


# BMJ Open Evaluating a system-wide, safety investigation in healthcare course in Norway: a qualitative study

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## ABSTRACT

**Objective and setting** National, system-wide safety investigation represents a new approach to safety improvement in healthcare. In 2019, a new master's level course in Safety Investigation in Healthcare was established to support the training and development of a new team of investigators from an independent investigatory body. The course was established at one Norwegian university and a total of 19 students were enrolled and completed the course. The aim of this study was to qualitatively evaluate the course, and the objectives were to explore the students' needs and expectations prior to the course conduct, and their experiences and suggestions for improvements after course completion.

**Design** The study design was a qualitative explorative study with individual and focus group interviews. Data collection included five individual interviews prior to course participation and two focus group interviews, after course participation, with a total sample size of 13 participants. Data were analysed according to thematic analysis.

**Results** The results showed a need for a common conceptual foundation for the multidisciplinary team of safety investigators who were all employed in the same investigatory body. Course participation contributed to create reflexive spaces for the participants and generated new knowledge about the need for a broad range of investigatory tools and approaches. This contrasted with the initial aspiration among the participants to have a recipe for how to conduct safety investigations.

**Conclusions** Course participation contributed to a common language among a highly multidisciplinary group of safety investigators and supported building a culture of collaborative learning. The need for additional activities to further develop a safety investigation curriculum in healthcare was identified. It is recommended that such a curriculum be co-created with independent investigators, safety scientists, patients and users, and healthcare professionals to ensure a strong methods repertoire and a sound theoretical backdrop for investigatory practice.

## INTRODUCTION

One of the most fundamental aspects of safety in healthcare is to learn from adverse events to improve future healthcare services.<sup>1–6</sup> Every year, a large number of patients across the world are harmed by adverse events such as late diagnosis, wrong diagnosis, wrong

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The participants represent independent national investigators who work for learning purposes only, to improve patient safety in Norway.
- ⇒ The course was developed based on input from the national investigatory body to ensure relevance.
- ⇒ The study evaluated the first round of running the new investigation course where 13 out of 19 students participated. A higher number of participants could have provided additional information and perspectives.

treatment, technical failure, medication errors and infections. It is estimated that unsafe care most likely is one of the 10 leading causes of death and disability in the world.<sup>7</sup> Nearly 50% of the harmed caused by adverse events in hospitals, could be prevented in high-income countries.<sup>8</sup> To learn from these events, safety investigation is key.<sup>4 9–12</sup> Investigating and learning from serious adverse events is a complex process that confronts many challenges.<sup>13–15</sup> These challenges relate to establishing multidisciplinary competence to address the complex non-linear phenomenon of adverse events, the independence of the investigatory body, patient and user involvement in investigations, and trust and system understanding.<sup>4 11 12 14–16</sup>

Different types of courses exist to train and support accident investigators in different sectors such as aviation (Airports Council International, Canada), transport, (Cranfield University, UK), industrial accidents (National Safety Council, USA) and healthcare (Norwegian Directorate of Health, Norway). Although accident investigation courses exist within the healthcare sector, few university level courses hold a systems perspective that supports competence development and specialist knowledge and skills required for independent, system-wide national safety investigation. Hence, on a collaboration request from a new independent national

**Table 1** Overview of main topics and content covered in each topic

Overall main topics of the safety investigation in healthcare course	Content covered in each topic
1 Accident models and theoretical foundation for safety investigations	Understanding risk and failure in healthcare systems and how to investigate risk across system levels and time
2 Complexity of healthcare systems, technology and people	Exploring the nature and implications for safety of complex interactions and sociotechnical adaptive systems
3 Methods of safety investigations	Understanding and comparing different methodological approaches and analytical tools for safety investigation and the relative strengths and limitations of each
4 Patient and stakeholder involvement in safety investigations	Understanding strategies and practices for integrating different perspectives and stakeholders into investigations—the harmed, the involved, the managers, the regulators
5 Just culture, safety investigation and organisational learning	Taking care of and involving the healthcare professionals—experiences from the field Approaches to investigate and contribute to system learning
6 Rapid table-top simulation of a safety investigation	Developing practical skills by applying the models, methods and tools of investigation to a simulated incident

healthcare safety investigation body in Norway, the University of Stavanger designed a Master of Science level course that could support future safety investigators in competence development to achieve high-quality safety investigations in healthcare. Specifically, the course was designed to give insight into the required knowledge, skills and analytical capacity to understand how safety investigations in healthcare can be approached to foster patient safety and learning processes from a system-wide perspective. During 2019, 19 students from a Norwegian independent safety investigatory body were enrolled and completed the course.

