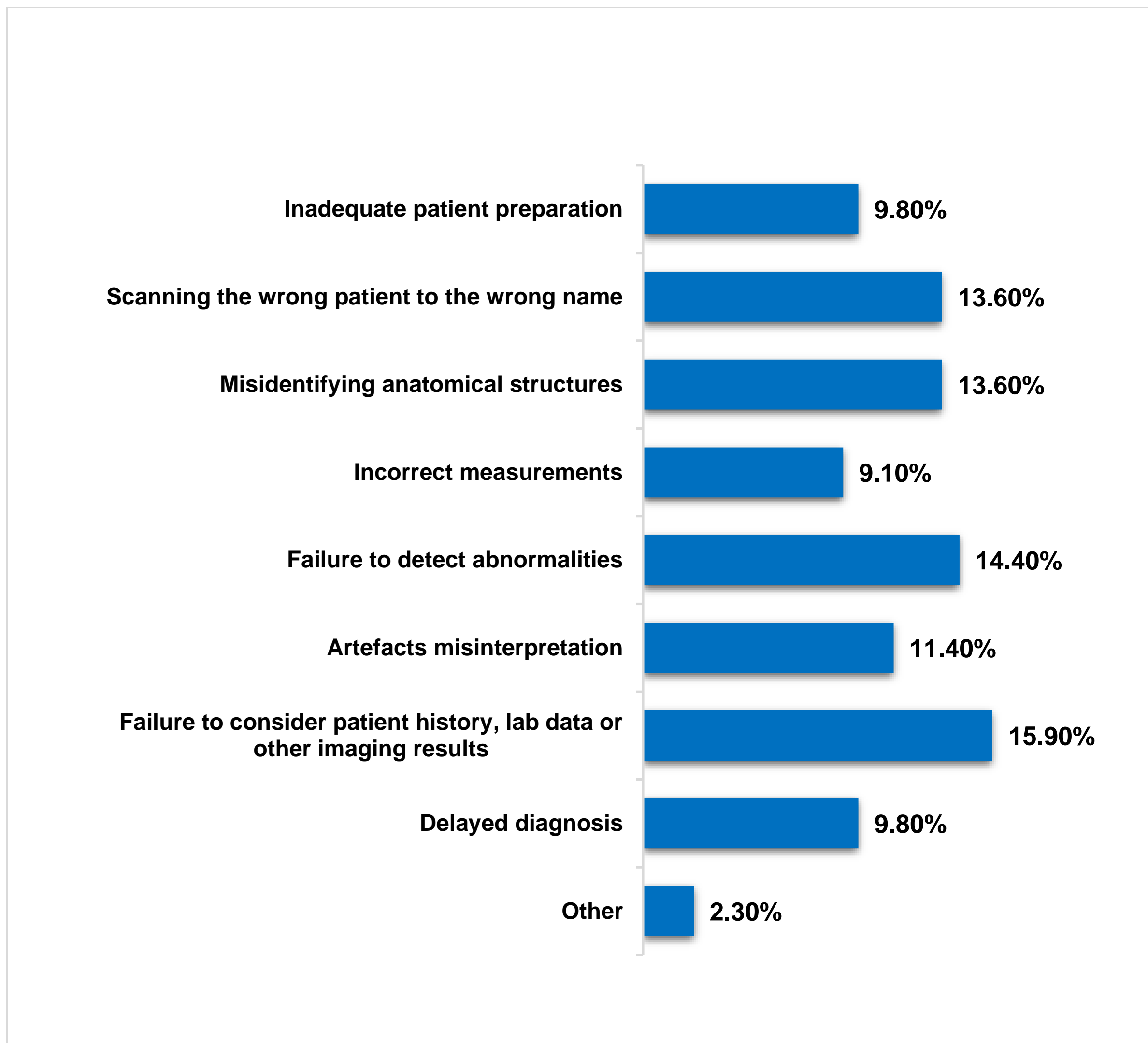

Figure 3: Occurrence and nature of mistakes made by UK sonographers

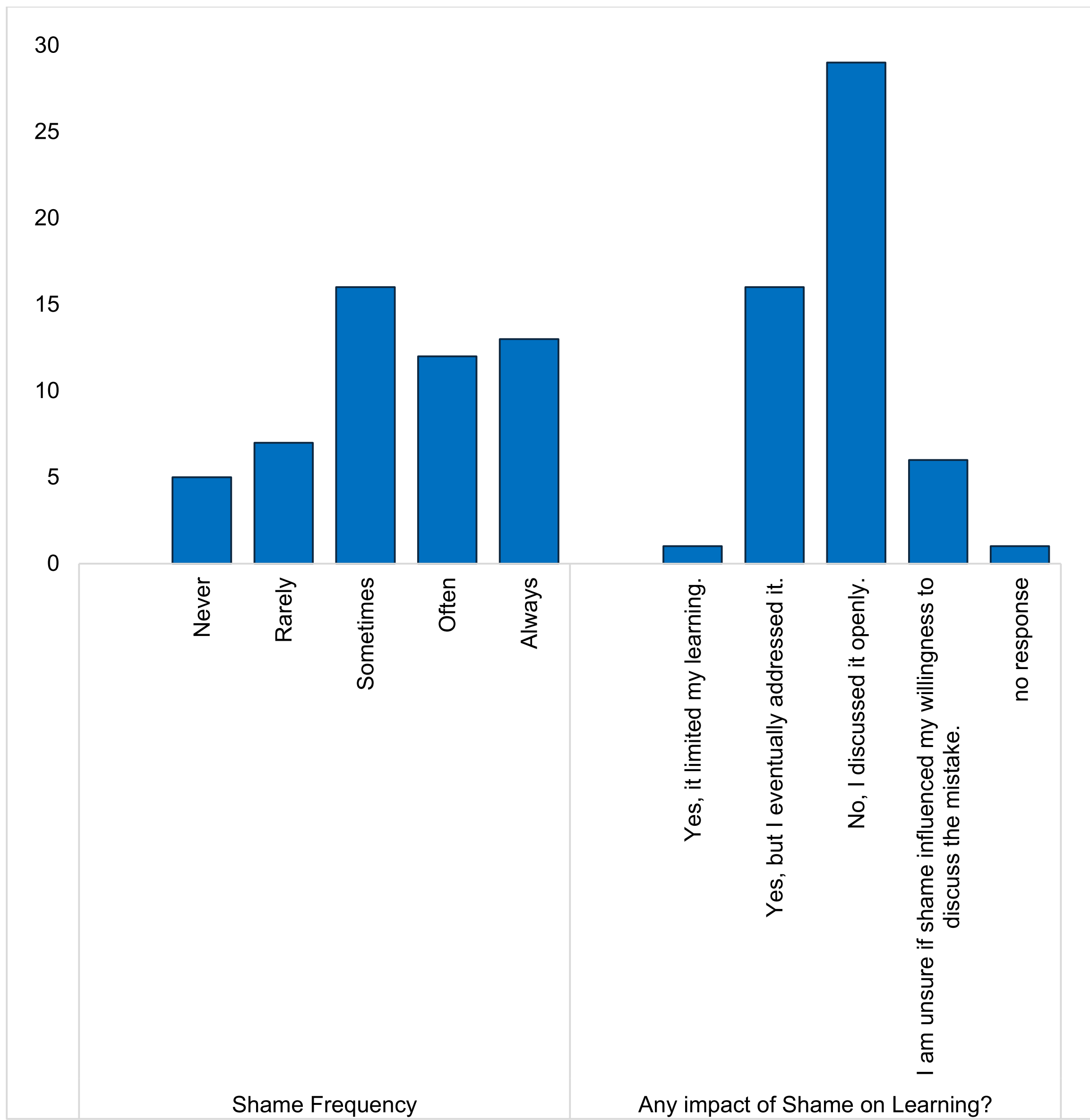

