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# Improving care of the acutely ill patient by enhancing interprofessional working, using in-situ simulation: a mixed methods study

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*Objectives*

Acutely unwell patients in general practice are uncommon, but their management requires intervention from staff (clinical and non-clinical) working as a team. Despite the advantages of interprofessional education being well documented, there is little research evidence of this in the primary care setting. This study aimed to improve care of the acutely ill patient by enhancing interprofessional working, using in-situ simulation.

*Methods*

Mixed methods evaluation study. Phase 1 scoped education provision in GP practices within Health Education England Kent, Surrey and Sussex (HEEKSS) via questionnaire to 668 practices. In Phase 2 a simulation of cardiac arrest occurred in three HEEKSS practices; all staff participated in interviews.

*Results*

Phase 1 showed the majority of practices ran sessions involving all staff, predominantly focusing on basic life support (BLS) (63 practices) and practice-specific areas such as managing difficult patients (28 practices). 61 said simulation was not used; 41 responded that it was, 37 specifying for BLS training. Qualitative thematic analysis identified four themes: 1) apprehension, anxiety, and (un)willing participation, 2) reflection on the simulation design, 3) experiences of the scenario and 4) training.

*Conclusions*

Practices made changes in their workplace, potentially benefitting the future management of acutely ill patients. The use of actors and involvement of clinical and non-clinical members of staff contributes to a fuller understanding of how in-situ simulation can benefit both workforce and patients.

*Key words*

Primary care; mixed methods; in-situ simulation; interprofessional training; medical emergency; qualitative research

Strengths and limitations of this study

- The qualitative approach is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.
- All practices were research-active, accessed through existing relationships with the research team. It is possible these practices were particularly confident in their ability and therefore willing to participate.
- As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond this study.

Background

Medical emergencies within primary care are rare, a number largely unknown. One study found six per cent of all out of hospital cardiac arrests were in primary care, viewing this as a significant number and suggesting primary care providers have an important role in managing OHCA[1]. Their management requires good teamwork, communication and effective use of available resources by the whole primary care team[2] and there has been a growing interesting in the application of simulation-based training to non-clinicians and the organisation as a whole[3].

There is little published data on the impact of multidisciplinary simulation-based medical emergencies training in general practice, most training being aimed specifically at clinicians. Training provides the opportunity to practice a variety of skills in a consequence-free environment, and team training enhances its effectiveness[4]. Simulation allows for the practice of skills needed in

emergency situations without relying on clinical opportunity[5] and can reinforce psychomotor and critical decision-making skills[6] as well as training the management of complex medical situations[7, 8]. Previous research using simulation-based medical emergencies training showed an improvement in GPs' reported management and confidence in responding to an emergency, and a positive impact on both from non-clinical staff[2]. Simulation-based medical emergency training has also allowed non-clinicians to gain experience and appreciation for the demands of patient care[3], emphasised the importance of defining team structures and processes[9], and provided participants with the opportunity to develop non-technical skills such as effective teamwork and communication[10]. Simulated exercises have the potential to allow individuals to practise the management of emergencies within a team setting, and also allows team to analyse and adapt their own performance[11].

In an interdisciplinary team, members work closely together and communicate frequently, organised around a common set of problems[12]. Whilst there are bodies of literature on interprofessional education and medical simulation, there is a paucity of literature which links the two. With minimal opportunities for health professionals to interact and engage in multiprofessional scenarios prior to real-life experience[13], it is important that the opportunities provided are seen as beneficial to all the participants. In-situ simulation has been used to develop individual and team learning across clinical and non-clinical areas[14]: bringing portable equipment to the actual clinical environment allows simulation training to be delivered to teams who may not benefit from the educational tool otherwise[15]. The use of a high-fidelity patient simulator in conjunction with a well-designed scenario enables near-perfect realism and is appropriate for use as a continuous professional development activity[16].

This project aimed to improve care of the acutely ill patient by enhancing interprofessional working, using in-situ simulation.

## Method

Phase 1 was developed to scope how education is currently delivered within primary care, including the current use of simulation. In February 2018 668 questionnaires and a cover letter outlining the research were sent to 'The Practice Manager' of GP practices in Kent, Surrey and Sussex (KSS). Addresses were obtained through internet searches of each Clinical Commissioning Group (CCG) in these regions.

Phase 2 – a simulation of a medical emergency was designed by the research team and further developed in collaboration with the actors [paper forthcoming]. Patient Mr Hughes (played by an actor and a high-fidelity mannequin (Laerdal ©)) would have a cardiac arrest in the surgery waiting room, witnessed by his 'wife' and another patient who would become increasingly annoyed at the perceived inconvenience. The actor playing Mr Hughes then undertook the role of the emergency call handler. Cameras were positioned in the waiting room to capture the simulation: the research team remained in the room and could view the simulation via a laptop and were able to tag the recording to capture significant moments. This film was used in the post-simulation debrief with all participants to reinforce the learning objectives and critique performance in an objective atmosphere[6].

Each participant consented to a semi-structured interview with AH and analysed using inductive thematic analysis[17]. AH, an experienced qualitative researcher, read each transcript and coded line by line, using NVivo to manage the dataset. Codes were derived inductively from the data and grouped to produce the initial coding frame. Codes and theme/subtheme definitions were iteratively developed by AH and SB, the lead for simulation education. Data saturation was achieved, and the coding manual fitted all of the data. Practices were recompensed £500.

Ethical approval was received from the Faculty of Health and Medical Sciences ethics committee (ref: 1349-FHMS-17). All staff members gave informed consent to participate in the simulation, debrief, and interview. Whilst on site, care was taken to ensure members of the public were not distressed if they happened to witness the training.

*Patient and public involvement*

No patient advisers were involved in the conduct of this study.

## Results

### Phase 1

109 responses were received, a rate of 16.32%. Only 12 respondents said their practice did not offer sessions which involved all members of staff training together. 64 respondents trained their staff together for basic life support (BLS). 61 practice managers responded that simulation was not used in their trainings, with one adding that simulation was 'generally not liked'. 41 respondents said simulation was used, 37 specifying this was for BLS training and two specifying simulation was used for reception training.

### Phase 2

Four research-active general practices within KSS were approached regarding participation. Each was visited by AH to answer questions and ensure the space available was appropriate for the simulation. One practice withdrew before filming; the remaining three participated between May

and August 2018. The simulation ran for approximately 20 minutes followed by a short break and a debrief of approximately 45 minutes. Face-to-face interviews occurred within a fortnight, depending on participant availability, and were audio-recorded. Each practice had nine participants in the simulation: one participant from both practices 1 and 3 was unable to be interviewed during to lack of availability.

Thematic analysis identified four themes relating to the participants' involvement in the simulation. The themes and subthemes are shown in Table 1. Illustrative quotations are provided.

Table 1 Themes and subthemes

Table 1: Themes and subthemes

| Theme | Subtheme | |
|---|---|---|
| 1. Apprehension, anxiety, and (un)willing participation | 1.1. Apprehension prior to event<br>1.2. Fear of assessment<br>1.3. (Un)willing to participate | 1.1.1 Fear of the unknown<br>1.1.2 Concerns about filming |
| 2. Reflection on the simulation design | 2.1 Overview<br>2.2 In-situ things<br>2.3 Equipment<br>2.4 Simulated patients<br>2.5 Knowledge transfer | |
| 3. Experiences of the scenario | 3.1 Clinical aspects<br>3.2 Non-clinical aspects<br>3.3 Future development | |
| 4. Training | 4.1 Clinical and non-clinical staff training together<br>4.2. Training preferences<br>4.3. Changes post-participation | |

1. Apprehension, anxiety, and (un)willing participation

All three practices reported limited exposure to simulation as a pedagogic approach; only junior clinicians had experienced simulation as part of their hospital training. Due to the nature of the research, participants only knew they would be involved in a simulation but had no further details.

*Apprehension prior to event*

Both clinical and non-clinical participants expressed anxiety felt prior to participating, both on an individual level and for the staff as a whole. Participants did not know what medical emergency the simulation would involve and this 'fear of the unknown' was off-putting to some. Anxiety was also due to being aware the simulation would be filmed and shown to the group.

> 'It was the filming bit that was the nerve-wracking bit for me. I'm just thinking, am I going to come across how I think I come across? Because you think you do a good job and you think you're not overly forceful or not forceful enough.' (Non-clinical, female, P2)

*(Un)willing to participate*

Despite expressing anxiety around participation, most people were enthusiastic, often because of its learning opportunity. Others were less willing, suggesting colleagues who would find it more useful.

> 'I did volunteer. Back in medical school I found they were really helpful. It's always excruciating, especially watching it back, but it's worth it for the learning.' (Clinical, female, P2).

*Idea of assessment*

Concerns that prior to the simulation it felt like a test were expressed by both clinical and non-clinical members of staff. Individuals were wary about how they would be viewed by colleagues and the research team. However, most people who felt this way at the beginning had a different view afterwards.

> 'I think you'd always be nervous if something real happened like that but, as far as it being like a test, which I think we all probably thought, oh gosh, this is like an exam or a test type thing, it wasn't really.' (Non-clinical, female, P2)

2. Reflection on the simulation design

In order to maximise realism, human interaction and real world benefit, the simulation used actors and the practices' own emergency equipment. The research team provided a mannequin, dressed in identical clothes to that of the actor playing the unwell patient to increase realism.

*Simulated patients*

The actors were highly praised for their realistic portrayal of patients: they enabled staff to fully participate within the scenario and enhance its psychological fidelity. However, when participants realised who the 'ill' actor was, he potentially became less believable. As the specifics of the scenario were unknown to participants beforehand, there was scope for people to be surprised and to demonstrate flexibility.

*The use of own equipment for an in-situ simulation*

Participants highlighted the importance of familiarity with their own equipment and being in a simulated emergency which was as realistic as possible. The use of own equipment was valued by all members of staff as a fundamental element for learning. The unique space constraints in each practice provided an additional challenge, but one viewed as beneficial.

> 'I was a bit keen to put the [defibrillator] pads on before the man had his bare chest. But I know that I've got to put the plastic pads on, but I was obviously faced with strange things' (Clinical, female, P2).

*The transferability of knowledge*

Staff noted that the simulation session provided them with a safe environment in which they could practice their skills and identify areas for improvement. For non-clinical staff, simulation showed the importance of a team approach and being able to assist when needed.

> 'I think everybody needs to go through this because it's a learning curve for even a receptionist, as we keep saying we're just receptionists, we're not medically trained but, when push comes to shove, you need to help' (Non-clinical, female, P1).

3. Experiences of the scenario

*Clinical aspects*

Many participants felt that the clinical aspects were the most important learning aspects of the training, expressing reassurance that staff were competent in their roles and that equipment was working and used successfully.

> 'Seeing how my colleagues react in a crisis situation, it's nice to know they do know what they're doing [laughs]' (Non-clinical, female, P4).

*Non-clinical aspects*

Teamwork, and the number of people participating, were viewed positively by participants. It was seen as enhancing the fidelity of the simulation and providing a useful learning opportunity. For many people it was the first simulation in which they had participated and this may have been unnerving.

> 'I think it was good to have so many people involved, because it gave you a real flow and what it would actually be like […] I think making it as realistic as possible is key' (Non-clinical, female, P2)

4. Training

All three practices identified Basic Life Support training as the only joint 'clinical' teaching; the sessions were about individual proficiency in the tasks rather than team work.

*Clinical and non-clinical staff members training together*

Both clinical and non-clinical members of staff felt it was beneficial to have joint training sessions, especially given the siloed nature of the primary care environment. However, offering trainings for all staff together was not always practical.

