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Development of a competency framework for healthcare safety investigators: a modified e-Delphi study

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ABSTRACT

Background: Systems-based healthcare safety investigation is an important initiative to improve patient safety worldwide. It requires the use of credible methods and approaches by competent investigators. There is currently no empirically developed competency framework for the healthcare safety investigator role. We developed a competency framework for healthcare safety investigators using an empirical research approach.

Method: We used a two-round modified Delphi technique electronically. Two web-based surveys were sent to a panel of experts in healthcare safety investigations in England. The panel rated the relevance of a proposed set of competencies and provided qualitative comments. Strength of agreement was assessed using the interquartile range (IQR), the median and percentage agreement. Participants' comments were reviewed, with reference to the contemporary healthcare safety literature and practice.

Results: A total of 28 participants completed the round-one survey. In round two, 24 of the 28 participants completed the survey. At the end of the round-two survey, 38 competencies and 82 corresponding descriptors were agreed as relevant with high agreement levels (IQR ≤ 1.25 , median ≥ 4 , percentage agreement $\geq 70\%$). These were organised in four domains: 1. Personal qualities, 2. Investigation knowledge and skill application, 3. Effective and compassionate engagement, and 4. Manages investigation lifecycle.

Conclusion: To our knowledge, this is the first empirically derived competency framework specifically focused on the healthcare safety investigator role. The high levels of agreement among participants give credibility to the findings. This competency framework provides an evidence base to inform the scope and requirements of the healthcare safety investigator workforce.

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1. Introduction

Globally, almost 3 million people die each year due to unsafe healthcare. (Slawomirski and Klazinga, 2022) Unsafe care or patient safety incidents can significantly impact the health and well-being of patients, families, carers and healthcare staff. (Wailling et al., 2022) People may also lose trust in the healthcare system. In addition, the economic cost of unsafe care is significant and estimated to be around \$1 trillion annually in the United States (Slawomirski and Klazinga, 2022) and £14.7 billion annually in England. (Illingworth et al., 2024).

Healthcare safety investigation is an important activity to drive improvement and management in patient safety, worldwide. (Macrae, 2016) Historically, these investigations have focused on the identification of 'human error' (blaming individuals). Accordingly, the focus of subsequent recommendations have often been on changing the behaviours of individuals, such as reminders, writing or rewriting policies and (re-)training staff, rather than addressing system-level issues. (Lea et al., 2023) There has also been a notable lack of meaningful or compassionate involvement of those affected by incidents (staff, patients, families and carers) in investigations, possibly contributing to compounded harm. (Wailling et al., 2022) In recent times, there is an increasing shift from focusing on 'human error' as the cause of incidents to understanding the context of the complex healthcare systems in which they happen. (Dekker, 2002; Wiig et al., 2020; Macrae and Vincent, 2014) Focussing attention at the systems level, and recommending changes here is purported to provide the basis for effective improvements in healthcare safety. (Card, 2017; NIOSH, 2024).

A systems-based healthcare safety investigation requires competent investigators and arguably a recognised professional role. (Peerally et al., 2017) There is no universally agreed definition of competence generally or within the context of healthcare safety investigators. Lester et al. suggests using a 'centre-outwards' approach when conceptualising and describing competence, starting from core activities relevant to a profession rather than defining all the roles and functions that a professional would undertake, at the outset. (Lester et al., 2018) This approach takes into account that practitioner roles and functions will vary and evolve, which is particularly relevant to underspecified and new roles such as healthcare safety investigators. Given the complex work that healthcare safety investigators undertake, it is important to also describe competence from an integrated and comprehensive perspective, taking into account the characteristics of the person and also the contexts in which competence is used. (Vitello et al., 2021) However, developing such a competency framework is challenging. In their scoping review of methods and strategies used in the development of existing competency frameworks in healthcare professions, Batt et al. concluded that there are no apparent 'gold standard' to competency framework development. (Batt et al., 2020) They suggested using a combination of approaches (methods and data sources) that sufficiently captures the complexities of practice and careful consideration of the scope, granularity and context within which the competences will be used. (Batt et al., 2020).

Healthcare safety investigator appears to be a relatively new role at national and international settings; there is little about the role in the published literature. It is therefore important to ensure that the unique nuances relevant to the practice of healthcare safety investigators are understood. Developing a competency framework using multiple data sources, and methods using a 'centre-outwards' approach, with a range of key stakeholders, can provide assurance of the relevance and applicability in different settings. This is also important because 'competence' could be interpreted and therefore applied in practice differently by those working in education, professional governance and organisations. (Lester et al., 2018).

To our knowledge, there has been no competency framework developed specifically for healthcare safety investigators, anywhere in the world, that takes a 'centre-outwards' multi-method empirical research approach. However, we are aware of two resources concerning healthcare safety investigator competencies in England, developed with

different intent and methods. The first resource concerns the Patient Safety Incident Response Standards, (NHS England, 2024) which forms part of the Patient Safety Incident Response Framework (PSIRF) in England. (NHS England, 2022) The Patient Safety Incident Response Standards list four competencies, covering four key areas of practice for healthcare safety investigators (termed Learning Response Leads). (NHS England, 2024) Whilst core to the role, these four alone are arguably not comprehensive for a complex healthcare safety investigator role.