Figure 4: Impact of shame on professional performance

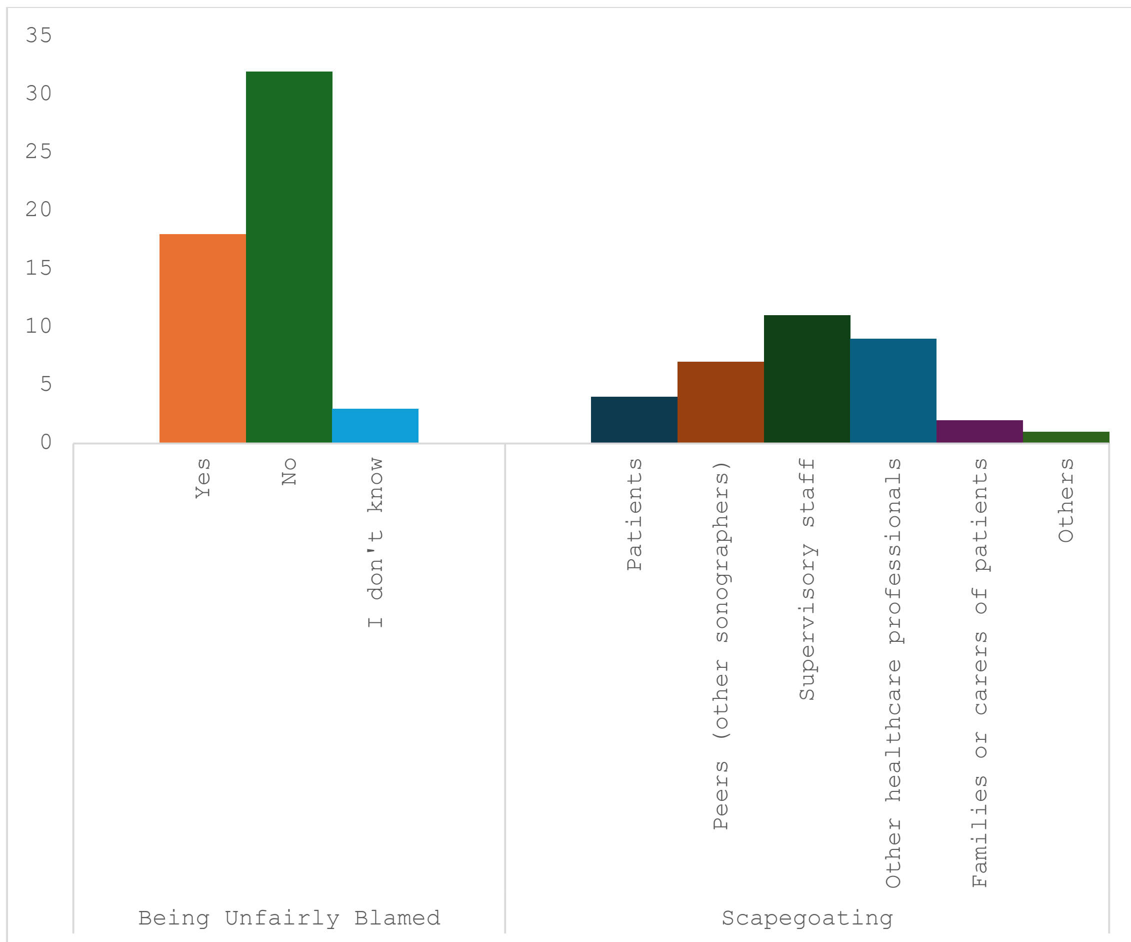

Figure 5: Perceptions of Scapegoating among Sonographers. The left bar represents all respondents (n=53), the Right bar represents counts of scapegoating sources among only those who said “Yes” (multiple choices allowed; n = 30).