*Changes post-participation*

All practices successfully managed the emergency situation: however, there were concerns over familiarity with equipment, and the idea of further training, specifically focusing on equipment, was voiced by staff at all three practices, with suggestions as to how this could be addressed. It was expressed that everyone on site should know how to use emergency equipment and that trainings would not need to be time-consuming in order to achieve greater familiarisation with equipment.

> 'I kind of veered towards that everyone should be trained to using the equipment. Because I know that I'd like to help, if I was the only one here or if there were two of us here, I couldn't leave a person' (Non-clinical, female, P2).

Management of staff was identified as a potential area for improvement. Participants acknowledged this was difficult at certain points during the scenario as people who would normally be involved were not participating/on duty that day. This highlights the need for there to be multiple plans in place for managing an emergency so all staff understand their role. Leadership was highlighted by several participants as a focus for the future.

> 'I feel like we've made some positive reflections on things that I'd do differently. Not necessarily to do with the clinical management of the case, but just the organisational running. I think the things that I did, I would probably make some changes in doing that again, so it was useful' (Clinical, female, P2).

There was a concern that non-clinical members of staff did not feel as confident to deal with the emergency as clinical colleagues. Whilst all staff members undergo mandatory BLS trainings, it was suggested that this could be done more frequently in-house.

'I think it's good to encourage not just your clinical staff but your admin staff to do things like this because it is quite out of your comfort zone and yes, I think it is good to just have the knowledge behind you.' (Non-clinical, female, P2).

## Discussion

The simulation showed all participating practices could successfully manage a medical emergency as well as meeting additional patient demands. Whilst many participants were apprehensive beforehand, all found it to be a beneficial training experience.

The response rate for this survey at 16.32% is low: however, it still provides an insight into the training occurring within GP practices. Whilst practices do differ in terms of their overall staff training, there was a degree of homogeneity in the responses: similarity in which training sessions clinicians and non-clinicians were undertaking separately and together. The high number of practices running training sessions for all staff members is encouraging and shows the appropriateness and acceptability of developing and running a joint training simulation.

### *Strengths and limitations*

All practices were research-active, accessed through existing relationships with the research team. It is possible these practices were particularly confident in their ability and therefore willing to participate. Also, all practices were large (15,000+ registered patients) and urban: we do not know how smaller, more rural practices would have fared. The participants may have perceived the simulation as unrealistic, but there is a tacit agreement between all participants that the organisers have tried to make it as real as possible and participants are asked to act as though it is real[18]. As

participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond this study. The qualitative method is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.

*Comparison with existing literature*

Evidence around the efficacy of in situ simulation is emerging, and existing research is promising, but this is a relatively new area(14): there is very limited research on investigating the value of high fidelity simulation within primary care, providing clinicians with the practical skills and confidence to manage emergencies within their surgeries. One project focusing on this led simulation-based workshops covering more commonly encountered medical emergencies and required participants to locate and use their own equipment and medication[19]. Results showed many participants knew how to respond 'in theory' but were unable to demonstrate practical aspects quickly and safely. This training is particularly important for time-critical illnesses. Previous research with health care assistants showed participants felt simulation-based training had reinforced their clinical knowledge and ability as well as adding to it[20]. Increased confidence following in-situ training has been shown to remain at an eight week follow-up[21] thus indicating this type of training has lasting benefits towards managing the acutely-ill patient.

By training clinicians in-situ, using their own equipment, practices are able to see how well their space works and also assess human-factor elements[22]. Problems such as clinical staff struggling with equipment are only going to be identified through actual use, and therefore it is paramount staff develop familiarity with equipment. Established resuscitation courses support individuals in managing emergencies, but a focus on their particular teamwork and communication in their actual day to day role cannot be provided, hence in-situ simulation offers an important complement[23].

Previous research has identified training as improving performance[24] and it is likely this can be translated into clinical practice. Health care professionals are trained predominantly in uniprofessional settings, yet have to work collaboratively in the practice environment; they may find they work side by side rather than together as an efficient team[25]. Teams are dynamic and require commitment to work and maintain: there is a need to understand other people's roles[26]. There is a growing awareness that patient safety in healthcare relies on the ability of individuals to collaborate with other professionals. This simulation allowed participants to view their colleagues in action and learn how they can best support one another in the management of an acute medical emergency. This supports previous findings in which participants were able to highlight their own strengths and weaknesses and being able to continually adapt to others in the team[27]. Team training has been identified as a high priority for the future of simulation[28].

When comparing teams, there was no consistent difference as to whether teams had been trained in their hospital or in a simulation centre. The advantages of local training are lower cost and no travel time or expenses (from the participants), the inclusion of healthcare assistants, receptionists and porters. All practices made changes to their staff training and equipment following the simulation session. These changes were easily identified, predominantly on increasing staff familiarity with equipment and offering more frequent training sessions than the mandatory BLS updates. Providing more opportunities for clinical and non-clinical members of staff to train together would enhance interprofessional working and reinforce understanding of the others' roles. Previous research referred to the 'emotional neutrality' of GP receptionists which can help to avoid exacerbating negative behaviour from annoyed patients[29]. It is important staff are able to tailor that offering to the needs of individual patients. Receptionists' work is complex and demanding and effective teamwork among receptionists should be recognised and developed[30].

*Implications for research and practice*

This research has emphasised the importance and benefits of team training, including all staff members within the GP surgery. Results show that whilst team training is already occurring within primary care, this can be developed. The use of in-situ simulation is positively received, although does cause apprehension for many participants. Future research will need to explore whether in-situ simulation is as well-received in smaller practices and consider whether improvements in teamwork would only apply to these teams, or also different teams, given changes in staff[24].

## Conclusion

Primary care staff members were given the opportunity to experience an acutely ill patient in a safe environment. From this, they were able to make changes in their workplace (such as increasing all-staff familiarity with on-site equipment) and this should benefit their performance, and as such the care of the patient, should they be faced with such an emergency in the future. Strengths identified in the debrief session can be highlighted and good practice can be shared with colleagues. The use of actors and fully involving both clinical and non-clinical members of staff builds upon previous research to form a fuller understanding of how in-situ simulation can benefit both the primary care workforce and patients.

## Contributors

SB was responsible for all aspects of the study including design, data collection and analysis. AH led on data collection, analysis and interpretation, and manuscript preparation. SB with MK, as the research general practitioner, were responsible for the clinical aspects of the research. HD

implemented the study and ML-W was involved in the development of the study design. All authors commented on manuscript drafts and approved the final version.

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Competing interests

There are no competing interests to declare.

Data sharing statement

No additional data available.

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## COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 4 |
| Credentials | 2 | What were the researcher's credentials? E.g. PhD, MD | 4 |
| Occupation | 3 | What was their occupation at the time of the study? | N/A |
| Gender | 4 | Was the researcher male or female? | N/A |
| Experience and training | 5 | What experience or training did the researcher have? | 4 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 4 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | 4 |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 4 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 4 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 5 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 5 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | N/A |
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | |
| Repeat interviews | 18 | Were repeat inter views carried out? If yes, how many? | N/A |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 5 |
| Field notes | 20 | Were field notes made during and/or after the inter view or focus group? | N/A |
| Duration | 21 | What was the duration of the inter views or focus group? | 5 |
| Data saturation | 22 | Was data saturation discussed? | 4 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or | N/A |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| | | correction? | |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 4 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | 5 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 4 |
| Software | 27 | What software, if applicable, was used to manage the data? | 4 |
| Participant checking | 28 | Did participants provide feedback on the findings? | N/A |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 6 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 6 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 6 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | N/A |

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# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study.

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# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study

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*Objectives*

Acutely unwell patients in general practice are uncommon, but their successful management requires involvement from staff (clinical and non-clinical) working as a cohesive team. Despite the advantages of interprofessional education being well documented, there is little research evidence of this in the primary care setting. Enhancing interprofessional working could ultimately improve care of the acutely ill patient. This proof of concept study aimed to develop an in-situ simulation of a medical emergency to use within primary care, and assess its acceptability and utility through participants' reported experiences.

*Methods*

The intervention of an in-situ simulation scenario of a cardiac arrest was developed by the research team and run in three research-active GP surgeries in south east England. Nine staff members per practice consented to participate, representing clinical and non-clinical professions. For the evaluation, staff participated in individual qualitative semi-structured interviews following the in-situ simulation: these focused on their experiences of participating, with particular attention on interdisciplinary training and potential future developments of the in-situ simulation.

*Results*

The in-situ simulation was appropriate for use within the participating GP surgeries. Qualitative thematic analysis identified four themes: 1) apprehension and (un)willing participation, 2) reflection on the simulation design, 3) experiences of the scenario and 4) training.

*Conclusions*

This study suggests in-situ simulation can be an acceptable approach for interdisciplinary team training within primary care, being well-received by practices and staff. This contributes to a fuller understanding of how in-situ simulation can benefit both workforce and patients. Future research is needed to further refine the in-situ simulation training session.

*Key words*

Primary care; mixed methods; in-situ simulation; interprofessional training; medical emergency; qualitative research

Strengths and limitations of this study

- This is a novel approach to exploring the use of in-situ simulation within the primary care setting.

- The qualitative approach is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.
- All practices were research-active, accessed through existing relationships with the research team. It is possible these practices were particularly confident in their ability and therefore willing to participate.
- As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond this first proof of concept study.

## Background

Medical emergencies within primary care are rare, a number largely unknown. One study found six per cent of all out of hospital cardiac arrests were in primary care, viewing this as a significant number and suggesting primary care providers have an important role in managing out of hospital cardiac arrests (OHCA)[1]. Their management requires good teamwork, communication and effective use of available resources by the whole primary care team[2] and there has been a growing interest in the application of simulation-based training to non-clinicians and the organisation as a whole[3].

There is little published data on the acceptability or impact of multidisciplinary simulation-based medical emergencies training in general practice, most training being aimed specifically at clinicians. Training provides the opportunity to practice a variety of skills in a consequence-free environment, and team training enhances its effectiveness[4]. Simulation allows for the practice of skills needed in emergency situations without relying on clinical opportunity[5] and can reinforce psychomotor and critical decision-making skills[6] as well as training the management of complex medical situations[7, 8]. Previous research using simulation-based medical emergencies training showed an improvement in GPs' reported management and confidence in responding to an emergency, and a positive impact on both from non-clinical staff[2]. Simulation-based medical emergency training has also allowed non-clinicians to gain experience and appreciation for the demands of patient care[3], emphasised the importance of defining team structures and processes[9], and provided participants with the opportunity to develop non-technical skills such as effective teamwork and communication[10]. Simulated exercises have the potential to allow individuals to practise the management of emergencies within a team setting, and also allows team to analyse and adapt their own performance[11].

In an interdisciplinary team, members work closely together and communicate frequently, organised around a common set of problems[12]. In recent years healthcare workers have been encouraged to move away from 'silo' roles towards an environment which is more interprofessional in order to improve patient care[13]. Whilst there are bodies of literature on interprofessional education and medical simulation, there is a paucity of literature which links the two. With minimal opportunities for health professionals to interact and engage in multiprofessional scenarios prior to real-life experience[14], it is important that the opportunities provided are seen as beneficial to all the participants. In-situ simulation has been used to develop individual and team learning across clinical and non-clinical areas[15]: bringing portable equipment to the actual clinical environment allows simulation training to be delivered to teams who may not benefit from the educational tool otherwise[16]. The use of a high-fidelity patient simulator in conjunction with a well-designed scenario enables near-perfect realism and is appropriate for use as a continuous professional development activity[17].

