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## Clarifying the learning experiences of healthcare professionals with in situ and off site simulation based medical education: a qualitative study

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**TITLE PAGE**

**Title: Clarifying the learning experiences of healthcare professionals with in situ and off site simulation-based medical education: a qualitative study**

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## ABSTRACT

**Objective:** To examine how the setting in in situ simulation (ISS) and off site simulation (OSS) in simulation-based medical education affects the perceptions and learning experience of healthcare professionals.

**Design:** Qualitative study using focus groups and content analysis.

**Participants:** Twenty-five healthcare professionals (obstetricians, midwives, auxiliary nurses, anaesthesiologists, a nurse anaesthetist and operating theatre nurses) participated in four focus groups and were recruited due to their exposure to either ISS or OSS in multi-professional obstetric emergencies in a randomised trial.

**Setting:** Departments of obstetrics and anaesthesia, Rigshospitalet, Copenhagen.

**Results:** Initially participants preferred ISS, but this changed after the training when the simulation site became of less importance. There was a strong preference for simulation in authentic roles. These perceptions were independent of the ISS or OSS setting. Several positive and negative factors in simulation were identified, but these had no relation to the simulation setting. Participants from ISS and OSS generated a better understanding of and collaboration with the various health professionals. They also provided individual and team reflections on learning. ISS participants described more experiences that would involve organisational changes than the OSS participants did.

**Conclusions:** Many psychological and sociological aspects related to the authenticity of the learning experience are important in simulation, but the physical setting of the simulation as ISS and OSS is the least important. Based on these focus groups OSS can be used provided that all other authenticity elements are taken into consideration and respected. The only difference was that ISS had an organisational impact and ISS participants talked more about issues that would involve practical organisational changes. ISS and OSS participants did, however, go through similar individual and team learning experiences.

## ARTICLE SUMMARY

### Strengths and limitation

- In situ simulation is fairly new and involves conducting simulations in the actual patient care unit, and based on the much-discussed topic of learning in context, in situ simulation is expected to increase fidelity and thereby learning. No previous qualitative studies have explored participant experiences of in situ versus off site simulation (i.e. simulation in training rooms).
- Based on findings from these focus groups the simulation settings in situ and off site had the same effect on individual and team learning. In situ simulation had more organisational impact and provided more information for practical organisational changes than off site simulation.
- Conclusions from the present focus groups indicate that healthcare professionals think that the physical context and physical fidelity of ISS and OSS were not the most important aspects for learning provided other psychological and sociological authenticity elements are respected. The participants in the focus groups highlighted the importance of participating in authentic teams in their own roles as healthcare professionals. This emerged in the focus groups as participants reflected upon previous negative experiences of simulation in other professional roles.
- The findings from the focus groups in this study show that staff in obstetrics and anaesthesiology appear to be more familiar with working in different places, which they see as an important skill, but we cannot say whether study findings are transferable to other groups of healthcare professionals working in medical areas with less emergency work.
- A limitation was the composition of the focus groups, which did not entirely mirror the distribution of healthcare professionals during the clinical work, and some groups were underrepresented.

## INTRODUCTION

Simulation-based medical education is an important training modality for training skills, teams and how to perform in emergency situations.[1-4] If emergencies are rare and hence can be difficult to learn about in real life, simulation-based medical education is warranted, for instance, in obstetric emergencies.[5] Simulation-based medical education involves “devices, trained persons, lifelike virtual environments, and contrived social situations that mimic problems, events, or conditions that arise in professional encounters”.[4] There are many unanswered questions as to how simulation-based medical education is best conducted, one of which concerns the fidelity of the setting. An unresolved issue is how in situ simulation (ISS) versus off site simulation (OSS) affects learning. ISS involves simulation-based medical education in the actual patient care unit.[6,7] OSS, on the other hand, entails training in facilities outside the patient care unit. ISS is believed to increase fidelity and thereby learning because it takes place in the clinical setting.[7-9] In a classic sense fidelity refers to the degree of faithfulness that exists between two entities, and these entities are fundamental for the transfer of simulation-based medical education and performance in the clinical settings.[10] The rationale behind this idea on the authenticity of simulation is the traditional assumption that the closer the learning context is to the context of practice, the better the learning, and situativity theory argues that knowledge, thinking and learning are situated in experience.[11-15] Therefore ISS is believed to increase learning because it takes place in the clinical setting, where the learning context is more similar to the context of practice.

We conducted a randomised controlled trial to reveal whether ISS was superior in facilitating learning compared to OSS.[16] We concluded that participant perception of the authenticity of the ISS and OSS differed significantly but did not find any differences between knowledge, safety attitudes, motivation, stress, perceptions of the simulation and team performance (*Submitted BMJopen, March 2015: Sørensen JL et. Simulation-based multi-professional obstetric anaesthesia training conducted in situ versus off site leads to similar individual and team outcomes; a randomised educational trial*). We were unable to identify any qualitative studies exploring how participants experience differences in the simulation setting, and found that studies clarifying participants experiences were of relevance.[17] Consequently we determined that carrying out qualitative research in combination with the randomised controlled trial, [16] which involved a complex intervention, would provide deeper insight into the learning experience of healthcare professionals participating in ISS and OSS.[18]

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6 This study attempts to shed light on the general assumption that context and fidelity are a  
7 determinant for how different kinds of simulation-based medical education are experienced and to  
8 determine the veracity of the common assumption that ISS is a more effective learning tool than  
9 OSS.[8] The research question was: How does the setting in simulation-based medical education  
10 (OSS or ISS) affect the perceptions and learning experience of healthcare professionals?  
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## 14 15 16 **METHOD**