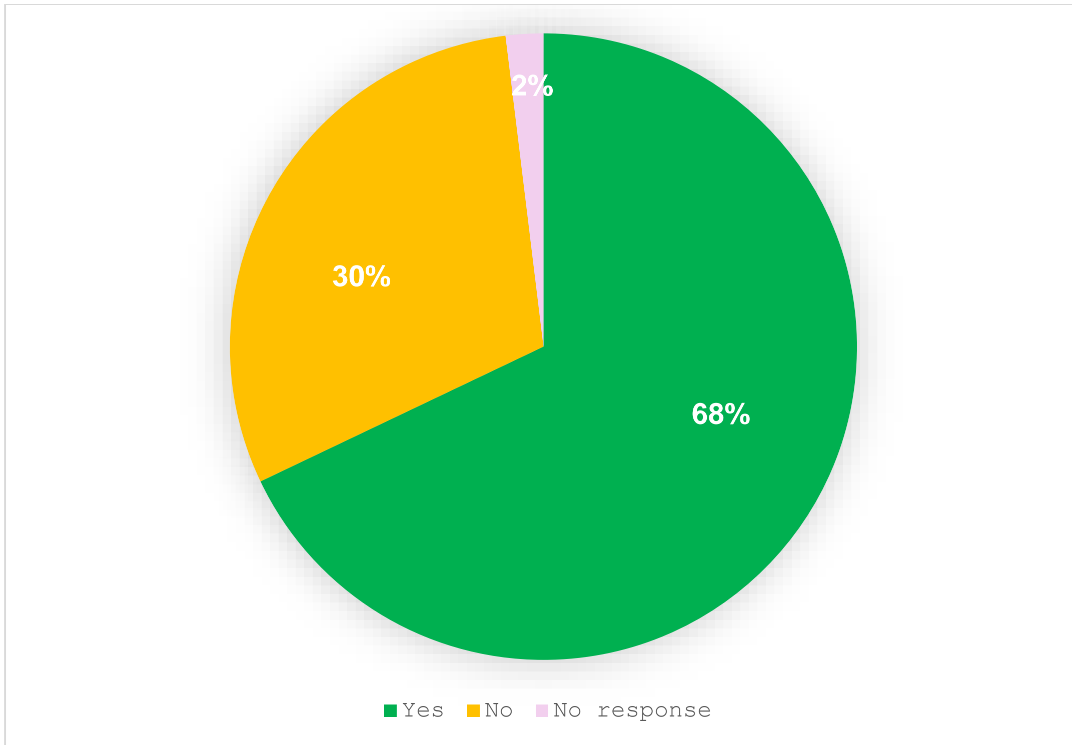

Figure 6: Perception of the Adequacy of Support Systems

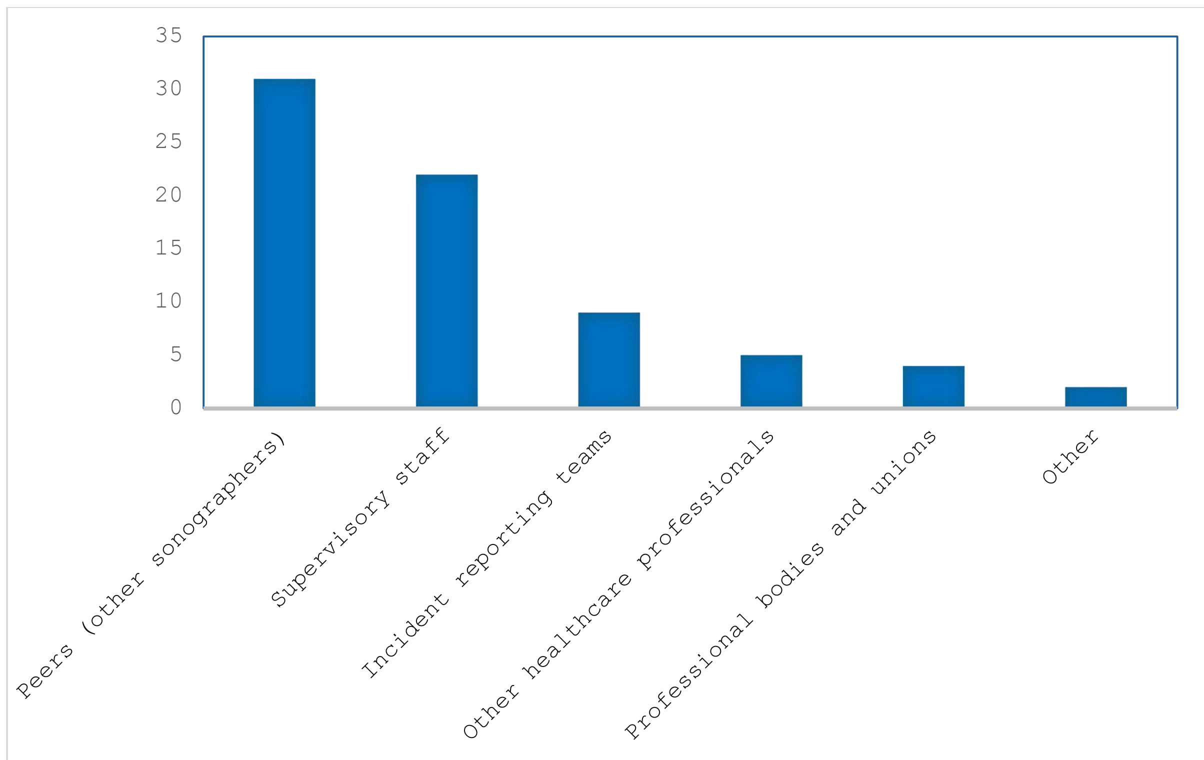

Figure 7: Sources of information about support, other = partner

Impact of Diagnostic Mistakes on UK Sonographers: Exploring Shame, Guilt, and Scapegoating

Informed Consent Statement [Blinded]
By selecting "Yes," you confirm that you understand the purpose of this study and your rights as a participant and agree to proceed with the questionnaire.

1. Do you understand and agree to participate in this questionnaire?*
Yes
No

2. Are you currently practicing as a sonographer in the United Kingdom?*
Yes
No (If “No,” the questionnaire will end here)

Demographics
Please answer a few questions about your background. Your responses are confidential and help us better analyse the survey results.

3. Age: What is your age?
20-29
30-39
40-49
50-59
60 and above

4. Gender: What is your gender?
Male
Female
Non-binary or gender diverse
I prefer not to disclose

5. Years of Experience: How many years of experience do you have as a sonographer?
1-5 years
6-10 years
11-15 years
16-20 years
More than 20 years

6. Type of Healthcare Setting: In what type of healthcare setting do you work primarily?
Public hospital (NHS)
Private clinic
Other

7. If you selected other, please specify:
Experience with Mistakes
Clarification: For the purpose of this survey, a 'mistake' is defined as any action, decision, or oversight during an ultrasound procedure or interpretation that deviates from expected professional standards, potentially affecting the accuracy of the results or the quality of patient care.

8. Types of mistakes: What types of mistakes have you made while performing ultrasound procedures, whether recognised immediately or identified later? (Select all that apply)

- Mistakes from inadequate patient preparation

- Scanning the wrong patient to the wrong name
- Misidentifying anatomical structures
- Incorrect measurements
- Failure to detect abnormalities (considering gestational age)
- Artifacts misinterpretation
- Mistakes from failure to consider patient history, laboratory data, or results from other imaging modalities
- Delayed diagnosis
- Other

9. If you selected other, please specify:

10. Frequency of mistakes: In the past year, approximately how many ultrasound mistakes have you made?
1-2 mistakes
3-5 mistakes
6-10 mistakes
More than 10 mistakes
I don't know

Experience with Guilt
Guilt is an emotional response experienced by healthcare professionals when they perceive that their actions, decisions, or omissions during patient care have led to harm, suboptimal outcomes, or deviation from professional standards.