The second resource concerns the work of the Maternity and Newborn Safety Investigations (MNSI) programme in England. (Maternity and Newborn Safety Investigations (MNSI), 2024) The MNSI has been using a competency framework and associated portfolio for their maternity investigators since 2024. (Maternity and Newborn Safety Investigations (MNSI), 2024) The competency framework consists of 24 competencies and follows the Skills for Health National Occupational Standards (NOS). (Skills for Health, n.d.) Whilst designed for generic healthcare roles, the selected NOS would have been considered representative of the role attributes of a Maternity Investigator. Drawing competencies from a generic healthcare baseline, additional interpretation would likely be required for their application in investigator practice. We understand that this took place. The literature discusses employers having to find time to deal with the complexity and length of NOS documents. (Laczik and Fettes, 2020) Using an empirical approach that directly describes the specific professional activities may avoid the problems of interpreting the NOS. Lester et al. note the move away from NOS by some self-governing professions. (Lester et al., 2018) This aligns with the aspiration for a 'centre-outwards' and empirical approach to developing competencies for healthcare safety investigators generally, and the wider aspiration of professionalising the Healthcare Safety Investigator role.

Therefore, we aimed to develop a competency framework for healthcare safety investigators using a 'centre-outwards' multi-method approach involving key stakeholders in this study.

2. Methods

2.1. Ethical considerations

The study received a favourable ethical opinion from the University of Reading School of Chemistry, Food and Nutritional Sciences and Pharmacy Research Ethics Committee (study no: 12/2024). All potential participants were provided with a participant information sheet and informed that participation was voluntary. All participants gave written informed consent before taking part in the study.

2.2. Study design

We used a modified two-round Delphi technique electronically (e-Delphi). The Delphi technique is a structured communication method widely used in health and social research to achieve consensus among experts on specific topics where evidence is sparse, and expert judgment is required to guide decision-making. (Hasson et al., 2000; Keeney et al., 2001; Trevelyan and Robinson, 2015) This technique uses multiple iterations of data collection (survey) rounds (typically two or three) to gather the opinions and judgements of a panel of experts, who are geographically distributed, on the topic of interest. (Hasson et al., 2000) We used the Delphi technique electronically to increase accessibility of taking part in the study to a wide range of participants.

2.3. Recruitment

The Delphi technique uses a panel of 'experts' that represents the target population. (Trevelyan and Robinson, 2015) Determining who constitutes an 'expert' is not straightforward; it depends on the topic being studied. (Baker et al., 2006; Clayton, 1997) 'Expert' in this study was defined as: individuals reflecting expertise and experience in

systems-based healthcare safety investigations. We did not specify thresholds for expertise or experience in conducting systems-based healthcare safety investigations; it would be an arbitrary threshold and it would also be difficult to verify the information from readily available sources about the individual participant. Participants were asked to self-report their expertise and experience. In addition, we sought to recruit a diverse panel of participants from different roles associated with healthcare safety investigators. The criteria for selection of our expert panel were also informed by Lepre et al. (LePre et al., 2021) and included individuals who are 1) healthcare safety investigators, 2) healthcare safety investigation education content experts, 3) healthcare safety investigation academics and/or 4) patient safety policymakers.

Identification of expert panel members.

Purposive and snowball sampling methods were used to identify participants. We identified potential individuals based in England, who met the inclusion criteria, from our existing network of contacts. We invited them to take part in the study (purposive sampling) by sending them a study invitation and participant information sheet via email. We also asked participants to suggest names of other potential participants whom they thought met the inclusion criteria (snowball sampling). Following screening by the researchers based on our inclusion criteria, we emailed these potential participants with a study invitation and participant information sheet, inviting them to take part in the study.

2.4. Sample size

The sample size for Delphi studies depends on the nature of the investigation, the complexity of the problem, the similarity or diversity of the sample, and the availability of resources. (Keeney et al., 2001) Clayton (Clayton, 1997) suggests between 15 and 30 participants for a Delphi panel. We aimed for a maximum of 30 participants for our study. We did not aim for equal representation of different groups in our panel as it would not be feasible or appropriate. For example, we did not aim to recruit equal numbers of healthcare safety investigators and patient safety policymakers.

2.5. Data collection

Development of the surveys.

In a typical Delphi study, the first round involves creating an initial survey designed to capture a wide range of expert opinions, from which subsequent surveys are then developed. (Hasson et al., 2000; Day and Bobeva, 2005) Our initial survey was developed using data collected for a separate study that aimed to define the principles underpinning an effective healthcare investigation (Pickup and McMaster, 2024; Benson et al., 2025). In the separate study, 50 UK and international human factors, safety science, investigation and patient safety specialists were interviewed (Pickup and McMaster, 2024; Benson et al., 2025). Purposive and snowballing sampling methods were used to identify participants who had expertise and experience in healthcare safety investigations. Participants consented to take part in the interviews that explored the key principles for good practice investigations, the prerequisites for effective investigations and the potential barriers to effective investigations. The interviews were audio-recorded, and recordings transcribed verbatim. Anonymised interview transcripts were analysed using template analysis by two experienced qualitative researchers who led the study (Pickup and McMaster, 2024; Benson et al., 2025). Vignettes from the interview data, that ranged from 10 to 200 words each, were analysed, interpreted and then synthesised to develop competency descriptors by two researchers that led this current study (SH and RL). (Hide and Lim, 2025) We used a structured approach, first involving a meeting to explore and confirm that we did not have conflicts of interest or barriers to working together. We also agreed to ethical and inclusive practices where the contribution of each other is welcomed and we each can express our thoughts, be listened to and treated with respect. We also established our work schedule and

activities that we would undertake alone and as a team. Then, we worked independently to identify a competency in a quote, whether we see ambiguity, or a unique feature that we want to explore. This was then followed by team meetings where one of us would describe how quotes were interpreted to create a competency description, and the relevance of any supplementary observations. The other person would listen and ask questions about interpretation that often lead to deeper discussions where each other's meaning, perceptions and mindsets were explored. These discussions supported the cognitive activities involved in, and reflexivity concerning competency description creation. We regularly questioned our attitudes, processes and assumptions from our professional backgrounds during the process. Both researchers also undertook reflection after each team meeting, and when working individually.