### Description of safety investigation course

The safety investigation course was designed as a 5 ECTS (European Credit and Accumulation System) course. This means that the course is expected to demand between 125 and 150 work hours.<sup>17</sup> The course was given in English, over a period of three 1-day sessions, with individual reading and group tasks to be completed in between sessions. Every course day lasted 7 hours from 9:00 to 16:00 hours, with 4 weeks between day 1 and day 2, and 3 weeks between day 2 and day 3. During the course, the students were introduced to six main topics and took

part in different student-active collaborative learning methods such as group work and a table-top simulation of a safety investigation (see [table 1](#)). In addition, the students applied their skills to real reported events as cases for testing and practicing theoretical perspectives and methods. The learning outcomes of the course were set according to knowledge, skills and general competence (see overview in [table 2](#)). The content of the course was based on recent research into accident and safety investigations in healthcare, with examples from other relevant industries. The course was finalised with a take-home examination, based on a group approach. This entails that the students were given the exam task at the beginning of the course. They were then grouped in groups of 4–5 students and worked on the group examination before submitting a paper at the end of the term. In the examination paper students describe, investigate and discuss a self-selected research problem with a word limit of 5000. A take-home examination is often preferred when the main aim is to foster higher-order thinking skills and allow time for reflection.<sup>18</sup> The examination papers were marked ‘approved’/‘not approved’, in accordance with The Norwegian Association of Higher Educations

**Table 2** Learning outcomes in the safety investigation in healthcare course

Knowledge	Skills	General competence
<ul style="list-style-type: none"> <li>▶ About the foundation of different types of safety investigations</li> <li>▶ About existing accident models and theories explaining causality</li> <li>▶ About principles, practices and processes of safety investigations</li> <li>▶ About safety investigation methods in healthcare and other industries</li> <li>▶ About how different stakeholders’ (eg, patients, next of kin, healthcare professionals, managers, regulators) perspectives and experiences can be incorporated into safety investigations</li> <li>▶ About strengths and limitations in safety investigations</li> </ul>	<ul style="list-style-type: none"> <li>▶ To apply accident theories and investigation methods in practice</li> <li>▶ To evaluate scientific publications in safety investigation</li> </ul>	<ul style="list-style-type: none"> <li>▶ To critically analyse different theoretical, methodological and practical approaches to safety investigations in healthcare</li> </ul>

Institutions guidelines for group examinations. During a take-home examination the students have access to, and are free to use, all course material, databases and internet resources to solve the examination task.

### Aim and research questions

The aim of this study was to qualitatively evaluate the Safety Investigation in Healthcare course and explore the students' needs and expectations prior to the course, and their experiences and suggestions for improvements after course completion.

The study was guided by the following research questions: (1) What are the expectations from healthcare safety investigators for a system-wide safety investigation course? (2) How did healthcare safety investigators experience attending the course and what are their suggestions for improvement?

## METHODS

### Design

The study was designed as a qualitative explorative study using individual and focus group interviews<sup>19</sup> in order to provide information concerning the students' needs, expectations and experiences related to the safety investigation in healthcare course.

### Data collection and analysis

Data collection was conducted in two phases. First, five individual interviews were undertaken prior to the course starting, followed by two focus group interviews after course completion. Individual interviews were chosen to give the participants, who had a range of different backgrounds, the opportunity to provide in depth descriptions of expectations and knowledge gaps, prior to course participation.<sup>20</sup> After course participation, focus group interviews were chosen since the topics of interest here were related to the joint experience of participating at the course. A total of 13 students took part in the study. Five of them participated in both an individual interview as well as a focus group interview, while eight of them only took part in focus group interviews. Safety investigators and managers of the investigatory body participated in both phases. All participants were affiliated with the same investigatory body and were recruited through an invitation by email to the contact person in the management team. The participants had a various of backgrounds such as, nursing, medicine, human factors, safety, philosophy, psychology, political science, etc.