This proof of concept project aimed to develop an in-situ simulation scenario of a medical emergency and explore the views of clinical and non-clinical staff as to whether it is feasible and beneficial to use as an interprofessional training format within primary care.

## Method

A qualitative evaluation of an in-situ simulation intervention exercise was designed to explore and understand the views of primary care staff as to their experiences of using simulation to deliver interdisciplinary training, focusing on appropriateness and acceptability.

### Setting:

Four research-active general practices within Health Education England Kent, Surrey and Sussex (HEEKSS), known to the research team, were approached regarding participation. Each was visited by AH to answer questions and ensure the space available was appropriate for the simulation. One practice withdrew before filming; the remaining three participated between May and August 2018. The practice managers and senior GPs from each practice were responsible for recruiting staff members willing to participate. Practices were recompensed £500, an amount set by the research funder (HEEKSS) to cover costs incurred from participation (such as ensuring additional staff were on duty to allow for the practice to remain open throughout the simulation).

### Intervention

A simulation of a medical emergency was designed by the research team and further developed in collaboration with the actors. SB, lead for simulation education and MK, a general practitioner and Simulation Lead for Post Graduate Medical Education at HEEKSS, developed the clinical outline of a cardiac arrest scenario which would occur in the waiting room of the GP practice. The character Mr Hughes would collapse, witnessed by his 'wife'. A third actor would play a patient who would become increasingly annoyed at the perceived inconvenience. During rehearsals with the wider research team and the actors the clinical skeleton underwent elaboration to include a greater medical history for the characters involved, to pre-empt questions which could be asked by the research participants. In order to maximise realism, human interaction and real world benefit, the simulation used actors and the practices' own emergency equipment. In the finalised scenario, the actor playing Mr Hughes would collapse in the waiting room, ensuring he was close to a dividing screen: this would be immediately moved by a member of the research team to reveal a high-fidelity mannequin (Laerdal ©)) dressed in identical clothing to allow participants to use chest compressions and their defibrillator. The actor would move out of the way and later became the emergency call handler when a member of staff 'phoned' 999 using the handset provided.

Cameras were positioned in the waiting room to capture the simulation: the research team remained in the waiting room and could view the simulation via a laptop and were able to tag the recording to capture significant moments, important for the subsequent debrief. SB and MK had laminated sheets containing clinical information about Mr Hughes (such as his blood pressure) which would be provided to participants when required. This film was used in the post-simulation debrief, which occurred in a separate private room,with all participants to reinforce the learning objectives and critique performance in an objective atmosphere[6]. Participants were reminded that the training was not an individual assessment. During the simulation, all members of staff who had consented to participate in the research had an active role – no one had the role of observer.
The simulation ran for approximately 20 minutes followed by a short break and a debriefing session of approximately 45 minutes, using 'the diamond' debriefing method as a guide for structure[18].
Face-to-face interviews occurred within a fortnight, depending on participant availability, and were audio-recorded.

Evaluation

Each participant consented to a semi-structured face-to-face interview (see Appendix 1) with AH, an experienced qualitative researcher. Each practice had nine staff members volunteer to participate in the simulation: two participants were unable to be interviewed during to lack of availability.

Participant demographics are shown in Table 1, using pseudonyms for the practices. Interviews were transcribed verbatim and analysed using inductive thematic analysis[19].

Table 1: Participant characteristics

| Role | Birch Practice | Hawthorn Practice | Willow Practice |
|---|---|---|---|
| Senior general practitioner | 1 female | 0 | 1 male |
| General practitioner | 1 female<br>1 male | 3 female | 1 female<br>2 male |
| Nurse | 2 female (one unable to be interviewed) | 2 female | 1 female |
| Health care assistant (HCA) | 1 male | 0 | 0 |
| Non-clinical (practice manager) | 0 | 1 female | 1 female |
| Non-clinical (e.g. receptionist, administrative support) | 3 female | 3 female | 3 female (one unable to be interviewed) |

AH read each transcript and coded line by line, using NVivo to manage the dataset. Codes were derived inductively from the data and grouped to produce the initial coding frame. Codes and theme/subtheme definitions were iteratively developed by AH and SB. Data saturation was achieved, and the coding manual fitted all of the data.

Ethical approval was received from the Faculty of Health and Medical Sciences ethics committee (ref: 1349-FHMS-17). All staff members gave informed consent to participate in the simulation, debrief, and interview. Whilst on site, care was taken to ensure members of the public were aware it was a training session and that the 'patients' involved were actors: signs were put in entrances, and on doors and walls in corridors and waiting areas, reception staff informed patients as they checked in for their appointments, and members of the research team were available to answer any questions in the hope that members of the public were shielded from any distress The cameras used for filming the scenario were positioned in such a way that they only captured a small section

of the waiting room and not members of the public. No patients reported any distress either to the research team or practice staff.

*Patient and public involvement*

No patient advisers were involved in the conduct of this study.

Results

Thematic analysis identified four themes relating to the participants' involvement in the simulation. The themes and subthemes are shown in Table 2. Illustrative quotations are provided.

Table 2 Themes and subthemes

Table 2: Themes and subthemes

| Theme | Subtheme | Additional subthemes (where applicable) |
|---|---|---|
| 1. Apprehension and (un)willing participation | 1.1 Apprehension prior to event<br>1.2 Fear of assessment<br>1.3 (Un)willing to participate | 1.1.1 Fear of the unknown<br>1.1.2 Concerns about filming |
| 2. Reflection on the simulation design | 2.1 Simulated patients<br>2.2 In-situ simulation elements<br>2.3 The transferability of knowledge | |
| 3. Experiences of the scenario | 3.1 Clinical aspects<br>3.2 Non-clinical aspects | |
| 4. Training | 4.1 Clinical and non-clinical staff training together<br>4.2 Changes post-participation | |

1. Apprehensionand (un)willing participation

All three practices reported limited exposure to simulation as a pedagogic approach; only junior clinicians had experienced simulation as part of their hospital training. Participants knew they would be involved in a simulation but had no further details as to the content of the scenario in advance.

*Apprehension prior to event*

Both clinical and non-clinical participants expressed anxiety felt prior to participating, both on an individual level and for the staff as a whole. Participants did not know what medical emergency the simulation would involve and this 'fear of the unknown' was off-putting to some. Anxiety was also due to being aware the simulation would be filmed and shown to the group.

> "I think it's because we were being videoed, if we weren't being videoed and I think that's a personal thing rather than or being worried professionally, if this was sort of just another BLS [basic life support] type simulation we do that annually, I wouldn't have minded that, because we were being videoed we didn't quite know what to expect and it was all you know we were told "oh they're on site and they're setting up" and there was bit of secrecy around it which sort of increased the stress levels but I think once we were in the situation in the scenario in the situation it was fine." (clinical, female, Birch Practice"

*Fear of assessment*

Concerns that prior to the simulation it felt like a test were expressed by both clinical and non-clinical members of staff. Individuals were wary about how they would be viewed by colleagues and the research team. However, most people who felt this way at the beginning had a different view afterwards.

> 'I think you'd always be nervous if something real happened like that but, as far as it being like a test, which I think we all probably thought, oh gosh, this is like an exam or a test type thing, it wasn't really.' (Non-clinical, female, Hawthorn Practice)

*(Un)willing to participate*

Despite expressing anxiety around participation, most people were enthusiastic, often because of its learning opportunity. Others were less willing, suggesting colleagues who would find it more useful.

> 'I did volunteer. Back in medical school I found they were really helpful. It's always excruciating, especially watching it back, but it's worth it for the learning.' (Clinical, female, Hawthorn Practice).

2. Reflection on the simulation design

*Simulated patients*

The actors were highly praised for their realistic portrayal of patients: they enabled staff to fully participate within the scenario and enhance its psychological fidelity. However, when participants realised who the 'ill' actor was, he potentially became less believable. As the specifics of the scenario were unknown to participants beforehand, there was scope for people to be surprised and to demonstrate flexibility.

> "the element of surprise is good, and the fact that you managed to keep that other actress well away so we didn't even know that she was, it was really clever […] when someone collapses on the floor we're not really used to having hysterical relatives and people fighting that doesn't normally happen so that was, that was good to see that we still managed to handle it as well as we did." (Non-clinical, female, Willow Practice)

*In-situ simulation elements*

Participants highlighted the importance of familiarity with their own equipment and being in a simulated emergency which was as realistic as possible (for example, the mannequin being fully dressed). The use of own equipment was valued by all members of staff as a fundamental element

for learning. The unique space constraints in each practice provided an additional challenge, but one viewed as beneficial.

> 'I was a bit keen to put the [defibrillator] pads on before the man had his bare chest. But I know that I've got to put the plastic pads on, but I was obviously faced with strange things' (Clinical, female, Hawthorn Practice).

> "where difficulties and insight is coming is using your own equipment, knowing where things are knowing the processes, knowing who is, who does what" (clinical, male, Willow Practice)

*The transferability of knowledge*

Staff noted that the simulation session provided them with a safe environment in which they could practice their skills and identify areas for improvement. For non-clinical staff, simulation showed the importance of a team approach and being able to assist when needed.

> 'I think everybody needs to go through this because it's a learning curve for even a receptionist, as we keep saying we're just receptionists, we're not medically trained but, when push comes to shove, you need to help' (Non-clinical, female, Birch Practice).

3. Experiences of the scenario

*Clinical aspects*

Many participants felt that the clinical aspects were the most important learning aspects of the training, expressing reassurance that staff were competent in their roles and that equipment was working and used successfully.

> 'Seeing how my colleagues react in a crisis situation, it's nice to know they do know what they're doing [laughs]' (Non-clinical, female, Birch Practice).

*Non-clinical aspects*

Teamwork, and the number of people participating, were viewed positively by participants. It was seen as enhancing the fidelity of the simulation and providing a useful learning opportunity.

> "the fact that we work as a team, I like that, I mean we do quite often hit the green [emergency] button and all sort of do it and that's so we are used to you know working as a team and each of us having our own job to do when if it happens. So I was pleased that it went so well this time round" (Non-clinical, female, Willow Practice)

4. Training

All three practices identified Basic Life Support training as the only joint 'clinical' teaching; however, the sessions were about individual proficiency in the tasks rather than team work.

*Clinical and non-clinical staff members training together*

Both clinical and non-clinical members of staff felt it was beneficial to have joint training sessions, especially given the siloed nature of the primary care environment. However, offering trainings for all staff together was felt to not always be practical, in part due to the difficulties in closing the practice.

*Changes post-participation*

All practices successfully managed the emergency situation: however, some participants had concerns over familiarity with equipment. The idea of further training, specifically focusing on equipment, was voiced by staff at all three practices, with suggestions as to how this could be addressed, such as additional opportunities for using practice-owned equipment during training sessions. It was expressed that everyone on site should know how to use emergency equipment and that trainings would not need to be time-consuming in order to achieve greater familiarisation with equipment.

> 'I kind of veered towards that everyone should be trained to using the equipment. Because I know that I'd like to help, if I was the only one here or if there were two of us here, I couldn't leave a person' (Non-clinical, female, Hawthorn Practice).

Management of staff was identified as a potential area for improvement. Participants acknowledged this was difficult at certain points during the scenario as people who would normally be involved were not participating/on duty that day. This highlights the need for there to be flexibility in terms of planning for managing an emergency so all staff understand their role. Leadership was highlighted by several participants as a focus for the future.