Through extensive discussions between SH and RL, a total of 97 individual descriptors depicting qualities and practices required of an investigator were generated from the analysis. (Hide and Lim, 2025) These were categorised under four domains within 40 'overarching' competency statements: 1) Personal qualities (32 descriptors), 2) Investigation knowledge and skill application (40 descriptors), 3) Effective and compassionate engagement (17 descriptors) and 4) Manages investigation lifecycle (8 descriptors). (Hide and Lim, 2025) These domains, competency statements and individual descriptors were presented for consideration by participants in the round-one eDelphi survey.

The Research Electronic Data Capture (REDCap), a secure web-based software platform for online surveys, (Harris et al., 2009) was used to administer each survey round. Participants were asked to rate on a 5-point Likert scale (to take into account central tendency), with 1 being strongly irrelevant and 5 being strongly relevant, their level of agreement on the relevance of each domain and descriptor for a healthcare safety investigator. For each, participants had the opportunity to provide comments on their interpretation and suggestions for rewording. In the final section of the survey, participants could suggest additional competencies that they felt were missing, based on their experience.

The round-two survey was developed based on the results of the round-one survey. Some descriptors were amended and others deleted as part of the analysis. The second-round survey asked participants to re-rate descriptors that lacked consensus. As with the round-one survey, participants also had the opportunity to provide further comments on all the descriptors.

Administering the surveys.

Following consent, participants were sent an email on a specified date that included a link to the online survey of the relevant survey round. Up to two reminder emails were sent at an interval of one week, if necessary. Participants had three weeks to complete each survey. Participants had the option to save and complete the survey in more than one sitting. Only panel members who had completed the round-one survey were invited to participate in the round-two survey. Data was collected from May to August 2024.

2.6. Data analysis

Descriptive statistics were used to analyse the quantitative data. We used the most common quantitative indicators and thresholds that are widely regarded as reliable: median score (≥ 4 for a 5-point Likert scale), interquartile range (IQR) (≤ 1.25), (Boulkedid et al., 2011; Taylor et al., 2016) and a specific threshold of agreement to determine consensus ($\geq 70\%$). (Diamond et al., 2014) The median scores, IQRs and percentage agreement were calculated for each descriptor, using the functions in Microsoft Excel. Participants' comments were reviewed by three core researchers in the team (OA, RL and SH), with reference to the contemporary healthcare safety literature and practice.

In deciding whether descriptors should remain as they were, be reworded, or be removed, the core researchers considered both the rating scores for each descriptor along with the comments provided.

Decisions were made on a case by case basis. We adopted the same inclusive and respectful discussion approach used to develop the initial competency domains, statements and descriptors used in the round-one eDelphi survey, but this time with a third new researcher. We worked independently to identify and document our respective responses to each of the participant’s comments in a traceable format. This was then followed by team meetings where one of us would describe how we have come to our responses, with clear justification. The other two researchers would listen and ask questions about interpretation. Any disagreements would lead to deeper discussions where each other’s meaning, perceptions and mindsets were further explored until we reached consensus. We regularly questioned our attitudes, processes and assumptions from our professional backgrounds during the process. All three researchers undertook reflection after each team meeting, and when working individually.

For example, following the round-one survey, descriptors that scored outside the thresholds specified for all three indicators were not always automatically removed. Comments related to the descriptor were considered in detail to identify potential reasons for non-consensus such as being out of scope or repetition within the framework. Similarly, not all descriptors that scored within the thresholds specified for all three indicators were included in the framework. If the option was to reword a descriptor, these changes were discussed and also agreed amongst the three core researchers. We reviewed the entire competency framework holistically and any competencies that now read repetitive and obsolete following participant feedback were removed. Participants were provided with a detailed table (see Table 2 in the Supplementary Material) describing the decision-making made by the core researchers to the competency framework, in response to participant feedback in the round-one survey. Participants also had the opportunity to comment on the revised competency framework in the round-two survey.

The combination of quantitative and qualitative approaches ensured a comprehensive evaluation of the data.

A summary of the e-Delphi process is presented in Fig. 1.

A two-round e-Delphi study design was deemed sufficient because consensus was reached following the round-two survey.

3. Results

A total of 67 potential participants were approached to take part in the study. Thirty-eight gave their consent to take part in the study, of which 28 completed the round-one survey and 24 out of 28 (86%) completed the round-two survey. Table 1 shows the participant demographics.

Table 1
Demographics of participants.