All interviews took place at the participants' current workplace. The interviews lasted approximately between 40 and 60 min and were conducted by three researchers (LS, JGA and CH-D) who had no involvement in the course delivery, only in the design and administrative tasks. Voice from all individual and focus groups interviews were tape recorded and verbatim transcribed by authors LS and JGA shortly after the interviews took place. The recordings only contained voice and no video.

The transcribed data material from both individual interviews and focus group interviews were analysed using thematic analysis.<sup>21</sup> The analysis process followed an inductive six step process, guided by the research questions although not following a specific framework in the analysis process. During step 1, authors LS and JGA transcribed and anonymised the data material, before authors CH-D, VG, JGA, LS, AR and SW familiarised themselves with the data and noting down initial ideas such as 'expectations', 'experiences' and 'suggestions for improvement'. In step 2 of the analysis, initial codes were generated before step 3, where the authors discussed initial themes and gathered all relevant data to each potential theme. In step 4, authors reviewed the themes and agreed on the final version of the themes in a second workshop, in step 5. In step 6, the authors produced the final text with the results. Author CH-D led the analytical process with support from SW.

### Individual interviews

The individual interviews were conducted using a semi-structured interview guide aimed to answer research question (1). The interviews were focused on mapping current work task, needs and practices as well as needs and expectations related to investigation methods, investigatory principles, theoretical knowledge, investigation methods, user involvement, interdisciplinary teamwork, simulation experience and competence related to setting criteria for investigation initiation.

### Focus group interviews

The focus group interviews were conducted 3–4 months after the participants had completed the course. The rationale for this was to give the participants the chance to include the knowledge and experiences from the course in their everyday work. Safety investigators and managers were divided into two separate groups during the focus group interviews to enable all participants to speak more freely.<sup>22</sup> Both groups consisted of four participants, safety investigators in group 1 (three male, one female) and managers in group 2 (three female, one male). The semi-structured interview guide for these interviews aimed to answer research question (2). The guide covered themes related to experiences and suggestions for improvement regarding course structure, relevance to current work tasks, theory, investigation methods, different pedagogical approaches, user involvement and interdisciplinary teamwork. In group 1, all the participants were eager to contribute, had a friendly tone and waited for their turn to speak. In group 2, it was mainly three of the four participants that spoke, while the fourth took a more confirmatory role, nodding in response to the other participants' contributions.

### Patient and public involvement

The course was developed with input on collaboration with the interdependent national investigatory body,





where different parts of the course such as content, layout and design were discussed.

## RESULTS

The analysis resulted in two main themes. These themes are: (1) Needs and Expectations and (2) Experiences. Each of the themes is described in turn below.

### Needs and expectations

This main theme holds the following three sub themes; (1) Feeling open, curious and excited, (2) Need for a common conceptual foundation and (3) Need for in-depth theoretical knowledge and a common investigative approach. The participants particularly highlighted that they were open, curious and excited about the course, they were eager to learn more and widen their perspectives. Due to their multidisciplinary backgrounds, the participants initially lacked a common conceptual foundation, and a common investigative approach and expressed a need for more in-depth theoretical knowledge.

### Feeling open, curious and excited

The participants expressed largely positive expectations towards the course, regardless of their professional backgrounds and prior knowledge and experience. They were open and curious about the potential for gaining new knowledge and learning new hands-on approaches. *'I think it will be good. I'm looking forward to it. Getting to do some study is only positive, really. It's a privilege to be allowed to attend school'* (Participant 1). Several felt that the course would cover themes that they already had knowledge of, but they expressed that the course content would likely complement their existing competencies. *'I am really excited. I think one of the most important things is perhaps "hands-on" tools and training in how to use them'* (Participant 2). The participants highlighted that they welcomed all kinds of new knowledge, and that they valued the opportunity for further education. *'I don't think I will get a very revolutionary new view of things, of why things happen. But maybe something to do with analysis. So, we'll see. I'll go in openly, with interest. I look forward to it'* (Participant 4).