11. Guilt Frequency: How often do you feel guilt after making a mistake during an ultrasound procedure?
Never
Rarely
Sometimes
Often
Always

12. Impact of Guilt on Performance: To what extent do you believe guilt affects your performance after an ultrasound mistake?
Not at all
Slightly
Moderately
Quite a bit
A great deal

13. How does guilt influence your interactions with patients and colleagues after making a mistake during an ultrasound procedure?
- It does not influence my interactions.
- I feel hesitant or less confident in my communication.
- I overcompensate by being overly cautious.
- I try to avoid interactions or feel withdrawn.
- I am unsure how guilt affects my interactions.
- Other

14. If you selected other, please specify:
Experience with Shame

Shame refers to the deeply personal and often overwhelming emotion that arises when a sonographer feels that their mistake reflects negatively on their competence, character, or identity.

15. Shame Frequency: How often do you feel shame after making a mistake during an ultrasound procedure?
Never
Rarely
Sometimes
Often
Always

17. Have you ever avoided discussing a mistake due to feelings of shame? If yes, how did this impact your ability to learn from the mistake?
Yes, it limited my learning.
Yes, but I eventually addressed it.
No, I discussed it openly.
I am unsure if shame influenced my willingness to discuss the mistake.
Other

18. If you selected other, please specify:
Scapegoating Experience
Clarification: Scapegoating in healthcare staff is a complex interpersonal process where an individual or group is blamed for mistakes within the healthcare system

19. Have you ever felt unfairly blamed for a mistake made during an ultrasound procedure?
Yes
No
I don't know

20. If you answered yes to feeling unfairly blamed, please describe the situation and how it affected your professional experience

21. If yes above, who do you feel was responsible for the scapegoating? (Select all that apply)
Patients
Peers (other sonographers)
Supervisory staff
Other healthcare professionals
Families or carers of patients
Other

23. Fear of Scapegoating: To what extent does fear of scapegoating affect your professional practice?
Not at all
Slightly
Moderately
Quite a bit
A great deal

Incident Reporting
Clarification: When mentioning reporting mistakes, this refers to self-reporting mistakes you have made and that of a colleague (sonographer)

24. Ease of Reporting Mistakes Made by Yourself: How easy do you find the process of reporting an ultrasound mistake that you have made?
Very easy
Somewhat easy
Neutral
Somewhat difficult
Very difficult

25. Comfort with Reporting Mistakes Made by a Peer: How comfortable are you with reporting an ultrasound mistake made by a colleague?
Very comfortable
Somewhat comfortable
Neutral
Somewhat uncomfortable
Very uncomfortable

26. Factors Influencing Reporting:

What factors impact your confidence in reporting an ultrasound mistake that you have made? (Select all that apply)

- Fear of judgment
- Desire to improve
- Fear of repercussions
- Adherance to professional guidance and practice
- Fear of backlash from management
- Impact on patient care
- Other

27. If you selected other, please specify:

28. What factors influence the ease of reporting an ultrasound mistake made by a colleague? (Select all that apply)

- Severity of the mistake
- Intent and pattern of behaviour
- Mood and emotional state of the observer
- Perception of fairness and social norms
- The potential for detrimental outcomes
- Impact on patient care
- Other

29. If you selected other, please specify:

Coping Strategies
Distinction: Clarifying different types of support (professional, personal, peer) to understand coping mechanisms better.

30. Support Systems: Do you feel that you have adequate support systems in place to help manage the emotional impact of mistakes?
Yes
No

31. If yes, who provides help and information about this support? (Select all that apply)
Peers (other sonographers)
Supervisory staff

Other healthcare professionals
Professional bodies and unions
Incident reporting teams
Psychological support teams
Other

32. If you selected other, please specify:

34. Coping Mechanisms: How do you typically cope with the emotional impact of making a mistake ? (Select all that apply)
Seeking support from colleagues (peer support)
Reflecting on the mistake (self-reflection)
Professional counselling
Trying to forget about it
Other

35. If you selected other, please specify:

36. General Feedback: Is there anything else you would like to share about your experience?