Category	Number of participants, n (%)	
	Round 1 (n = 28)	Round 2 (n = 24)
<i>Current role in healthcare safety investigation</i>		
Healthcare safety investigator	15 (54%)	13 (54%)
Healthcare safety investigation content educator	7 (25%)	5 (21%)
Participants involved in oversight function	4 (14%)	4 (17%)
Policy maker	2 (7%)	2 (8%)
<i>Training and education undertaken, relevant to healthcare safety investigations</i>		
University degree e.g. postgraduate diploma, Masters, PhD	12 (43%)	11 (46%)
Health Services Safety Investigations Body training and short courses	14 (50%)	11 (46%)
Conferences and workshops	1 (3.5%)	1 (4%)
Training from another sector	1 (3.5%)	1 (4%)
<i>Length of time involved in healthcare safety investigations</i>		
1–5 years	7 (25%)	5 (21%)
6–10 years	14 (50%)	13 (54%)
11–15 years	4 (14%)	4 (17%)
>16–20 years	3 (11%)	2 (8%)
<i>Total number of healthcare safety investigations completed using a systems-based approach</i>		
1–5	6 (21%)	4 (17%)
6–10	2 (7%)	2 (8%)
11–15	1 (4%)	1 (4%)
>15	19 (68%)	17 (71%)

n = total number of participants.

Most of the participants who completed both rounds of the survey were healthcare safety investigators (54%). Some said that they had more than one role. We included their primary role when describing the demographics of participants. 43% and 46% of participants in round one and round two respectively, had formal education related to safety investigations. These ranged from short courses to a doctorate. The majority of participants (75% (round-one), 79% (round-two)) had been involved in healthcare safety investigations for more than 6 years. More than two-thirds had been involved in more than 15 systems-based healthcare investigations. Overall, our panel of experts can be considered a diverse, qualified and experienced sample.

Round-one survey findings.

The round-one survey contained 40 competency statements and 97 individual descriptors. For each competency statement, there could be more than one descriptor. Out of the 97 descriptors rated by participants, 85 (88%) had high levels of agreement (IQR ≤ 1.25, % agreement ≥ 70%) with a strong median range (4–5 on a 5-point Likert scale). Eleven descriptors had varying levels of agreement and one descriptor, a

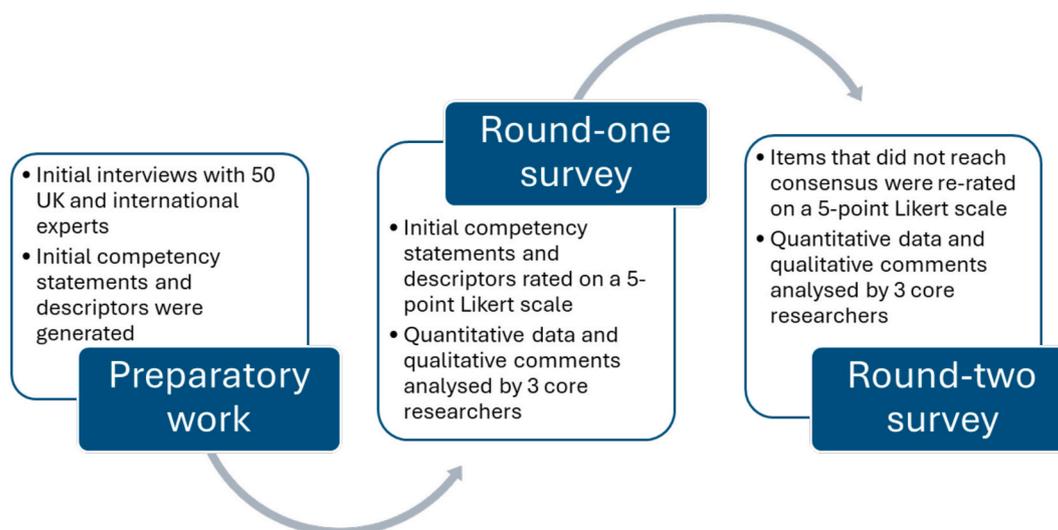


Fig. 1. Summary of the e-Delphi process.

Table 2
List of final competencies and descriptors.