### Need for a common conceptual foundation

The safety investigators were a highly interdisciplinary group from a wide variety of professional backgrounds (nursing, medicine, human factors, philosophy, psychology, political science, etc.). They, therefore, represented a variety of different perspectives and starting points before attending the course. *'If [the managers] had made it easy for themselves, they would have hired 20 lawyers or something like that. Or whatever. Nurses. Something or other. But they have been very clear that here we recruit people who represent different perspectives. ... And that is good. But it is also very demanding'* (Participant 5). This also included varying prior knowledge and experience of safety theories and safety investigation methods. *'We have decided that we are going to be very interdisciplinary... everyone has a very different*

*perspective on what it means to investigate. ... We have all these discussions, where people professionally speaking are living on their own planets'* (Participant 2). The participants noted that the highly interdisciplinary nature of the group was first and foremost a strength that had a mostly positive impact on their investigations. But conversely, it was clear that the group's significant heterogeneity could challenge their investigative work and collaborative practices. This was often expressed as being due to a lack of a common conceptual foundation or common language with which to approach and discuss cases. *'It's this conceptual framework, to be able to talk to colleagues. ... Having common ground, that is very important. ... The reason we are employed here is that we have different perspectives. But we also have that common knowledge. It's that common knowledge which needs increasing'* (Participant 3).

### Need for in-depth theoretical knowledge and a common investigative approach

Several participants expressed a need for broader theoretical knowledge and a more in-depth understanding of the safety science field. Many were vocal about their concern that the focus here ought to be on learning about complex systems theories rather than approaches that are built around simple causal explanations. Adopting a systems perspective was also seen as vital to facilitate learning across levels and organisations. Gaining the theoretical knowledge necessary to develop a common conceptual apparatus was therefore high on the list of the participants' educational needs prior to attending the course. *'We're really in the middle of it now. In the first investigation. Because we have collected a lot of data. And we agree that we have a lot of data. And we agree that we have a lot of interesting findings, in the data. ... But we have no idea how to select those findings and present them in a meaningful way. That is what we are discussing. ... How to systemize what we have found?'* (Participant 2).

Participants expressed a definite need for a common investigative approach, including a common set of analytical methods and tools to use in investigations. This was referred to within the group as a 'methodological hunger'. *'We have some ideas about what, who we are and how we should work. But, in a way, it is only the broad outlines that have been drawn, and not so much the minor lines and the minor methods. And, maybe that's why method, in particular, is something we do not have much of. ... And when I say method, I'm thinking of method of analysis. So that's the 'methodological hunger' we've been joking about'* (Participant 1). With a lack of hands-on experience of investigative methods and tools, there was a sense of uncertainty regarding how to best approach the analytical phase of investigations. They therefore talked about the importance of being able to familiarise themselves with and test different tools and approaches in an effort to gain the insight necessary to make informed decisions about the usefulness or not of the various options available. *'I need to know more about different, concrete tools actually. Investigative, or maybe methods of analysis. ... To gain knowledge of different analysis methods because that makes me*

better able to choose [between them]. And use them or have an opinion on them' (Participant 5). Again, participants were concerned that simplistic causal approaches would be too narrow in scope for the purposes of their investigations, which aim to facilitate cross-level learning. There was therefore a need for investigative methods and tools with a complex system focus.

### Experiences

This main theme holds the four following sub themes: (1) Joint experiences provide common ground, (2) Collaborative working requires collaborative learning, (3) Create arena for reflection and discussion and (4) Extensive subject-limited time. The safety investigation course gave the participants a more common ground to work from, making it easier to collaborate and to understand each other's perspectives. They also appreciated the collaborative learning experiences which reflected their everyday work practice and that the course provided them with an arena for reflection and discussion. However, they felt that the course provided insufficient time to go through such an extensive subject.

#### Joint experiences provide common ground

The participants highlighted that the most important effect of the course was that it had provided them with common ground. *'In the beginning, I felt it was really noticeable (the differences). But this has subsided after we have gotten the chance to test out our ideas on each other. I believe we have seen that there is a lot of common ground, that it is okay to be different. (...) And the course gave us some experiences with each other'* (Participant 7). The participants believed that course participation along with a longer work experience had given them a similar understanding of the underlying meaning of different safety related terms. The managers emphasised that they considered the building of a common culture as the most positive outcome of course participation. This aspect was particularly important for the investigators working part-time since course participation made them more included in the team of investigators. The investigators themselves believed that it getting to know each other through the course's practical learning tasks was of most importance. *'After the course at the University, I believe that we became more similar, I mean, maybe we kind of see things through the same lenses. It provided us with more similar ways of thinking. Maybe on both a conscious and unconscious level'* (Participant 1).