> "I think reception staff erm you know often they haven't had simulation training where you've been in involved in something cardiac arrest or something they've learned a lot and enjoyed the experience but yeah I think um I think as a practice now we will go away and each of us the nurses will think about it, the receptionist will think about it, the doctors will think about it and then try and make changes where there needs to be changes." (Clinical, male, Birch Practice)

There was a concern that non-clinical members of staff did not feel as confident to deal with the emergency as clinical colleagues. Whilst all staff members undergo mandatory BLS trainings, it was suggested that this could be done more frequently in-house.

> 'I think it's good to encourage not just your clinical staff but your admin staff to do things like this because it is quite out of your comfort zone and yes, I think it is good to just have the knowledge behind you.' (Non-clinical, female, Hawthorn Practice).

## Discussion

This unique study has shown proof of concept that in-situ simulation could be an acceptable and feasible way of developing interprofessional skills in the primary care workforce and as such have the potential to improve patient care. The simulation showed all participating practices could potentially successfully manage a medical emergency as well as meeting additional patient demands. Whilst many participants, both clinical and non-clinical, were apprehensive beforehand, all found it to be a beneficial training experience and were enthusiastic about its potential benefit to learning. Whilst the in-situ set up proved challenging, it increased the perceived fidelity of the simulation. Overall, participants were reassured that staff displayed competence in their roles and that the practices' own equipment was used successfully.

*Strengths and limitations*

All practices were research-active, accessed through existing relationships with the research team. It is possible these practices were particularly confident in their ability and therefore willing to participate. Also, all practices were large (15,000+ registered patients) and urban: we do not know how smaller, more rural practices would have fared. . As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond those that participated. However in each practice there was a good range of different roles included. The qualitative method is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.

*Comparison with existing literature*

Evidence around the efficacy of in situ simulation is emerging, and existing research is promising, but this is a relatively new area(15): there is very limited research on investigating the value of high fidelity simulation within primary care, providing clinicians with the practical skills and confidence to manage emergencies within their surgeries. One project focusing on this led simulation-based workshops covering more commonly encountered medical emergencies and required participants to locate and use their own equipment and medication[20]: the results showed many participants knew how to respond 'in theory' but were unable to demonstrate practical aspects quickly and safely. This training is particularly important for time-critical illnesses. Previous research with health care assistants showed participants felt simulation-based training had reinforced their clinical knowledge and ability as well as adding to it[21]. Increased confidence following in-situ training has been shown to remain at an eight week follow-up[22] thus indicating this type of training has lasting benefits towards managing the acutely-ill patient.

By training clinicians in-situ, using their own equipment, practices are able to see how well their space works and also assess human-factor elements[23]. Problems such as clinical staff struggling with equipment are only going to be identified through actual use, and therefore it is paramount staff develop familiarity with equipment. Established resuscitation courses support individuals in

managing emergencies, but a focus on their particular teamwork and communication in their actual day to day role cannot be provided, hence in-situ simulation offers an important complement[24].

Previous research has identified training as improving performance[25] and it is likely this can be translated into clinical practice. Health care professionals are trained predominantly in uniprofessional settings, yet have to work collaboratively in the practice environment; they may find they work side by side rather than together as an efficient team[26]. Teams are dynamic and require commitment to work and maintain: there is a need to understand other people's roles[27]. There is a growing awareness that patient safety in healthcare relies on the ability of individuals to collaborate with other professionals. This simulation allowed participants to view their colleagues in action and learn how they can best support one another in the management of an acute medical emergency. This supports previous findings in which participants were able to highlight their own strengths and weaknesses and being able to continually adapt to others in the team[28]. Team training has been identified as a high priority for the future of simulation[29].

When comparing teams, there was no consistent difference as to whether teams had been trained in their hospital or in a simulation centre. The advantages of local training are lower cost and no travel time or expenses (from the participants), the inclusion of healthcare assistants, receptionists and porters. All practices made changes to their staff training and equipment following the simulation session. These changes were easily identified, predominantly on increasing staff familiarity with equipment and offering more frequent training sessions than the mandatory BLS updates. Providing more opportunities for clinical and non-clinical members of staff to train together would enhance interprofessional working and reinforce understanding of the others' roles. Previous research referred to the 'emotional neutrality' of GP receptionists which can help to avoid exacerbating negative behaviour from annoyed patients[30]. It is important staff are able to tailor that offering to the needs of individual patients. Receptionists' work is complex and demanding and effective teamwork among receptionists should be recognised and developed[31].

A limitation with this study is the lack of comparison to training where clinical and non-clinical members of staff learn with their professional peers rather than the whole practice team. Whilst we have shown that interprofessional training has been beneficial in this instance, we are unable to show if this is definitively better than the more common profession-specific training. Previous research has shown that the voice of doctors can be dominant even if individuals are aware of this, which has the potential to be detrimental to the learning of others[32].

*Implications for research and practice*

This research has emphasised the potential importance and benefits of team training through in-situ simulation which includes all staff members within the GP surgery. The use of in-situ simulation was positively received, although did cause apprehension for many participants which may impact on recruitment in future studies. Future research in the form of a feasibility study will need to explore whether in-situ simulation is as well-received in smaller practices and consider whether improvements in teamwork would only apply to these teams, or also different teams, given changes in staff[25].

## Conclusion

Primary care staff members were given the opportunity to experience participating in the care/management of an acutely ill patient in a safe environment. From this, they were able to suggest changes in their workplace (such as increasing all-staff familiarity with on-site equipment) and this should benefit their performance, and as such the care of the patient, should they be faced with such an emergency in the future. Strengths identified in the debrief session can be highlighted and good practice can be shared with colleagues. The use of actors and fully involving both clinical and non-clinical members of staff builds upon previous research to form a fuller understanding of how in-situ simulation can benefit both the primary care workforce and patients.

## Contributors

SB was responsible for all aspects of the study including design, data collection and analysis. AH led on data collection, analysis and interpretation, and manuscript preparation. SB and MK were responsible for the clinical aspects of the research. HD implemented the study and ML-W was involved in the development of the study design. All authors commented on manuscript drafts and approved the final version.

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Competing interests

There are no competing interests to declare.

Data sharing statement

No additional data available.

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Appendix 1 – interview guide

# Primary Care Education Simulation Project Interview Guide

## Introduction

- Interviewer to (re)introduce themselves and purpose of interview (to explore their involvement in, and feelings towards, the simulation training exercise).
- Confirm with the participant that the consent form has been completed, they are still willing to be interviewed, and for the interview to be recorded.
- Remind the participant that they can change their mind about participating and stop the interview at any point.
- Ask if the participant has any questions, then start recording.

## Section 1 – Role and training within the practice

1. Can you tell me about your job and what it involves?
   *Part/full time, (non)clinical, weekly hours worked, responsibilities for junior members of staff.*
2. How long have you been working at this practice?
   a. For clinical staff: for how many years have you been qualified?
   b. For non-clinical staff: previous roles held (if applicable)
3. Since starting your current role at this practice, what training/professional development have you had?
   *What form has this taken? E.g. on/off site, mandatory/optional trainings, practical sessions, face to face/e-learning/online trainings.*
4. Thinking about the trainings you have undertaken since you started in your current role, who has been involved in this training with you?
   *Peers within the practice, (non)clinical staff, senior staff, SMT, junior staff, peers from other practices.*
5. What form of training/professional development you would like to have in the future?
   *Career progression, specifics if known…*

## Section 2 – Simulation

6. How did you feel beforehand about participating in today's simulation?
   *Participated in any simulation training before? Excited, nervous, apprehensive?*
7. Overall, how do you feel the simulation went?
8. What were the best and worst elements of today's simulation?
9. What was it like to be in a training session onsite with all members of practice staff?
   *Have you participated in an interdisciplinary training before, working alongside (non)clinical staff, training in situ*
10. Would you recommend simulation-based training to staff at other GP practices?
    *Why, why not…*

## Section 3 – Future development(s)

11. How could we develop this simulation to further improve training within GP practices?
*Different serious events, duration, mixture of staff, involvement of paramedics…*

12. Is there anything regarding today's simulation which you would like to mention?

## Closing

- Inform participant that the recorder is switched off, ask if they have any questions, and thank them for their time and involvement.

# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 4 |
| Credentials | 2 | What were the researcher's credentials? E.g. PhD, MD | 4 |
| Occupation | 3 | What was their occupation at the time of the study? | N/A |
| Gender | 4 | Was the researcher male or female? | N/A |
| Experience and training | 5 | What experience or training did the researcher have? | 4 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 4 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | 4 |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 4 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 4 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 5 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 5 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | N/A |
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | |
| Repeat interviews | 18 | Were repeat inter views carried out? If yes, how many? | N/A |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 5 |
| Field notes | 20 | Were field notes made during and/or after the inter view or focus group? | N/A |
| Duration | 21 | What was the duration of the inter views or focus group? | 5 |
| Data saturation | 22 | Was data saturation discussed? | 4 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or | N/A |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| | | correction? | |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 4 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | 5 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 4 |
| Software | 27 | What software, if applicable, was used to manage the data? | 4 |
| Participant checking | 28 | Did participants provide feedback on the findings? | N/A |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 6 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 6 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 6 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | N/A |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

**Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.**

BMJ Open

# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study.

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| | |

# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study

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*Objectives*

Acutely unwell patients in the primary care setting are uncommon, but their successful management requires involvement from staff (clinical and non-clinical) working as a cohesive team. Despite the advantages of interprofessional education being well documented, there is little research evidence of this within primary care. Enhancing interprofessional working could ultimately improve care of the acutely ill patient. This proof of concept study aimed to develop an in-situ simulation of a medical emergency to use within primary care, and assess its acceptability and utility through participants' reported experiences.

*Methods*

The intervention of an in-situ simulation scenario of a cardiac arrest was developed by the research team and run in three research-active General Practices in south east England. Nine staff members per practice consented to participate, representing clinical and non-clinical professions. For the evaluation, staff participated in individual qualitative semi-structured interviews following the in-situ simulation: these focused on their experiences of participating, with particular attention on interdisciplinary training and potential future developments of the in-situ simulation.

*Results*

The in-situ simulation was appropriate for use within the participating General Practices. Qualitative thematic analysis of the interviews identified four themes: 1) apprehension and (un)willing participation, 2) reflection on the simulation design, 3) experiences of the scenario and 4) training.

*Conclusions*

This study suggests in-situ simulation can be an acceptable approach for interdisciplinary team training within primary care, being well-received by practices and staff. This contributes to a fuller understanding of how in-situ simulation can benefit both workforce and patients. Future research is needed to further refine the in-situ simulation training session.

*Key words*

Primary care; mixed methods; in-situ simulation; interprofessional training; medical emergency; qualitative research

Strengths and limitations of this study

- This is a novel approach to exploring the use of in-situ simulation within the primary care setting.

- The qualitative approach is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.
- All centres were research-active, accessed through existing relationships with the research team. It is possible these centres were particularly confident in their ability and therefore willing to participate.
- As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond this first proof of concept study.

## Background

Medical emergencies within primary care are rare, a number largely unknown. One study found six per cent of all out of hospital cardiac arrests were in primary care, viewing this as a significant number and suggesting primary care providers have an important role in managing out of hospital cardiac arrests (OHCA)[1]. Their management requires good teamwork, communication and effective use of available resources by the whole primary care team[2] and there has been a growing interest in the application of simulation-based training to non-clinicians and the organisation as a whole[3].