Domain One: Personal Qualities	
Inherent Characteristics	
1	Is empathic <i>Is sensitive to and seeks to understand the feelings and experiences of others. Demonstrates their concern through compassionate engagement with those in an investigation.</i>
2	Is inquisitive <i>Demonstrates interest and curiosity in an investigation. Actively seeks new information and a range of views throughout an investigation.</i>
3	Is rigorous <i>Is meticulous in attention to detail. Critically reflects upon robustness of own practice at all stages in an investigation.</i>
Professional identity	
4	Demonstrates knowledge in healthcare safety investigations <i>Understands depth and scope of high-quality healthcare safety investigations through appropriate training. Understands the fundamentals of a systems approach, investigation methodologies and methods, and of engaging people.</i>
5	Invests in personal professional development <i>Keeps abreast of developments in theory and practice relating to healthcare safety investigations. Reflects upon scope of own investigation skill and knowledge. Identifies professional learning needs and develops a strategy to maintain, strengthen and build own skills and experience.</i>
6	Supports knowledge development in investigation practice <i>Shares knowledge and experience in the field of healthcare safety investigations. Where possible, offers support to the development of other healthcare safety investigators.</i>
7	Is perceived as a credible professional <i>Is clear about their identity as an investigator and scope of their role in an investigation. Is recognised for having the necessary skills, expertise, and autonomy to direct and undertake a healthcare safety investigation.</i>
8	Actively promotes team-working <i>Demonstrates effective, collaborative and supportive practices with those involved in an investigation.</i>
Ethical practice	
9	Responds to reflection of own expertise and experiences <i>Seeks additional knowledge and/or specialist input as needed. Adopts measures to reduce any unintended influences of their personal and professional background in an investigation.</i>
10	Is sensitive and responsive to the needs of investigation participants <i>Anticipates the potential for trauma to self and all involved in an investigation and adapts practice accordingly. Actively contributes to a psychologically safe culture.</i>
11	Seeks and offers peer review <i>Values constructive criticism with peers and external experts.</i>
12	Demonstrates independence <i>Investigates from a neutral stance. Collects information only for the purpose of a healthcare safety investigation.</i>
13	Maintains confidentiality <i>Keeps confidential the personal information that informs and supports a systems investigation, except when high and/or immediate safety risk is identified. Raises concern when high and/or immediate safety risk is identified during an investigation. Reports only the relevant personal information that supports subsequent interpretation and learning.</i>
14	Demonstrates integrity <i>Is open, transparent, and honest throughout a healthcare safety investigation. Communicates orally and in writing (as required) the processes, progress, reasoning, and rationale for each stage of the investigation. Is alert to and avoids influences from others that might impact their impartiality.</i>
15	Demonstrates diplomacy <i>Identifies and confidently negotiates conflict and challenging situations. Uses diplomacy and tact in all communications and engagement.</i>
Domain Two: Investigation knowledge and skill application	
Core knowledge and understanding	
16	Demonstrates knowledge and understanding of the investigation context <i>Understands the immediate and broader context of a healthcare investigation.</i>
17	Demonstrates knowledge and understanding of systems thinking within complex healthcare systems investigations <i>Understands systems thinking and why it is needed within investigations in complex healthcare systems.</i>
18	Demonstrates knowledge and understanding of the principles (as below) core to a healthcare safety investigation

Table 2 (continued)

Domain One: Personal Qualities	
<i>A systems approach is used in an investigation rather than a sequential or linear enquiry.</i>	
<i>'Human error' or blame is not the final outcome of an investigation; the focus is on understanding the work system.</i>	
<i>'What happened' is the driver to explore and understand interactions among contributory factors in the work system.</i>	
<i>Normal work practices (work-as-done: WAD) are explored to learn of; (i) inherent variabilities, demands upon people, and adaptations to work-as-imagined (WAI), and (ii) inherent strengths and weaknesses/risks.</i>	
<i>Counterfactual reasoning (what could or should have happened) is not the final outcome of an investigation; the focus is on understanding the work system.</i>	
<i>Exploring local rationality (the influence of situation and context on decisions and actions) is key to understanding why work differs from what was expected.</i>	
<i>There may not be a single 'truth'; there may be contradiction or different perspectives among those involved in an investigation.</i>	
19	Demonstrates knowledge and understanding of principles of engagement and involvement <i>Demonstrates knowledge of principles relating to engaging and involving people in an investigation.</i>
20	Demonstrates knowledge and understanding of principles of restorative just culture <i>Demonstrates knowledge of restorative just culture principles in an investigation.</i>
Investigation practice	
21	Demonstrates applied skills as an investigator to plan, prepare and review the design of an investigation <i>Clearly defines the aims and purposes of an investigation, that includes both restoration of trust, and organisational learning to support system improvements. Identifies at an early stage people key to an investigation. Consults with them on issues of investigation scope, timescale and terms of reference. Reviews the range of those involved in an investigation and approaches others, as appropriate during an investigation. Determines the terms of reference (ToR): (i) Focuses the ToR to meet the investigation aim and agrees timescales. (ii) Promotes a breadth of investigation and offers sufficient flexibility to pursue emergent issues.</i>
22	Demonstrates skills as an investigator to use system-based investigation methodologies <i>Uses human factors and ergonomics/safety science informed methodologies (i.e. models, frameworks, thinking or principles) to guide the design and conduct of an investigation.</i>
23	Demonstrates applied skills as an investigator to use investigation methods and techniques <i>Appropriately uses a range of methods, tools or techniques to understand performance influencing factors.</i>
24	Demonstrates skills as an investigator to collect investigation data <i>Determines what information is needed, and where and how to find it. Demonstrates awareness of the quality and quantity of data, and its sufficiency for analysis and interpretation.</i>
25	Demonstrates skills as an investigator to analyse and interpret data <i>Demonstrates the use of investigation principles, chosen framework and methods to undertake a systems based analysis. Weighs up the evidence during analysis to create perspective. Explores interactions, identifies emergent themes, and determines implications of findings across the work system. Considers how findings might inform subsequent development of systems improvements.</i>
26	Demonstrates skills as an investigator to identify areas for system improvement <i>Identifies goals for system improvements, based on both investigation findings and engagement with those affected. Is not unduly influenced by perceptions of what the organisation is willing to consider when developing systems improvement.</i>
27	Demonstrates skills as an investigator to report the investigation <i>Presents key details of the investigation. Applies professional judgement in determining the breadth and depth of the systems analysis and interpretation to include in the report. Reports any outstanding gaps in the event or contextual knowledge.</i>
28	Demonstrates skills as an investigator to assure quality of investigation integrity <i>Critically considers and responds to peer and/or external review. Uses agreed quality indicators at defined investigation milestones.</i>
Domain Three: Effective and compassionate engagement	
Being supportive of people involved in an investigation	
29	Demonstrates insight into the experience of others