#### Collaborative working requires collaborative learning

The participants highly appreciated the sessions with group work. *'Working in smaller groups was a good way to learn (...) combined with the exam paper we had to write, this forced you to get more involved in the topics, learn more about the course themes'* (Participant 4). Both managers and safety investigators believed that the table-top simulation and group work were the most fruitful approaches, since it reflected their everyday investigatory work practices. Learning together therefore became important since it resembled

how they usually worked. The participants emphasised that the cases they were going to discuss needed to be highly authentic and recognisable for them. They believed that the more 'real' the cases felt, the easier it was to get engaged and learn. Some of the participants believed that lack of authenticity was the reason why they found other pedagogical approaches such as tabletop exercises with movies less useful. The participants also preferred pedagogical approaches where they got to engage with each other and take an active role in their own learning. *'The group work combined with the exam paper felt like an engaging way to learn and the group dynamics felt engaging...one got to go "deeper" in a sense.... I believe this was what we learnt the most from ....'* (Participant 6).

#### Create arena for reflection and discussion

Participants made a range of reflections related to the course subjects. They had become more aware of the implications of a systems perspective, the difficulties of engaging in systematic methods, the need for case specific adjustments, that there is no single recipe for conducting investigations, the demanding task of giving attention to details as well as seeing the whole picture, and the need for a combination of different approaches. *'The lecturer gave us quite explicit advice: To test out different analytical tools for different investigations. And, in fact, that is what we do'* (Participant 7). They also reflected on their data gathering practices and that different narratives will provide different information, as well as how to conduct valid data collection, what data is, and issues concerning how to set criteria for case selection. *'The course created an arena where we got to know each other better through working together and reflecting on issues such as investigative tools and theory'* (Participant 5). One of the contributions from course participation therefore seemed to be that it created an arena for reflection and discussions, allowing the participants to become more aware of the strengths and weaknesses related to their work.

#### Extensive subject-limited time

Participants from both focus groups stressed that the course had proved demanding, with a high number of different subjects and highly advanced literature to be covered in a short amount of time: *'The idea of having a whole day designated to learning is great, but you need time to process, think. So, it was too much, and too little time'* (Participant 4). Although they valued and respected the English-speaking lecturer, and the English curriculum, it was demanding for Norwegian speakers to navigate new territory with a large amount of new subject specific terminologies in a different language. The participants believed that the short introduction to several new subjects, instead of more in-depth studies of fewer subjects, was the reason they found the course material to be somewhat fragmented. *'It was a quite small course, quite limited. So, I guess I'm left with a feeling of missing something, I missed going in-depth into both safety theories and analytical tools'* (Participant 7). Although both groups wanted more in-depth



knowledge of the subjects, they all acknowledged that there was a discrepancy between their needs and expectations and the amount of in-depth study that it is possible to offer with a 5 ECTS course.

The participants suggested that future classes should be taught in the participants' native language. They also suggested taking time to present an overview of the material at the beginning of the course, and to include some 'lighter' items on the curriculum to ease access to complex and difficult material. The participants valued authenticity and that the course developer should strive to make all case studies and group work highly recognisable and authentic to real life cases. All participants suggested a longer and more extensive course that gave the opportunity for more in-depth understanding of each of the safety investigation theories presented throughout the course: *'In retrospect I believe that there should have been selected a few themes, which we could have studied in greater depth-or had longer time'* (Participant 8).

## DISCUSSION

This paper explored the participants' needs, expectations and experiences related to a system-wide, learning focused safety investigation in healthcare course. The findings showed that a heterogeneous group of multidisciplinary healthcare investigators shared a need for collective understanding of safety investigatory concepts, tools and practice. In the following, the findings and implications for further curriculum development are discussed with the purpose of contributing to enhanced system-wide and learning focused investigatory practice in healthcare. The complexity of safety investigations in healthcare