There is little published data on the acceptability or impact of multidisciplinary simulation-based medical emergencies training in general practice, most training being aimed specifically at clinicians. Training provides the opportunity to practice a variety of skills in a consequence-free environment, and team training enhances its effectiveness[4]. Simulation allows for the practice of skills needed in emergency situations without relying on clinical opportunity[5] and can reinforce psychomotor and critical decision-making skills[6] as well as training the management of complex medical situations[7, 8]. Previous research using simulation-based medical emergencies training showed an improvement in general practitioners' (GPs') reported management and confidence in responding to an emergency, and a positive impact on both from non-clinical staff[2]. Simulation-based medical emergency training has also allowed non-clinicians to gain experience and appreciation for the demands of patient care[3], emphasised the importance of defining team structures and processes[9], and provided participants with the opportunity to develop non-technical skills such as effective teamwork and communication[10]. Simulated exercises have the potential to allow individuals to practise the management of emergencies within a team setting, and also allows team to analyse and adapt their own performance[11].

In an interdisciplinary team, members work closely together and communicate frequently, organised around a common set of problems[12]. In recent years healthcare workers have been encouraged to move away from 'silo' roles towards an environment which is more interprofessional in order to improve patient care[13]. Whilst there are bodies of literature on interprofessional education and medical simulation, there is a paucity of literature which links the two. With minimal opportunities for health professionals to interact and engage in multiprofessional scenarios prior to real-life experience[14], it is important that the opportunities provided are seen as beneficial to all the participants. In-situ simulation has been used to develop individual and team learning across clinical and non-clinical areas[15]: bringing portable equipment to the actual clinical environment allows simulation training to be delivered to teams who may not benefit from the educational tool otherwise[16]. The use of a high-fidelity patient simulator in conjunction with a well-designed scenario enables near-perfect realism and is appropriate for use as a continuous professional development activity[17].

This proof of concept project aimed to develop an in-situ simulation scenario of a medical emergency and explore the views of clinical and non-clinical staff as to whether it is feasible and beneficial to use as an interprofessional training format within primary care.

## Method

A qualitative evaluation of an in-situ simulation intervention exercise was designed to explore and understand the views of primary care staff as to their experiences of using simulation to deliver interdisciplinary training, focusing on appropriateness and acceptability.

### *Setting*

Four research-active general practice centres within Health Education England Kent, Surrey and Sussex (HEEKSS), known to the research team, were approached regarding participation. Each was visited by AH to answer questions and ensure the space available was appropriate for the simulation. One centre withdrew before filming; the remaining three participated between May and August 2018. The practice managers and senior GPs from each centree were responsible for recruiting staff members willing to participate. Centres were recompensed £500, an amount set by the research funder (HEEKSS) to cover costs incurred from participation (such as ensuring additional staff were on duty to allow for the centre to remain open throughout the simulation).

### *Intervention*

A simulation of a medical emergency was designed by the research team and further developed in collaboration with the actors. SB, lead for simulation education and MK, a general practitioner and Simulation Lead for Post Graduate Medical Education at HEEKSS, developed the clinical outline of a cardiac arrest scenario which would occur in the waiting room of the GP centre. The character Mr Hughes would collapse, witnessed by his 'wife'. A third actor would play a patient who would become increasingly annoyed at the perceived inconvenience. During rehearsals with the wider research team and the actors the clinical skeleton underwent elaboration to include a greater medical history for the characters involved, to pre-empt questions which could be asked by the research participants. In order to maximise realism, human interaction and real world benefit, the simulation used actors and the centres' own emergency equipment. In the finalised scenario, the actor playing Mr Hughes would collapse in the waiting room, ensuring he was close to a dividing screen: this would be immediately moved by a member of the research team to reveal a high-fidelity mannequin (Laerdal ©)) dressed in identical clothing to allow participants to use chest compressions and their defibrillator. The actor would move out of the way and later became the emergency call handler when a member of staff 'phoned' 999 using the handset provided.

Cameras were positioned in the waiting room to capture the simulation: the research team remained in the waiting room and could view the simulation via a laptop and were able to tag the recording to capture significant moments, important for the subsequent debrief. SB and MK had laminated sheets containing clinical information about Mr Hughes (such as his blood pressure) which would be provided to participants when required. This film was used in the post-simulation debrief, which occurred in a separate private room, with all participants to reinforce the learning objectives and critique performance in an objective atmosphere[6]. Participants were reminded that the training was not an individual assessment. During the simulation, all members of staff who had consented to participate in the research had an active role – no one had the role of observer.
The simulation ran for approximately 20 minutes followed by a short break and a debriefing session of approximately 45 minutes, using 'the diamond' debriefing method as a guide for structure[18].
Face-to-face interviews occurred within a fortnight, depending on participant availability, and were audio-recorded.

Patient and public involvement

No patient involved.

Evaluation

Each participant consented to a semi-structured face-to-face interview (see Appendix 1) with AH, an experienced qualitative researcher. Interviews were transcribed verbatim and analysed using inductive thematic analysis[19].

AH read each transcript and coded line by line, using NVivo to manage the dataset. Codes were derived inductively from the data and grouped to produce the initial coding frame. Codes and theme/subtheme definitions were iteratively developed by AH and SB. Data saturation was achieved, and the coding manual fitted all of the data.

Ethical approval was received from the Faculty of Health and Medical Sciences ethics committee (ref: 1349-FHMS-17). All staff members gave informed consent to participate in the simulation, debrief, and interview. Whilst on site, care was taken to ensure members of the public were aware it was a training session and that the 'patients' involved were actors: signs were put in entrances, and on doors and walls in corridors and waiting areas, reception staff informed patients as they checked in for their appointments, and members of the research team were available to answer any questions in the hope that members of the public were shielded from any distress The cameras used for filming the scenario were positioned in such a way that they only captured a small section of the waiting room and not members of the public.

Results

Each centre had nine staff members volunteer to participate in the simulation: two participants were unable to be interviewed during to lack of availability. Table 1 shows the total number of clinical and non-clinical staff members who participated.

Table 1: Participant characteristics (grouped data)

| Role | Female participants | Male participants |
|---|---|---|
| General Practitioner | 6 | 4 |
| Nurses and health care assistants | 5 (1 unable to be interviewed) | 1 |

| | | |
|---|---|---|
| Non-clinical roles (e.g. general practice manager, receptionist, administration) | 11 (1 unable to be interviewed) | 0 |

Thematic analysis identified four themes relating to the participants' involvement in the simulation. The themes and subthemes are shown in Table 2. Illustrative quotations are provided.

Table 2 Themes and subthemes

Table 2: Themes and subthemes

| Theme | Subtheme | Additional subthemes (where applicable) |
|---|---|---|
| 1. Apprehension and (un)willing participation | 1.1 Apprehension prior to event<br>1.2 Fear of assessment<br>1.3 (Un)willing to participate | 1.1.1 Fear of the unknown<br>1.1.2 Concerns about filming |
| 2. Reflection on the simulation design | 2.1 Simulated patients<br>2.2 In-situ simulation elements<br>2.3 The transferability of knowledge | |
| 3. Experiences of the scenario | 3.1 Clinical aspects<br>3.2 Non-clinical aspects | |
| 4. Training | 4.1 Clinical and non-clinical staff training together<br>4.2 Changes post-participation | |

1. Apprehension and (un)willing participation

All three centres reported limited exposure to simulation as a pedagogic approach; only junior clinicians had experienced simulation as part of their hospital training. Participants knew they would be involved in a simulation but had no further details as to the content of the scenario in advance.

*Apprehension prior to event*

Both clinical and non-clinical participants expressed anxiety felt prior to participating, both on an individual level and for the staff as a whole. Participants did not know what medical emergency the simulation would involve and this 'fear of the unknown' was off-putting to some. Anxiety was also due to being aware the simulation would be filmed and shown to the group.

> "I think it's because we were being videoed, if we weren't being videoed and I think that's a personal thing rather than or being worried professionally, if this was sort of just another BLS [basic life support] type simulation we do that annually, I wouldn't have minded that, because we were being videoed we didn't quite know what to expect and it was all you know we were told "oh they're on site and they're setting up" and there was bit of secrecy around it which sort of increased the stress levels but I think once we were in the situation in the scenario in the situation it was fine." (clinical participant )

*Fear of assessment*

Concerns that prior to the simulation it felt like a test were expressed by both clinical and non-clinical members of staff. Individuals were wary about how they would be viewed by colleagues and the research team. However, most people who felt this way at the beginning had a different view afterwards.

> 'I think you'd always be nervous if something real happened like that but, as far as it being like a test, which I think we all probably thought, oh gosh, this is like an exam or a test type thing, it wasn't really.' (Non-clinical participant)

*(Un)willing to participate*

Despite expressing anxiety around participation, most people were enthusiastic, often because of its learning opportunity. Others were less willing, suggesting colleagues who would find it more useful.

> 'I did volunteer. Back in medical school I found they were really helpful. It's always excruciating, especially watching it back, but it's worth it for the learning.' (Clinical participant).

2. Reflection on the simulation design

*Simulated patients*

The actors were highly praised for their realistic portrayal of patients: they enabled staff to fully participate within the scenario and enhance its psychological fidelity. However, when participants realised who the 'ill' actor was, he potentially became less believable. As the specifics of the scenario were unknown to participants beforehand, there was scope for people to be surprised and to demonstrate flexibility.

> "the element of surprise is good, and the fact that you managed to keep that other actress well away so we didn't even know that she was, it was really clever […] when someone collapses on the floor we're not really used to having hysterical relatives and people fighting that doesn't normally happen so that was, that was good to see that we still managed to handle it as well as we did." (Non-clinicalparticipant)

*In-situ simulation elements*

Participants highlighted the importance of familiarity with their own equipment and being in a simulated emergency which was as realistic as possible (for example, the mannequin being fully dressed). The use of own equipment was valued by all members of staff as a fundamental element for learning. The unique space constraints in each centre provided an additional challenge, but one viewed as beneficial.

> 'I was a bit keen to put the [defibrillator] pads on before the man had his bare chest. But I know that I've got to put the plastic pads on, but I was obviously faced with strange things' (Clinical participant).

"where difficulties and insight is coming is using your own equipment, knowing where things are knowing the processes, knowing who is, who does what" (clinical participant)

*The transferability of knowledge*

Staff noted that the simulation session provided them with a safe environment in which they could practice their skills and identify areas for improvement. For non-clinical staff, simulation showed the importance of a team approach and being able to assist when needed.

'I think everybody needs to go through this because it's a learning curve for even a receptionist, as we keep saying we're just receptionists, we're not medically trained but, when push comes to shove, you need to help' (Non-clinical participant).

3. Experiences of the scenario

*Clinical aspects*

Many participants felt that the clinical aspects were the most important learning aspects of the training, expressing reassurance that staff were competent in their roles and that equipment was working and used successfully.

'Seeing how my colleagues react in a crisis situation, it's nice to know they do know what they're doing [laughs]' (Non-clinical participant).

*Non-clinical aspects*

Teamwork, and the number of people participating, were viewed positively by participants. It was seen as enhancing the fidelity of the simulation and providing a useful learning opportunity.

"the fact that we work as a team, I like that, I mean we do quite often hit the green [emergency] button and all sort of do it and that's so we are used to you know working as a team and each of us having our own job to do when if it happens. So I was pleased that it went so well this time round" (Non-clinical participant)

4. Training

All three centres identified Basic Life Support training as the only joint 'clinical' teaching; however, the sessions were about individual proficiency in the tasks rather than team work.

*Clinical and non-clinical staff members training together*

Both clinical and non-clinical members of staff felt it was beneficial to have joint training sessions, especially given the siloed nature of the primary care environment. However, offering trainings for all staff together was felt to not always be practical, in part due to the difficulties in closing the centre.