(continued on next page)

Table 2 (continued)

Domain One: Personal Qualities	
	<i>Recognises the emotional impact upon those involved in an investigation and the potential for an investigation to re-traumatise. Balances information needs against risk of causing further harm and signposts, where appropriate, to suitable support (such as treatment, mediation, reconciliation, or financial help).</i>
Meaningful engagement with people	
30	Prepares for engagement and involvement <i>Recognises the diverse circumstances and unique engagement needs among those involved in an investigation. Adapts engagement and involvement approaches as roles and personal circumstances permit. This could include consideration of the means, frequency, length, location, and the nature of contact preferred.</i>
31	Engages intentionally and genuinely with people <i>Ensures that collaboration with people is central to an investigation. Establishes trusting relationships, and seeks to understand people's lived experiences, perspectives and motivations to participate. Involves (as appropriate) those involved in an investigation in developing the ToR, interpreting findings, developing safety improvements and reviewing draft reports.</i>
Promotes engagement through interview practice	
32	Prepares and supports interviewees <i>Adapts approach to build rapport with prospective interviewees, encouraging them to speak openly and detailing how privacy and confidentiality of the information they provide is addressed. Promotes understanding and expectations of interview aim, conduct, systems thinking and use of resultant data in an investigation. Facilitates appropriate support for the interviewee during the interview.</i>
33	Conducts the interview <i>Uses language that is meaningful to both the interviewer and interviewee. Adapts interview approach to suit the interviewee's role and needs, whether undertaken in person or remotely. Emotional influences upon an interviewee's standpoint are acknowledged. Adapts the interview focus or style based on effective observational and listening skills.</i>
Writes for the audience	
34	Tailors content for the user <i>Presents information using plain English or any other language as needed, with the appropriate tone and presentation style specific to the audience.</i>
Domain Four: Manages investigation lifecycle	
35	Identifies opportunities to learn from completed investigations <i>Reflects and learns from different sources of safety information.</i>
36	Uses agreed organisational investigation processes <i>Uses agreed organisational processes in all aspects relating to an investigation.</i>
37	Schedules work and manages time <i>Identifies and agrees schedules for appropriate and timely investigations. Plans for own availability and changing needs in an investigation.</i>
38	Manages data <i>Uses agreed methods for documenting all collected data and for its immediate and longer-term use, safe storage and disposal, permissions for access, and management.</i>

low level of agreement. Following analysis of qualitative comments from participants, 15 competencies and 57 descriptors were rephrased to enhance clarity. Two competencies and 14 descriptors were deleted. See Supplementary Material 1 for the full results.

For example, competency 40 “Monitors and measures the impact of investigation outputs” was deleted due to a lack of agreement amongst participants on its relevance as a competency to an investigator. Participants said it was not within the remit of an investigator to monitor and assess the effects of recommendations; it was the responsibility of the recipient organisation because there is usually a long lead time for any impact to be realised. This feedback also aligned with (Vincent et al., 2017) regarding a time lag in being able to assess of the impact of any recommendations made over time. Based on the quantitative figures, qualitative comments and the relevant literature, the review team decided to remove this competency and the associated descriptors.

The descriptor “Focuses the Terms of Reference (ToR) to meet investigation aim and timescales”, within competency 21 also had low levels of agreement amongst the participants. During the investigation of a safety incident, the ToR provides the scope of the investigation, while the timescale refers to the timeframe within which the investigation is to be conducted. Participants commented on the problem of focusing ToR to meet timescales. While ToR and timescale are distinctively different,

both are interconnected and part of the investigation planning process. The statement was re-phrased to “Focuses the ToR to meet investigation aim and agrees timescales”. This new statement had higher levels of agreement (IQR = 1, Median = 4, % agreement = 87.5) in the round-two survey.

An additional descriptor “Raises concern when high and/or immediate safety risk is identified during an investigation” was added to the competency 13 statement “Maintains confidentiality”. Participants commented on the safety risks and the need to escalate issues where an ongoing or unmitigated and significant risk is identified during an investigation.

Round-two survey findings.

Participants were asked only to rate new descriptors and those that did not reach consensus in the round-one survey. There were three descriptors that required re-rating. At the end of the round-two survey, two of the three descriptors had high levels of agreement (IQR (≤ 1.25 , % agreement ($\geq 70\%$) with a strong median range (4–5 on a 5-point Likert scale). There was lack of agreement on the relevance of the remaining descriptor “Ensures that systems improvements are amenable for evaluation” (IQR 2, % agreement $\geq 70\%$). This descriptor was therefore deleted. One participant commented that “while recommendations may be static, adapting such for ongoing improvements has to be dynamic, taking into cognisance changes in time and local context”. Therefore, the competency would be more relevant to those implementing the improvement rather than the individual healthcare safety investigator.