Prior to course participation, the participants described both needs and expectations related to a common conceptual apparatus and investigative approach. More specifically, they had expectations of receiving detailed information regarding how to investigate different types of cases. At that time, the participants had limited experience of working together, they all came from different backgrounds, and had different levels of experience with safety investigation in healthcare. Within learning processes, the difference between a novice and an expert level is the ability to extract key principles and transfer them to similar situations.<sup>23</sup> With such a high degree of difference and uncertainty among them, it is to be expected that the participants at this particular point in time, and in a novel situation, acted much like novices wanting stability and a recipe of how to approach their new task. However, although this was what the participants initially craved, only a short time after the completion of the course the participants acknowledged that there was a need for a more nuanced approach than that provided by a standard recipe. The need to have a methods repertoire and insight into the varying options available and their limitations, contributed to a better understanding of their role and position in approaching the investigative task. Our results are in line with recent research arguing

for the need for a large toolbox to fit the exact case and context of adverse events investigations.<sup>16</sup> This furthermore demonstrates the participants' ability to advance to a higher level of reflection in a short period of time, on their way towards becoming experts.

## Reflexive spaces as a mean to promote system learning

Previous research<sup>24</sup> argues that creating and supporting reflexive spaces, such as what was done at the safety investigation course, is key in learning processes in the sense that it brings people together and bridges tacit and explicit knowledge. Learning from adverse events is important to improve future healthcare services. However, purely knowledge is not enough to make a change in behaviour.<sup>25</sup> Changing investigation methods within the healthcare setting requires that the investigators have knowledge, skills and education regarding both why and how a change is to be made.<sup>25</sup> The reflexive spaces created during the safety investigation course could potentially help the participants to gain not only the knowledge needed, but also the skill set and the education concerning why and how changes in the investigation methods could occur.

Safety investigation in healthcare is complex and multifaceted with context specific aspects that investigations need to consider for better understanding the sum of causal factors.<sup>11 16 26</sup> This has similarities to how other sectors with longer traditions for independent investigations, such as the aviation or nuclear fields, need to investigate their specific contexts. However, to transfer methods and approaches directly from one sector to another could be challenging.<sup>27 28</sup> Healthcare in general has, in line with the course described in this paper, adopted investigation methods developed in other sectors. We argue that the ability to reflect on how different approaches, methods and narratives of what happened likely will provide different answers is of central importance for safety investigators in healthcare.

Creating reflexive spaces and making use of simulation-based activities<sup>24 29</sup> allow for such critical reflections to take place. Our findings indicate that this should be a significant part of a healthcare safety investigation course, as well as in everyday investigatory practice to ensure continuous learning processes in the team and within the investigation body itself, and to share findings and recommendations with the field. Learning from investigation reports published by different investigatory bodies has proved challenging for the practice field as similar adverse events reoccur within and across organisations. In Norway, for example, around 1000 of the most severe types of adverse events, which are mandatory to report to the Norwegian Board of Health Supervision, were reported in 2020. This number includes under-reporting, and a high proportion of deaths or severe patient harm.<sup>30</sup> Being able to create reflection among stakeholders involved in adverse events within and across system levels, and to share experiences of how to approach safety investigations in healthcare might be a key step to system



learning and improvement. We argue that creation of reflexive spaces is a fundamental aspect that international healthcare systems should nurture for future safety investigation bodies.

### Developing a culture for multidisciplinary investigatory practice

There was a clear tension between the desire to on the one hand have an interdisciplinary group of investigators and an organisational culture that gives room for diverse perspectives, and on the other hand, the need for a common conceptual apparatus or framework from which the staff can find some common ground in approaching investigations. Interdisciplinary teamwork is said to be paramount in order to develop collaborative and effective teams<sup>31 32</sup> and for accident investigation to succeed in understanding complex causal relations.<sup>11 16 33–35</sup> However, for interdisciplinary teamwork to be efficient, it is dependent on shared knowledge and skills, mutual trust and respect.<sup>36</sup> The course allowed the participants to engage in group work and simulated work tasks, enabling them to get to know each other and build trust and understanding of each other's views in a safe environment. As such, the joint experience of developing interdisciplinary teamwork skills through course participation could in itself be seen as equally important as the theoretical knowledge gained. Although a longer and more extensive course would have been beneficial in providing participants with more in-depth theoretical knowledge, participation in this relatively short course gave them valuable team working skills which are particularly appreciated in investigations in complex healthcare systems. Future research and testing of modules in safety investigation in healthcare should focus more on user involvement in investigatory practice, while further enriching the investigatory toolbox with diverse system models and investigation methods adapted to the healthcare context by involving multidisciplinary investigation teams to ensure relevance to the field.<sup>16</sup>