*Changes post-participation*

All centres successfully managed the emergency situation: however, some participants had concerns over familiarity with equipment. The idea of further training, specifically focusing on equipment, was voiced by staff at all three centres, with suggestions as to how this could be addressed, such as additional opportunities for using centre-owned equipment during training sessions. It was expressed that everyone on site should know how to use emergency equipment and that trainings would not need to be time-consuming in order to achieve greater familiarisation with equipment.

> 'I kind of veered towards that everyone should be trained to using the equipment. Because I know that I'd like to help, if I was the only one here or if there were two of us here, I couldn't leave a person' (Non-clinical participant).

Management of staff was identified as a potential area for improvement. Participants acknowledged this was difficult at certain points during the scenario as people who would normally be involved were not participating/on duty that day. This highlights the need for there to be flexibility in terms of planning for managing an emergency so all staff understand their role. Leadership was highlighted by several participants as a focus for the future.

> "I think reception staff erm you know often they haven't had simulation training where you've been in involved in something cardiac arrest or something they've learned a lot and enjoyed the experience but yeah I think um I think as a practice now we will go away and each of us the nurses will think about it, the receptionist will think about it, the doctors will think about it and then try and make changes where there needs to be changes." (Clinical participant)

There was a concern that non-clinical members of staff did not feel as confident to deal with the emergency as clinical colleagues. Whilst all staff members undergo mandatory BLS trainings, it was suggested that this could be done more frequently in-house.

> 'I think it's good to encourage not just your clinical staff but your admin staff to do things like this because it is quite out of your comfort zone and yes, I think it is good to just have the knowledge behind you.' (Non-clinical participant).

## Discussion

This unique study has shown proof of concept that in-situ simulation could be an acceptable and feasible way of developing interprofessional skills in the primary care workforce and as such have the potential to improve patient care. The simulation showed all participating centres could potentially successfully manage a medical emergency as well as meeting additional patient demands. Whilst many participants, both clinical and non-clinical, were apprehensive beforehand, all found it to be a beneficial training experience and were enthusiastic about its potential benefit to learning. Whilst the in-situ set up proved challenging, it increased the perceived fidelity of the simulation. No patients reported any distress either to the research team or centre staff. Overall, participants were reassured that staff displayed competence in their roles and that the centres' own equipment was used successfully.

### *Strengths and limitations*

All centres were research-active, accessed through existing relationships with the research team. It is possible these centres were particularly confident in their ability and therefore willing to

participate. Also, all centres were large (15,000+ registered patients) and urban: we do not know how smaller, more rural centres would have fared. T. As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond those that participated. However in each centre there was a good range of different roles included. The qualitative method is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.

*Comparison with existing literature*

Evidence around the efficacy of in situ simulation is emerging, and existing research is promising, but this is a relatively new area[15]: there is very limited research on investigating the value of high fidelity simulation within primary care, providing clinicians with the practical skills and confidence to manage emergencies within their surgeries. One project focusing on this led simulation-based workshops covering more commonly encountered medical emergencies and required participants to locate and use their own equipment and medication[20]: the results showed many participants knew how to respond 'in theory' but were unable to demonstrate practical aspects quickly and safely. This training is particularly important for time-critical illnesses. Previous research with health care assistants showed participants felt simulation-based training had reinforced their clinical knowledge and ability as well as adding to it[21]. Increased confidence following in-situ training has been shown to remain at an eight week follow-up[22] thus indicating this type of training has lasting benefits towards managing the acutely-ill patient.

By training clinicians in-situ, using their own equipment, centres are able to see how well their space works and also assess human-factor elements[23]. Problems such as clinical staff struggling with equipment are only going to be identified through actual use, and therefore it is paramount staff develop familiarity with equipment. Established resuscitation courses support individuals in managing emergencies, but a focus on their particular teamwork and communication in their actual day to day role cannot be provided, hence in-situ simulation offers an important complement[24].

Previous research has identified training as improving performance[25] and it is likely this can be translated into clinical practice. Health care professionals are trained predominantly in uniprofessional settings, yet have to work collaboratively in the practice environment; they may find they work side by side rather than together as an efficient team[26]. Teams are dynamic and require

commitment to work and maintain: there is a need to understand other people's roles[27]. There is a growing awareness that patient safety in healthcare relies on the ability of individuals to collaborate with other professionals. This simulation allowed participants to view their colleagues in action and learn how they can best support one another in the management of an acute medical emergency. This supports previous findings in which participants were able to highlight their own strengths and weaknesses and being able to continually adapt to others in the team[28]. Team training has been identified as a high priority for the future of simulation[29].

When comparing teams, there was no consistent difference as to whether teams had been trained in their hospital or in a simulation centre. The advantages of local training are lower cost and no travel time or expenses (from the participants), the inclusion of healthcare assistants, receptionists and porters. All centres made changes to their staff training and equipment following the simulation session. These changes were easily identified, predominantly on increasing staff familiarity with equipment and offering more frequent training sessions than the mandatory BLS updates. Providing more opportunities for clinical and non-clinical members of staff to train together would enhance interprofessional working and reinforce understanding of the others' roles. Previous research referred to the 'emotional neutrality' of GP receptionists which can help to avoid exacerbating negative behaviour from annoyed patients[30]. It is important staff are able to tailor that offering to the needs of individual patients. Receptionists' work is complex and demanding and effective teamwork among receptionists should be recognised and developed[31].

A limitation with this study is the lack of comparison to training where clinical and non-clinical members of staff learn with their professional peers rather than the whole centre team. Whilst we have shown that interprofessional training has been beneficial in this instance, we are unable to show if this is definitively better than the more common profession-specific training. Previous research has shown that the voice of doctors can be dominant even if individuals are aware of this, which has the potential to be detrimental to the learning of others[32].

*Implications for research and practice*

This research has emphasised the potential importance and benefits of team training through in-situ simulation which includes all staff members within the GP surgery. The use of in-situ simulation was positively received, although did cause apprehension for many participants which may impact on recruitment in future studies. Future research in the form of a feasibility study will need to explore

whether in-situ simulation is as well-received in smaller centres and consider whether improvements in teamwork would only apply to these teams, or also different teams, given changes in staff[26].

## Conclusion

Primary care staff members were given the opportunity to experience participating in the care/management of an acutely ill patient in a safe environment. From this, they were able to suggest changes in their workplace (such as increasing all-staff familiarity with on-site equipment) and this should benefit their performance, and as such the care of the patient, should they be faced with such an emergency in the future. Strengths identified in the debrief session can be highlighted and good practice can be shared with colleagues. The use of actors and fully involving both clinical and non-clinical members of staff builds upon previous research to form a fuller understanding of how in-situ simulation can benefit both the primary care workforce and patients.

## Contributors

SB was responsible for all aspects of the study including design, data collection and analysis. AH led on data collection, analysis and interpretation, and manuscript preparation. SB and MK were responsible for the clinical aspects of the research. HD implemented the study and ML-W was involved in the development of the study design. All authors commented on manuscript drafts and approved the final version.

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Competing interests

There are no competing interests to declare.

Data sharing statement

No additional data available.

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Appendix 1 – interview guide

# Primary Care Education Simulation Project Interview Guide

## Introduction

- Interviewer to (re)introduce themselves and purpose of interview (to explore their involvement in, and feelings towards, the simulation training exercise).
- Confirm with the participant that the consent form has been completed, they are still willing to be interviewed, and for the interview to be recorded.
- Remind the participant that they can change their mind about participating and stop the interview at any point.
- Ask if the participant has any questions, then start recording.

## Section 1 – Role and training within the practice

1. Can you tell me about your job and what it involves?
   *Part/full time, (non)clinical, weekly hours worked, responsibilities for junior members of staff.*
2. How long have you been working at this practice?
   a. For clinical staff: for how many years have you been qualified?
   b. For non-clinical staff: previous roles held (if applicable)
3. Since starting your current role at this practice, what training/professional development have you had?
   *What form has this taken? E.g. on/off site, mandatory/optional trainings, practical sessions, face to face/e-learning/online trainings.*
4. Thinking about the trainings you have undertaken since you started in your current role, who has been involved in this training with you?
   *Peers within the practice, (non)clinical staff, senior staff, SMT, junior staff, peers from other practices.*
5. What form of training/professional development you would like to have in the future?
   *Career progression, specifics if known…*

## Section 2 – Simulation

6. How did you feel beforehand about participating in today's simulation?
   *Participated in any simulation training before? Excited, nervous, apprehensive?*
7. Overall, how do you feel the simulation went?
8. What were the best and worst elements of today's simulation?
9. What was it like to be in a training session onsite with all members of practice staff?
   *Have you participated in an interdisciplinary training before, working alongside (non)clinical staff, training in situ*
10. Would you recommend simulation-based training to staff at other GP practices?
    *Why, why not…*

## Section 3 – Future development(s)

11. How could we develop this simulation to further improve training within GP practices?
*Different serious events, duration, mixture of staff, involvement of paramedics…*

12. Is there anything regarding today's simulation which you would like to mention?

## Closing

- Inform participant that the recorder is switched off, ask if they have any questions, and thank them for their time and involvement.

# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 4 |
| Credentials | 2 | What were the researcher's credentials? E.g. PhD, MD | 4 |
| Occupation | 3 | What was their occupation at the time of the study? | N/A |
| Gender | 4 | Was the researcher male or female? | N/A |
| Experience and training | 5 | What experience or training did the researcher have? | 4 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 4 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | 4 |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 4 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 4 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 5 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 5 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | N/A |
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | |
| Repeat interviews | 18 | Were repeat inter views carried out? If yes, how many? | N/A |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 5 |
| Field notes | 20 | Were field notes made during and/or after the inter view or focus group? | N/A |
| Duration | 21 | What was the duration of the inter views or focus group? | 5 |
| Data saturation | 22 | Was data saturation discussed? | 4 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or | N/A |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| | | correction? | |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 4 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | 5 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 4 |
| Software | 27 | What software, if applicable, was used to manage the data? | 4 |
| Participant checking | 28 | Did participants provide feedback on the findings? | N/A |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 6 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 6 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 6 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | N/A |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

**Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.**

BMJ Open

# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study in primary care in England.



| | |
|---|---|
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| Keywords: | PRIMARY CARE, mixed methods, in-situ simulation, interprofessional training, QUALITATIVE RESEARCH, medical emergency |
| | |

# Using in-situ simulation to improve care of the acutely ill patient by enhancing interprofessional working: a qualitative proof of concept study in primary care in England

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*Objectives*

Acutely unwell patients in the primary care setting are uncommon, but their successful management requires involvement from staff (clinical and non-clinical) working as a cohesive team. Despite the advantages of interprofessional education being well documented, there is little research evidence of this within primary care. Enhancing interprofessional working could ultimately improve care of the acutely ill patient. This proof of concept study aimed to develop an in-situ simulation of a medical emergency to use within primary care, and assess its acceptability and utility through participants' reported experiences.

*Setting*

Three research-active General Practices in south east England. Nine staff members per practice consented to participate, representing clinical and non-clinical professions.

*Methods*

The intervention of an in-situ simulation scenario of a cardiac arrest was developed by the research team. For the evaluation, staff participated in individual qualitative semi-structured interviews following the in-situ simulation: these focused on their experiences of participating, with particular attention on interdisciplinary training and potential future developments of the in-situ simulation.

*Results*

The in-situ simulation was appropriate for use within the participating General Practices. Qualitative thematic analysis of the interviews identified four themes: 1) apprehension and (un)willing participation, 2) reflection on the simulation design, 3) experiences of the scenario and 4) training.