Consensus was reached on 38 competencies (sub-divided in 4 domains) and 82 individual descriptors for healthcare safety investigators. Table 2 shows the final list of competencies. To provide an overview,

- Domain One (competencies 1–15, comprised of 31 descriptors) concerns ‘Personal qualities’; the characteristics of an investigator. It incorporates their identity and role as a professional, and the way they conduct their work in an ethical manner by doing the right thing on a day-to-day basis and when faced with dilemmas in an investigation. These competencies underpin all investigation-related activities.
- Domain Two (competencies 16–28, comprised of 31 descriptors) concerns ‘Investigation knowledge and skill application’; these competencies relate to the core knowledge set that is fundamental for undertaking healthcare safety investigations. It also includes the competencies relevant to the application of this knowledge in practice.
- Domain Three (competencies 29–34, comprised of 15 descriptors) concerns ‘Effective and compassionate engagement’; these competencies relate to the approaches taken to support, develop and enhance meaningful engagement with a range of people such as patients, families, staff, subject matter experts and any others involved directly or indirectly in an investigation.
- Domain Four (competencies 35–38, comprised of 5 descriptors) concerns ‘Manages investigation lifecycle’ and comprise ongoing operational practices that underpin investigation functions.

4. Discussion

To our knowledge, this is the first empirically derived competency framework for the healthcare safety investigator role. Our two-round e-Delphi consensus study identified 38 competencies and 82 corresponding descriptors for healthcare safety investigators. The competencies and descriptors were organised into four domains: 1. Personal qualities, 2. Investigation knowledge and skill application, 3. Effective and compassionate engagement, and 4. Manages investigation lifecycle.

These domains and competencies align with the literature that suggests that investigators need to possess a broad set of competencies covering areas such as technical knowledge and expertise, (Chang et al., 2012) communication and interpersonal skills, (Nixon and Braithwaite, 2018; Daud et al., 2010) ethical and behavioural competencies, (Provan et al., 2019) while also being adaptable to different situations (Ishimaru

et al., 2020) and committed to continuous learning. (Christodoulou, 2014) There are however some key differences such as the level of detail describing each competency. Our competency framework included clear descriptions of each competency and the accompanying descriptors, providing clarity to users to avoid potential misunderstanding. For example, we amended the wordings of competencies and descriptors following feedback from participants during both survey rounds. Also unique to our competency framework is the emphasis on effective and compassionate engagement with those affected by an incident, in Domain 3. The competencies in Domain 3 goes beyond being empathic and curious, as included in other competency frameworks to include considerations of the journey that an investigation participant may encounter throughout the investigation lifecycle. (Chang et al., 2012; Nixon and Braithwaite, 2018; Daud et al., 2010; Provan et al., 2019; Ishimaru et al., 2020; Christodoulou, 2014) An example is the involvement of investigation participants in the development of the terms of reference, reviewing of investigation findings and involvement in safety actions or recommendations. This is absent from existing competency frameworks such as that in the aircraft accident investigators and generic safety professional competencies. (Chang et al., 2012; Nixon and Braithwaite, 2018; Daud et al., 2010; Provan et al., 2019; Ishimaru et al., 2020; Christodoulou, 2014) There is also an absence on managing the investigation lifecycle in other competency frameworks but considered important to our study participants. The content of the competency framework reflects contemporary thinking in safety science in healthcare, which in turn provides the opportunity for organisations to reflect on the quality and nature of current healthcare safety investigations to impact patient and healthcare system outcomes. The narrow inter-quartile range (≤ 1.25) and high percentage agreement ($\geq 70\%$) obtained for the majority (88%) of the descriptors indicate a high level of confidence in our reported findings.

Being the first of its kind, our findings have the potential to influence the scope and requirements of the healthcare safety investigator workforce in England, and globally following further validation. The competency framework could also support healthcare systems worldwide to reflect on their approach to healthcare investigations, through a gap analysis of their systems and processes. This set of competencies and the accompanying descriptors for healthcare safety investigators can be used for a variety of purposes. For example, they can be used in a standardised way to inform the recruitment and selection process of healthcare safety investigators through job descriptions and role profiles. Healthcare organisations could consider using the competency framework as a resource to inform the hiring process such as competency-based interview questions and/or assessments targeted at relevant competencies. They can also be used as a tool for personal and organisational reflection, in identifying opportunities or gaps in investigator knowledge and skill at a personal, team and organisational level. Bowie *et al.* proposed the need to implement standardised content for safety training, including certification and continuous professional development for healthcare safety investigators. (Bowie et al., 2023) Our study findings can be used to inform the development of content to educate healthcare safety investigators to ensure that there is a common conceptual foundation for safety investigators, as also advocated by Haraldseid-Driftland *et al.* (Haraldseid-Driftland et al., 2022) For example, the design of educational and training courses could be structured around the four domains, and the curricula focused on the 38 competencies. The healthcare safety investigator curricula could be the basis for certification of investigators, and performance management, moving the role towards professionalisation. (Skulmoski et al., 2007).

4.1. Strengths of the study

To enhance robustness of the quantitative findings in this study, three indicators (IQR, Median and % agreement) were used to assess consensus in comparison to two quantitative measures that are used in most Delphi studies. Our panel of experts represented a range of

stakeholders who had considerable experience in healthcare safety incident investigations. We had a high response rate (74% in round one) and high retention rate (86% in round two) for the study, suggesting interest and importance of the study. More than half of the participants were practising healthcare safety investigators, providing perspectives based on actual experiences of working as an investigator.