### Strengths and limitations

This study has some strengths and limitations that should be acknowledged. The study evaluated the first round of a new safety investigation in healthcare course. We conducted interviews both before and after the course and included both investigators and managers as participants. This gives the study a high information richness, from different perspectives<sup>37</sup> although a higher number of study participants could have provided additional information and perspectives. The course was developed in collaboration with the investigatory body, and the responses could be biased due to that. At the same time, however, a collaborative approach to course development likely also contributes to its increased relevance to the original training needs. It was voluntary to participate in all parts of the study which could have resulted in some of the students not participating in the study, either prior to and/or after the course completion. Participating in

focus group interviews could potentially restrict the participants from speaking their minds freely. There is also a risk that the participants in the group do not entirely represent the broader target group. Potential bias due to this must therefore be considered. However, different representatives participated in different stages of the data collection and two different data gathering techniques were used to give them the opportunity to both speak freely as well as get a consensus from a group. The study could have benefited from the use of behavioural change theory, to further investigate how attending such courses might influence behaviour. However, this would have required a somewhat different methodological approach focusing on changes in investigatory practice which was out of scope of this study. To ensure trustworthiness in the research process, the data collection and the analysis process were strengthened through group collaboration featuring a team of researchers with various backgrounds such as safety investigation, pedagogy, healthcare, psychology and risk management.<sup>38</sup>

### CONCLUSION

Developing competence in system-wide and learning-based safety investigation is fundamental for investigating severe adverse events, trends and system failure in healthcare.<sup>4</sup> Our study found that a university master's level course designed to establish competence in different theoretical perspectives of safety and investigatory approaches contributed to create reflexive spaces where participants discussed systemic safety investigations, opportunities, limits and identified knowledge gaps in this new field of practice. Course participation helped establish a common language among a highly multidisciplinary group and build a culture of collaborative learning. Further course and practice activities are needed to create a full curriculum for safety investigation in healthcare.

### Implications for practice

It is recommended that such a future curriculum is co-created with independent investigators, safety scientists, patients and users, and healthcare professionals to ensure a strong methods repertoire and a sound theoretical backdrop for investigatory practice that may contribute to system-wide learning and improvement.

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**Patient and public involvement** Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Ethics approval** The study was approved by the Norwegian Centre for Research Data (ref.nr 217643). Participants gave informed consent to participate in the study before taking part.

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**Data availability statement** Data are available on reasonable request.