*Conclusions*

This study suggests in-situ simulation can be an acceptable approach for interdisciplinary team training within primary care, being well-received by practices and staff. This contributes to a fuller understanding of how in-situ simulation can benefit both workforce and patients. Future research is needed to further refine the in-situ simulation training session.

*Key words*

Primary care; mixed methods; in-situ simulation; interprofessional training; medical emergency; qualitative research

Strengths and limitations of this study

- This is a novel approach to exploring the use of in-situ simulation within the primary care setting.

- The qualitative approach is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.
- All centres were research-active, accessed through existing relationships with the research team. It is possible these centres were particularly confident in their ability and therefore willing to participate.
- As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond this first proof of concept study.

## Background

Medical emergencies within primary care are rare, a number largely unknown. One study found six per cent of all out of hospital cardiac arrests were in primary care, viewing this as a significant number and suggesting primary care providers have an important role in managing out of hospital cardiac arrests (OHCA)[1]. Their management requires good teamwork, communication and effective use of available resources by the whole primary care team[2] and there has been a growing interest in the application of simulation-based training to non-clinicians and the organisation as a whole[3].

There is little published data on the acceptability or impact of multidisciplinary simulation-based medical emergencies training in general practice, most training being aimed specifically at clinicians. Training provides the opportunity to practice a variety of skills in a consequence-free environment, and team training enhances its effectiveness[4]. Simulation allows for the practice of skills needed in emergency situations without relying on clinical opportunity[5] and can reinforce psychomotor and critical decision-making skills[6] as well as training the management of complex medical situations[7, 8]. Previous research using simulation-based medical emergencies training showed an improvement in general practitioners' (GPs') reported management and confidence in responding to an emergency, and a positive impact on both from non-clinical staff[2]. Simulation-based medical emergency training has also allowed non-clinicians to gain experience and appreciation for the demands of patient care[3], emphasised the importance of defining team structures and processes[9], and provided participants with the opportunity to develop non-technical skills such as effective teamwork and communication[10]. Simulated exercises have the potential to allow individuals to practise the management of emergencies within a team setting, and also allows team to analyse and adapt their own performance[11].

In an interdisciplinary team, members work closely together and communicate frequently, organised around a common set of problems[12]. In recent years healthcare workers have been encouraged to move away from 'silo' roles towards an environment which is more interprofessional in order to improve patient care[13]. Whilst there are bodies of literature on interprofessional education and medical simulation, there is a paucity of literature which links the two. With minimal opportunities for health professionals to interact and engage in multiprofessional scenarios prior to real-life experience[14], it is important that the opportunities provided are seen as beneficial to all the participants. In-situ simulation has been used to develop individual and team learning across clinical and non-clinical areas[15]: bringing portable equipment to the actual clinical environment allows simulation training to be delivered to teams who may not benefit from the educational tool otherwise[16]. The use of a high-fidelity patient simulator in conjunction with a well-designed scenario enables near-perfect realism and is appropriate for use as a continuous professional development activity[17].

This proof of concept project aimed to develop an in-situ simulation scenario of a medical emergency and explore the views of clinical and non-clinical staff as to whether it is feasible and beneficial to use as an interprofessional training format within primary care.

## Method

A qualitative evaluation of an in-situ simulation intervention exercise was designed to explore and understand the views of primary care staff as to their experiences of using simulation to deliver interdisciplinary training, focusing on appropriateness and acceptability.

### *Setting*

Four research-active general practice centres within Health Education England Kent, Surrey and Sussex (HEEKSS), known to the research team, were approached regarding participation. Each was visited by AH to answer questions and ensure the space available was appropriate for the simulation. One centre withdrew before filming; the remaining three participated between May and August 2018. The practice managers and senior GPs from each centree were responsible for recruiting staff members willing to participate. Centres were recompensed £500, an amount set by the research funder (HEEKSS) to cover costs incurred from participation (such as ensuring additional staff were on duty to allow for the centre to remain open throughout the simulation).

### *Intervention*

A simulation of a medical emergency was designed by the research team and further developed in collaboration with the actors. SB, lead for simulation education and MK, a general practitioner and Simulation Lead for Post Graduate Medical Education at HEEKSS, developed the clinical outline of a cardiac arrest scenario which would occur in the waiting room of the GP centre. The character Mr Hughes would collapse, witnessed by his 'wife'. A third actor would play a patient who would become increasingly annoyed at the perceived inconvenience. During rehearsals with the wider research team and the actors the clinical skeleton underwent elaboration to include a greater medical history for the characters involved, to pre-empt questions which could be asked by the research participants. In order to maximise realism, human interaction and real world benefit, the simulation used actors and the centres' own emergency equipment. In the finalised scenario, the actor playing Mr Hughes would collapse in the waiting room, ensuring he was close to a dividing screen: this would be immediately moved by a member of the research team to reveal a high-fidelity mannequin (Laerdal ©)) dressed in identical clothing to allow participants to use chest compressions and their defibrillator. The actor would move out of the way and later became the emergency call handler when a member of staff 'phoned' 999 using the handset provided.

Cameras were positioned in the waiting room to capture the simulation: the research team remained in the waiting room and could view the simulation via a laptop and were able to tag the recording to capture significant moments, important for the subsequent debrief. SB and MK had laminated sheets containing clinical information about Mr Hughes (such as his blood pressure) which would be provided to participants when required. This film was used in the post-simulation debrief, which occurred in a separate private room, with all participants to reinforce the learning objectives and critique performance in an objective atmosphere[6]. Participants were reminded that the training was not an individual assessment. During the simulation, all members of staff who had consented to participate in the research had an active role – no one had the role of observer.
The simulation ran for approximately 20 minutes followed by a short break and a debriefing session of approximately 45 minutes, using 'the diamond' debriefing method as a guide for structure[18].
Face-to-face interviews occurred within a fortnight, depending on participant availability, and were audio-recorded.

## Patient and public involvement

Patients and the public were not involved in the design or planning of the study.

Evaluation

Each participant consented to a semi-structured face-to-face interview (see Appendix 1) with AH, an experienced qualitative researcher. Interviews were transcribed verbatim and analysed using inductive thematic analysis[19].

AH read each transcript and coded line by line, using NVivo to manage the dataset. Codes were derived inductively from the data and grouped to produce the initial coding frame. Codes and theme/subtheme definitions were iteratively developed by AH and SB. Data saturation was achieved, and the coding manual fitted all of the data.

Ethical approval was received from the Faculty of Health and Medical Sciences ethics committee (ref: 1349-FHMS-17). All staff members gave informed consent to participate in the simulation, debrief, and interview. Whilst on site, care was taken to ensure members of the public were aware it was a training session and that the 'patients' involved were actors: signs were put in entrances, and on doors and walls in corridors and waiting areas, reception staff informed patients as they checked in for their appointments, and members of the research team were available to answer any questions in the hope that members of the public were shielded from any distress The cameras used for filming the scenario were positioned in such a way that they only captured a small section of the waiting room and not members of the public.

Results

Each centre had nine staff members volunteer to participate in the simulation: two participants were unable to be interviewed during to lack of availability. Table 1 shows the total number of clinical and non-clinical staff members who participated.

Table 1: Participant characteristics (grouped data)

| Role | Female participants | Male participants |
|---|---|---|
| General Practitioner | 6 | 4 |
| Nurses and health care assistants | 5 (1 unable to be interviewed) | 1 |

| | | |
|---|---|---|
| Non-clinical roles (e.g. general practice manager, receptionist, administration) | 11 (1 unable to be interviewed) | 0 |

Thematic analysis identified four themes relating to the participants' involvement in the simulation. The themes and subthemes are shown in Table 2. Illustrative quotations are provided.

Table 2 Themes and subthemes

Table 2: Themes and subthemes

| Theme | Subtheme | Additional subthemes (where applicable) |
|---|---|---|
| 1. Apprehension and (un)willing participation | 1.1 Apprehension prior to event<br>1.2 Fear of assessment<br>1.3 (Un)willing to participate | 1.1.1 Fear of the unknown<br>1.1.2 Concerns about filming |
| 2. Reflection on the simulation design | 2.1 Simulated patients<br>2.2 In-situ simulation elements<br>2.3 The transferability of knowledge | |
| 3. Experiences of the scenario | 3.1 Clinical aspects<br>3.2 Non-clinical aspects | |
| 4. Training | 4.1 Clinical and non-clinical staff training together<br>4.2 Changes post-participation | |

1. Apprehension and (un)willing participation

All three centres reported limited exposure to simulation as a pedagogic approach; only junior clinicians had experienced simulation as part of their hospital training. Participants knew they would be involved in a simulation but had no further details as to the content of the scenario in advance.

*Apprehension prior to event*

Both clinical and non-clinical participants expressed anxiety felt prior to participating, both on an individual level and for the staff as a whole. Participants did not know what medical emergency the simulation would involve and this 'fear of the unknown' was off-putting to some. Anxiety was also due to being aware the simulation would be filmed and shown to the group.

> "I think it's because we were being videoed, if we weren't being videoed and I think that's a personal thing rather than or being worried professionally, if this was sort of just another BLS [basic life support] type simulation we do that annually, I wouldn't have minded that, because we were being videoed we didn't quite know what to expect and it was all you know we were told "oh they're on site and they're setting up" and there was bit of secrecy around it which sort of increased the stress levels but I think once we were in the situation in the scenario in the situation it was fine." (clinical participant )

*Fear of assessment*

Concerns that prior to the simulation it felt like a test were expressed by both clinical and non-clinical members of staff. Individuals were wary about how they would be viewed by colleagues and the research team. However, most people who felt this way at the beginning had a different view afterwards.

> 'I think you'd always be nervous if something real happened like that but, as far as it being like a test, which I think we all probably thought, oh gosh, this is like an exam or a test type thing, it wasn't really.' (Non-clinical participant)

*(Un)willing to participate*

Despite expressing anxiety around participation, most people were enthusiastic, often because of its learning opportunity. Others were less willing, suggesting colleagues who would find it more useful.

> 'I did volunteer. Back in medical school I found they were really helpful. It's always excruciating, especially watching it back, but it's worth it for the learning.' (Clinical participant).

2. Reflection on the simulation design

*Simulated patients*

The actors were highly praised for their realistic portrayal of patients: they enabled staff to fully participate within the scenario and enhance its psychological fidelity. However, when participants realised who the 'ill' actor was, he potentially became less believable. As the specifics of the scenario were unknown to participants beforehand, there was scope for people to be surprised and to demonstrate flexibility.

> "the element of surprise is good, and the fact that you managed to keep that other actress well away so we didn't even know that she was, it was really clever […] when someone collapses on the floor we're not really used to having hysterical relatives and people fighting that doesn't normally happen so that was, that was good to see that we still managed to handle it as well as we did." (Non-clinicalparticipant)

*In-situ simulation elements*

Participants highlighted the importance of familiarity with their own equipment and being in a simulated emergency which was as realistic as possible (for example, the mannequin being fully dressed). The use of own equipment was valued by all members of staff as a fundamental element for learning. The unique space constraints in each centre provided an additional challenge, but one viewed as beneficial.

> 'I was a bit keen to put the [defibrillator] pads on before the man had his bare chest. But I know that I've got to put the plastic pads on, but I was obviously faced with strange things' (Clinical participant).

"where difficulties and insight is coming is using your own equipment, knowing where things are knowing the processes, knowing who is, who does what" (clinical participant)

*The transferability of knowledge*

Staff noted that the simulation session provided them with a safe environment in which they could practice their skills and identify areas for improvement. For non-clinical staff, simulation showed the importance of a team approach and being able to assist when needed.