4.2. Limitations of the study

All study participants were based in England. This is to capture views and experiences of those practising within similar national circumstances and practices such as the implementation of PSIRF. The resultant competency framework would therefore be relevant primarily to healthcare safety investigators in England. But, our initial data source were interviews with 50 national and international experts in healthcare safety investigations, and therefore also represented views from an international viewpoint. For the e-Delphi, we cannot be sure whether participants' perspectives included their experiences working outside England and/or in other non-healthcare settings. Our use of a snowball sampling approach could have drawn participants from a similar network rather than a wider group. We invited patient, carer and healthcare staff representatives to take part in the study but none consented to take part. Their perspectives were therefore not directly represented in the development of these competencies. It is important to note that most if not all healthcare safety investigators would typically have direct contact with patients, carers and/or healthcare staff in their investigations, providing indirect insights. Healthcare safety investigator participants' experiences may likely be shaped one way or another by their contact with patients, carers and/or healthcare staff. We did not ask participants whether they had ever been directly involved in a healthcare safety investigation as a patient, carer or healthcare professional. If they had, we cannot be sure whether participant responses also represented these experiences.

A traditional Delphi study provides participants with inter-round aggregated responses from the panel prior to the next survey round. Aggregated responses allow participants to see the collective responses of the group, helping them understand the general consensus or divergence of views. (Skulmoski et al., 2007) Participants can then use the information to inform their decision-making one way or another in subsequent rounds. There is, however, methodological diversity in Delphi studies. Criticism has been made on the value of providing aggregated responses between survey rounds such as the risk of conformity bias, cognitive load and survey fatigue. (Khodyakov et al., 2023; Veugelers et al., 2020; Hasson et al., 2025; Schifano and Niederberger, 2025) Aggregated group responses can lead to 'group think' rather than genuine reconsideration of initial decisions that represent participants' independent, authentic expert views. (Khodyakov et al., 2023; Veugelers et al., 2020; Hasson et al., 2025; Schifano and Niederberger, 2025) In this study, we prioritised authentic uninfluenced perspectives over the risk of conformity bias to avoid inadvertently influencing expert responses. We acknowledge the decision not to include inter-round feedback as a design trade-off. We acknowledge that the absence of inter-round feedback may limit the opportunity for individual participants to clarify any potential misunderstandings, reflect and reconsider their ratings against the rest of the panel. Participants, however, had access to the decision-making of the core researchers as presented in Table 2 in the Supplementary File. We do not know whether or not this decision may have affected the nature or stability of consensus.

The landscape of healthcare safety investigation is evolving. It is also possible that there could be additional competencies that had not been included in the current competency framework.

4.3. Future research

An adoption and implementation plan that addresses how the framework would be trialled and subsequently used, and by whom,

could be a next step from our work. There is potential for the competency framework to be incorporated into standards, policies and inform efforts towards professionalising the role of the healthcare safety investigator nationally or internationally. Additional work may include working closely with stakeholders to develop supporting or explanatory notes for using the competency framework in practice.

Evaluating the use and value of the competency framework is another key piece of work. For example, longitudinal studies could assess how well the competencies translate into practice and whether they contribute to measurable improvements in patient safety outcomes. Additionally, exploring regional adaptations through cross-cultural studies would be valuable, as healthcare systems and investigative practices vary globally. As this is the first iteration of the healthcare safety investigator competency framework, it is likely that there will be refinements over time to ensure its relevance and credibility. A next step would be to incorporate the views of patients, families and frontline clinical staff into the competency framework. Following that, there would also be a need for evaluation of the use of the framework from the initial introduction through to adoption and ongoing use. Working closely with key stakeholders would be important to ensure relevance and impact.

Other future work could also involve mapping the training and development needs of healthcare safety investigators based on this framework to inform the design of educational programmes. Accompanying this piece of work is a consideration of 'oversight' of the practice of healthcare safety investigations within teams and organisation.

5. Conclusions

This is the first empirically derived competency framework for the healthcare safety investigator role. Using an e-Delphi consensus approach, we identified four domains that encompassed a set of 38 competencies and 82 corresponding descriptors for healthcare safety investigators. The high levels of agreement among participants give credibility to the findings. This comprehensive competency framework provides an evidence base to inform the scope and requirements of healthcare safety investigator workforce. Future work includes developing an adoption, implementation and evaluation plan for using the competency framework in practice.

CRedit authorship contribution statement

Rosemary HM Lim: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Sophie Hide:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Formal analysis, Conceptualization. **Omotoyosi Akanbi:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis. **Jane Carthey:** Writing – review & editing, Investigation. **Claire Cox:** Writing – review & editing, Investigation. **Clare Crowley:** Writing – review & editing, Investigation. **Christopher Elston:** Writing – review & editing, Investigation. **Saskia Fursland:** Writing – review & editing, Investigation. **Tracey Herlihey:** Writing – review & editing, Investigation. **Scott Hislop:** Writing – review & editing, Investigation. **Catherine Leon:** Writing – review & editing, Investigation. **Cherry Lumley:** Writing – review & editing, Investigation. **Jenny O'Donnell:** Writing – review & editing, Investigation. **Catherine O'Reilly:** Writing – review & editing, Investigation. **Melanie Ottewill:** Writing – review & editing, Investigation. **Deinniol Owens:** Writing – review & editing, Investigation. **Laura Pickup:** Writing – review & editing, Investigation. **Louise Pye:** Writing – review & editing, Investigation. **Yasmin Razmus:** Writing – review & editing, Investigation. **Nicholas Seaton:** Writing – review & editing, Investigation. **Judy Walker:** Writing – review & editing, Investigation. **William Lea:** Writing – review & editing, Investigation. **Nicholas Woodier:** Writing – review & editing, Investigation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssci.2026.107161>.

Data availability

Data is included in the [Supplementary Material](#)

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