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#### REFERENCES

- Kennedy I. The report of the Public Inquiry into children's heart surgery at the Bristol Royal Infirmary 1984-1995. Learning from Bristol The Bristol Royal Infirmary Inquiry; 2001. [http://www.bristol-inquiry.org.uk/final\\_report/the\\_report.pdf](http://www.bristol-inquiry.org.uk/final_report/the_report.pdf)
- Adams SA, Paul KT, Ketelaars C, et al. The use of mystery guests by the Dutch health Inspectorate: results of a pilot study in long-term intramural elderly care. *Health Policy* 2015;119:821-30.
- Francis R. *Report of the mid Staffordshire NHS Foundation trust public inquiry: Executive summary*. The Stationery Office, 2013.
- Wiig S, Macrae C. Introducing national healthcare safety investigation bodies. *Br J Surg* 2018;105:1710-2.
- Vincent C. *Patient safety*. Blackwell: John Wiley & Sons, 2011.
- Vincent C, Amalberti R. Safety in healthcare is a moving target, 24 BMJ Publishing Group Ltd; 2015: 539-40.
- Jha A. *Patient safety—a grand challenge for healthcare professionals and policymakers alike*. Roundtable at the Grand Challenges Meeting of the Bill & Melinda Gates Foundation, 2018.
- de Vries EN, Ramrattan MA, Smorenburg SM, et al. The incidence and nature of in-hospital adverse events: a systematic review. *Qual Saf Health Care* 2008;17:216-23.
- Macrae C, Vincent C. Learning from failure: the need for independent safety investigation in healthcare. *J R Soc Med* 2014;107:439-43.
- Salmon PM, Cornelissen M, Trotter MJ. Systems-Based accident analysis methods: a comparison of Accimap, HFACS, and stamp. *Saf Sci* 2012;50:1158-70.
- Wiig S, Braithwaite J, Clay-Williams R. It's time to step it up. Why safety investigations in healthcare should look more to safety science. *Int J Qual Health Care* 2020;32:281-4.
- Wiig S, Hibbert PD, Braithwaite J. The patient died: what about involvement in the investigation process? *Int J Qual Health Care* 2020;32:342-6.
- Wrigstad J, Bergström J, Gustafson P. One event, three investigations: the reproduction of a safety norm. *Saf Sci* 2017;96:75-83.
- Hibbert PD, Thomas MJW, Deakin A, et al. Are root cause analyses recommendations effective and sustainable? An observational study. *Int J Qual Health Care* 2018;30:124-31.
- Peerally MF, Carr S, Waring J, et al. The problem with root cause analysis. *BMJ Qual Saf* 2017;26:417-22.
- Wiig S, Braithwaite J, Braut GS. Politics, Accident Research and Analysis: The Evolution of Investigation Methods and Practices in Healthcare. In: *Inside hazardous technological systems*. CRC Press, 2021: 203-21.
- European Commission. European education area- quality education and training for all, 2022. Available: <https://education.ec.europa.eu/levels/higher-education/inclusion-connectivity/european-credit-transfer-accumulation-system>
- Bengtsson L. Take-Home exams in higher education: a systematic review. *Educ Sci* 2019;9:267.
- Malterud K. *Fokusgrupper SOM forskningsmetode for medisin OG helsefag (Focusgroups as research method within medicine and healthcare)*. Oslo: Universitetsforlaget, 2011.
- Cohen L, Manion L, Morrison K. *Research methods in education*. 8th edn. New York: Routledge, 2018.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77-101.
- Krueger RA, Casey MA. *Focus groups: a practical guide for applied research*. Los Angeles, California: Sage, 2009.
- Benner P, Sutphen M, Leonard V. *Educating nurses: a call for radical transformation*. California: San Francisco: Jossey-Bass, 2010.
- Wiig S, Aase K, Bal R. Reflexive spaces: Leveraging resilience into healthcare regulation and management. *J Patient Saf* 2020.
- Arlinghaus KR, Johnston CA. Advocating for behavior change with education. *Am J Lifestyle Med* 2018;12:113-6.
- Wears R, Sutcliffe K. *Still not safe: patient safety and the Middle-Management of American medicine*. Oxford University Press, 2020.
- Sampson P, Back J, Drage S. Systems-Based models for investigating patient safety incidents. *BJA Educ* 2021;21:307-13.
- Macrae C, Stewart K. Can we import improvements from industry to healthcare? *BMJ* 2019;364:11039.
- Macrae C. Imitating incidents: how simulation can improve safety investigation and learning from adverse events. *Simul Healthc* 2018;13:227-32.
- Norwegian Board of Health Supervision (Statens helsetilsyn). Annual report 2020, 2020. Available: <https://www.helsetilsynet.no/globalassets/opplastinger/publikasjoner/aarsrapporter/aarsrapport2020.pdf>
- Barr H, Koppel I, Reeves S. Effective interprofessional education: argument. In: *Bssumption and evidence (promoting partnership for health)*. John Wiley & Sons, 2008.
- Thistlethwaite J. Interprofessional education: a review of context, learning and the research agenda. *Med Educ* 2012;46:58-70.
- Canham A, Thomas Jun G, Waterson P, et al. Integrating systemic accident analysis into patient safety incident investigation practices. *Appl Ergon* 2018;72:1-9.
- Behr L, Grit K, Bal R, et al. Framing and reframing critical incidents in hospitals. *Health Risk Soc* 2015;17:81-97.
- Hulme A, Stanton NA, Walker GH, et al. What do applications of systems thinking accident analysis methods tell us about accident causation? A systematic review of applications between 1990 and 2018. *Saf Sci* 2019;117:164-83.
- Way D, Jones L, Busing N. *Implementation strategies: collaboration in primary care—family doctors & nurse practitioners delivering shared care*. 8. Toronto: Ontario College of family physicians, 2000.
- Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. *Qual Health Res* 2016;26:1753-60.
- Patton M. *Qualitative research and evaluation methods thousand oaks*. Sage, 2002.