'I think everybody needs to go through this because it's a learning curve for even a receptionist, as we keep saying we're just receptionists, we're not medically trained but, when push comes to shove, you need to help' (Non-clinical participant).

3. Experiences of the scenario

*Clinical aspects*

Many participants felt that the clinical aspects were the most important learning aspects of the training, expressing reassurance that staff were competent in their roles and that equipment was working and used successfully.

'Seeing how my colleagues react in a crisis situation, it's nice to know they do know what they're doing [laughs]' (Non-clinical participant).

*Non-clinical aspects*

Teamwork, and the number of people participating, were viewed positively by participants. It was seen as enhancing the fidelity of the simulation and providing a useful learning opportunity.

"the fact that we work as a team, I like that, I mean we do quite often hit the green [emergency] button and all sort of do it and that's so we are used to you know working as a team and each of us having our own job to do when if it happens. So I was pleased that it went so well this time round" (Non-clinical participant)

4. Training

All three centres identified Basic Life Support training as the only joint 'clinical' teaching; however, the sessions were about individual proficiency in the tasks rather than team work.

*Clinical and non-clinical staff members training together*

Both clinical and non-clinical members of staff felt it was beneficial to have joint training sessions, especially given the siloed nature of the primary care environment. However, offering trainings for all staff together was felt to not always be practical, in part due to the difficulties in closing the centre.

*Changes post-participation*

All centres successfully managed the emergency situation: however, some participants had concerns over familiarity with equipment. The idea of further training, specifically focusing on equipment, was voiced by staff at all three centres, with suggestions as to how this could be addressed, such as additional opportunities for using centre-owned equipment during training sessions. It was expressed that everyone on site should know how to use emergency equipment and that trainings would not need to be time-consuming in order to achieve greater familiarisation with equipment.

> 'I kind of veered towards that everyone should be trained to using the equipment. Because I know that I'd like to help, if I was the only one here or if there were two of us here, I couldn't leave a person' (Non-clinical participant).

Management of staff was identified as a potential area for improvement. Participants acknowledged this was difficult at certain points during the scenario as people who would normally be involved were not participating/on duty that day. This highlights the need for there to be flexibility in terms of planning for managing an emergency so all staff understand their role. Leadership was highlighted by several participants as a focus for the future.

> "I think reception staff erm you know often they haven't had simulation training where you've been in involved in something cardiac arrest or something they've learned a lot and enjoyed the experience but yeah I think um I think as a practice now we will go away and each of us the nurses will think about it, the receptionist will think about it, the doctors will think about it and then try and make changes where there needs to be changes." (Clinical participant)

There was a concern that non-clinical members of staff did not feel as confident to deal with the emergency as clinical colleagues. Whilst all staff members undergo mandatory BLS trainings, it was suggested that this could be done more frequently in-house.

> 'I think it's good to encourage not just your clinical staff but your admin staff to do things like this because it is quite out of your comfort zone and yes, I think it is good to just have the knowledge behind you.' (Non-clinical participant).

## Discussion

This unique study has shown proof of concept that in-situ simulation could be an acceptable and feasible way of developing interprofessional skills in the primary care workforce and as such have the potential to improve patient care. The simulation showed all participating centres could potentially successfully manage a medical emergency as well as meeting additional patient demands. Whilst many participants, both clinical and non-clinical, were apprehensive beforehand, all found it to be a beneficial training experience and were enthusiastic about its potential benefit to learning. Whilst the in-situ set up proved challenging, it increased the perceived fidelity of the simulation. No patients reported any distress either to the research team or centre staff. Overall, participants were reassured that staff displayed competence in their roles and that the centres' own equipment was used successfully.

### *Strengths and limitations*

All centres were research-active, accessed through existing relationships with the research team. It is possible these centres were particularly confident in their ability and therefore willing to

participate. Also, all centres were large (15,000+ registered patients) and urban: we do not know how smaller, more rural centres would have fared. T. As participation in the simulation was not compulsory, we do not know how individuals who did not participate would have experienced the event: therefore, care should be taken in generalising findings beyond those that participated. However in each centre there was a good range of different roles included. The qualitative method is appropriate for exploring participants' experiences and perceptions – multiple coders during analysis strengthened the rigour of the study.

*Comparison with existing literature*

Evidence around the efficacy of in situ simulation is emerging, and existing research is promising, but this is a relatively new area[15]: there is very limited research on investigating the value of high fidelity simulation within primary care, providing clinicians with the practical skills and confidence to manage emergencies within their surgeries. One project focusing on this led simulation-based workshops covering more commonly encountered medical emergencies and required participants to locate and use their own equipment and medication[20]: the results showed many participants knew how to respond 'in theory' but were unable to demonstrate practical aspects quickly and safely. This training is particularly important for time-critical illnesses. Previous research with health care assistants showed participants felt simulation-based training had reinforced their clinical knowledge and ability as well as adding to it[21]. Increased confidence following in-situ training has been shown to remain at an eight week follow-up[22] thus indicating this type of training has lasting benefits towards managing the acutely-ill patient.

By training clinicians in-situ, using their own equipment, centres are able to see how well their space works and also assess human-factor elements[23]. Problems such as clinical staff struggling with equipment are only going to be identified through actual use, and therefore it is paramount staff develop familiarity with equipment. Established resuscitation courses support individuals in managing emergencies, but a focus on their particular teamwork and communication in their actual day to day role cannot be provided, hence in-situ simulation offers an important complement[24].

Previous research has identified training as improving performance[25] and it is likely this can be translated into clinical practice. Health care professionals are trained predominantly in uniprofessional settings, yet have to work collaboratively in the practice environment; they may find they work side by side rather than together as an efficient team[26]. Teams are dynamic and require

commitment to work and maintain: there is a need to understand other people's roles[27]. There is a growing awareness that patient safety in healthcare relies on the ability of individuals to collaborate with other professionals. This simulation allowed participants to view their colleagues in action and learn how they can best support one another in the management of an acute medical emergency. This supports previous findings in which participants were able to highlight their own strengths and weaknesses and being able to continually adapt to others in the team[28]. Team training has been identified as a high priority for the future of simulation[29].

When comparing teams, there was no consistent difference as to whether teams had been trained in their hospital or in a simulation centre. The advantages of local training are lower cost and no travel time or expenses (from the participants), the inclusion of healthcare assistants, receptionists and porters. All centres made changes to their staff training and equipment following the simulation session. These changes were easily identified, predominantly on increasing staff familiarity with equipment and offering more frequent training sessions than the mandatory BLS updates. Providing more opportunities for clinical and non-clinical members of staff to train together would enhance interprofessional working and reinforce understanding of the others' roles. Previous research referred to the 'emotional neutrality' of GP receptionists which can help to avoid exacerbating negative behaviour from annoyed patients[30]. It is important staff are able to tailor that offering to the needs of individual patients. Receptionists' work is complex and demanding and effective teamwork among receptionists should be recognised and developed[31].

A limitation with this study is the lack of comparison to training where clinical and non-clinical members of staff learn with their professional peers rather than the whole centre team. Whilst we have shown that interprofessional training has been beneficial in this instance, we are unable to show if this is definitively better than the more common profession-specific training. Previous research has shown that the voice of doctors can be dominant even if individuals are aware of this, which has the potential to be detrimental to the learning of others[32].

*Implications for research and practice*

This research has emphasised the potential importance and benefits of team training through in-situ simulation which includes all staff members within the GP surgery. The use of in-situ simulation was positively received, although did cause apprehension for many participants which may impact on recruitment in future studies. Future research in the form of a feasibility study will need to explore

whether in-situ simulation is as well-received in smaller centres and consider whether improvements in teamwork would only apply to these teams, or also different teams, given changes in staff[26].

## Conclusion

Primary care staff members were given the opportunity to experience participating in the care/management of an acutely ill patient in a safe environment. From this, they were able to suggest changes in their workplace (such as increasing all-staff familiarity with on-site equipment) and this should benefit their performance, and as such the care of the patient, should they be faced with such an emergency in the future. Strengths identified in the debrief session can be highlighted and good practice can be shared with colleagues. The use of actors and fully involving both clinical and non-clinical members of staff builds upon previous research to form a fuller understanding of how in-situ simulation can benefit both the primary care workforce and patients.

## Contributors

SB was responsible for all aspects of the study including design, data collection and analysis. AH led on data collection, analysis and interpretation, and manuscript preparation. SB and MK were responsible for the clinical aspects of the research. HD implemented the study and ML-W was involved in the development of the study design. All authors commented on manuscript drafts and approved the final version.

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Competing interests

There are no competing interests to declare.

Data sharing statement

No additional data available.

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Appendix 1 – interview guide

# Primary Care Education Simulation Project Interview Guide

## Introduction

- Interviewer to (re)introduce themselves and purpose of interview (to explore their involvement in, and feelings towards, the simulation training exercise).
- Confirm with the participant that the consent form has been completed, they are still willing to be interviewed, and for the interview to be recorded.
- Remind the participant that they can change their mind about participating and stop the interview at any point.
- Ask if the participant has any questions, then start recording.

## Section 1 – Role and training within the practice

1. Can you tell me about your job and what it involves?
   *Part/full time, (non)clinical, weekly hours worked, responsibilities for junior members of staff.*
2. How long have you been working at this practice?
   a. For clinical staff: for how many years have you been qualified?
   b. For non-clinical staff: previous roles held (if applicable)
3. Since starting your current role at this practice, what training/professional development have you had?
   *What form has this taken? E.g. on/off site, mandatory/optional trainings, practical sessions, face to face/e-learning/online trainings.*
4. Thinking about the trainings you have undertaken since you started in your current role, who has been involved in this training with you?
   *Peers within the practice, (non)clinical staff, senior staff, SMT, junior staff, peers from other practices.*
5. What form of training/professional development you would like to have in the future?
   *Career progression, specifics if known…*

## Section 2 – Simulation

6. How did you feel beforehand about participating in today's simulation?
   *Participated in any simulation training before? Excited, nervous, apprehensive?*
7. Overall, how do you feel the simulation went?
8. What were the best and worst elements of today's simulation?
9. What was it like to be in a training session onsite with all members of practice staff?
   *Have you participated in an interdisciplinary training before, working alongside (non)clinical staff, training in situ*
10. Would you recommend simulation-based training to staff at other GP practices?
    *Why, why not…*

## Section 3 – Future development(s)

11. How could we develop this simulation to further improve training within GP practices?
*Different serious events, duration, mixture of staff, involvement of paramedics…*

12. Is there anything regarding today's simulation which you would like to mention?

## Closing

- Inform participant that the recorder is switched off, ask if they have any questions, and thank them for their time and involvement.

# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 4 |
| Credentials | 2 | What were the researcher's credentials? E.g. PhD, MD | 4 |
| Occupation | 3 | What was their occupation at the time of the study? | N/A |
| Gender | 4 | Was the researcher male or female? | N/A |
| Experience and training | 5 | What experience or training did the researcher have? | 4 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 4 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | 4 |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 4 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 4 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 5 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 5 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | N/A |
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | |
| Repeat interviews | 18 | Were repeat inter views carried out? If yes, how many? | N/A |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 5 |
| Field notes | 20 | Were field notes made during and/or after the inter view or focus group? | N/A |
| Duration | 21 | What was the duration of the inter views or focus group? | 5 |
| Data saturation | 22 | Was data saturation discussed? | 4 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or | N/A |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| | | correction? | |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 4 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | 5 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 4 |
| Software | 27 | What software, if applicable, was used to manage the data? | 4 |
| Participant checking | 28 | Did participants provide feedback on the findings? | N/A |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 6 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 6 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 6 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | N/A |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

**Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.**