### 17 18 19 **Design**

20 We chose to do a qualitative study using focus groups, deeming this to be an appropriate method  
21 with regard to the research question. Focus groups, which can be defined as “a form of group  
22 interview that capitalises on communication between research participants in order to generate  
23 data”, [19] are useful for gathering information about the points of view of different participants and  
24 can be used to explore and explain phenomena.[20] We also wanted to examine data from the  
25 randomised controlled trial more closely [16] and using focus groups is described as a valuable way  
26 of further analysing and interpreting data subsequently.[18-20] The focus groups were conducted  
27 based on criteria in the literature.[19-24]  
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### 36 **Participant selection and intervention before the focus groups**

37 The focus group participants, recruited from among 97 healthcare professionals enrolled in an  
38 randomised controlled trial, comprised consultant and trainee obstetricians, midwives, consultant  
39 and trainee anaesthesiologists, auxiliary nurses, operating theatre nurses and nurse anaesthetists.  
40 [16] The trial included two multi-disciplinary simulation cases conducted using ISS or OSS: an  
41 emergency caesarean section and the management of postpartum haemorrhage. A simulated patient  
42 was given instructions and then acted as the patient in the real labour room (ISS) and in the  
43 simulated labour room (OSS). When the simulation was transferred to the operating theatre, a full-  
44 scale birthing simulator (SimMom) was the patient in the real operating theatre (ISS) and in the  
45 simulated operating theatre (OSS). The simulated emergency scenarios were designed to allow  
46 standardised training in both the ISS and OSS groups. [16] The instructors running the simulation  
47 scenarios also carried out the debriefing sessions.[25]  
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### Recruitment and composition of the focus groups

Eligible participants were informed by email and a personal letter. If they agreed to participate they were contacted by the principal investigator (JLS) and enrolled after informed written consent.

Only very few minor conflicts occurred during the randomised controlled trial, and they did not involve anxiety or power dominance, indicating that using homogenous focus groups was not a necessity. Hence we also determined that the participants would feel comfortable in multi-professional focus groups. We also expected heterogeneous groups to add to the richness of data due to the process of co-construction. All four groups should comprise individuals who had participated in ISS and OSS based on the assumption that this would add to the co-construction process. In accordance with recommendations in the literature,<sup>[20]</sup> each focus group was limited to 6-8 participants.

### Moderators and conduction of the focus groups

Two anthropologists (LEN, HMM) with comprehensive experience in moderating and analysing data from focus groups led the focus groups. They did not have any experience with obstetric-anaesthesia emergencies or simulation-based medical education. The principal investigator (JLS), who is an experienced obstetrician and an expert in simulation, introduced the moderators to the RCT.<sup>16;17</sup> LEN observed an ISS training day and part of an OSS day. In addition to viewing videos on ISS and OSS, both moderators observed clinical work in the departments of obstetrics and anaesthesia for a total of 28 hours. Neither moderators had any professional connection to the participants and did not know them personally.

The four focus groups, scheduled to begin immediately after end of the randomised controlled trial, [16] lasted 105 minutes and took place in the afternoon in a quiet room located in the same building as the labour ward and the operating theatre but on a different floor. Participant remuneration was the equivalent of the participants' normal salary per hour.

Scheduled to come on a specific day, participants were welcomed upon arrival by the principal investigator (JLS) or one of the midwives responsible for doing simulations. After briefly introducing of the participants to the moderators, the principal investigator or midwife would leave the room.



The moderators were provided with the names of the participants in the focus groups and some of their baseline characteristics based on information from the randomised controlled trial. (*Submitted BMJ Open, March 2015: Sørensen JL et. Simulation-based multi-professional obstetric anaesthesia training conducted in situ versus off site leads to similar individual and team outcomes; a randomised educational trial*).

### Interview guide

The interview guide (table 1) was based on previous experience, the anthropologists' observations of clinical work and OSS and ISS, and the literature.[1-3,8,26-28]

Table 1. Interview guide for the focus group

- What were your expectations concerning what you would learn during the simulation (ISS/OSS)? Were these expectations met?
- What was of most importance for your learning in the simulation (ISS/OSS)? What elements of the simulation were important?
- To what degree did you find the simulation (ISS/OSS) realistic/authentic? What made the simulation (ISS/OSS) realistic and unrealistic?
- Was it possible to identify yourself with the simulation (ISS/OSS)? Examples?
- Did you find it important for your learning that the simulation (ISS/OSS) was realistic / authentic? To what degree and why?
- Which elements contributed to making the simulation (ISS/OSS) authentic / realistic? Perhaps compare your experience with previous experiences with simulation?
- Do you think that participating in the simulation (ISS/OSS) has influenced your clinical work and daily routines? Examples?
- How does, in your experience, learning through simulation-based training differ from and benefit you compared to daily clinical learning?
- Do you think that the ISS/OSS setting influenced your level of stress and anxiety?
- Do you think that the ISS/OSS setting influenced the cooperation and communication in your simulation team?
- How did you learn about roles and responsibility in the simulation? Were you influenced by the ISS/OSS setting?

#### Other suggested elements of importance in the focus groups

- The rooms
- The time spent on the simulation
- Placement and organisation of physical objects
- Sounds
- Technical equipment
- Patient surrogate or the actress
- Manikin e.g. SimMom
- Participants' clothing
- Authentic roles in the simulation teams
- Simulation with colleagues from own workplace

### Data capture, coding and analysis of qualitative data

Conventional content analysis, a method used for the subjective interpretation of written data through a classification process of coding and identifying themes or patterns, was used to study the focus group data.[29-32] The method involves repeatedly reading and discussing the text to identify

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4 units of meaning and codes, followed by a step that entails repeatedly analysing the data and  
5 condensing it into themes.[29-31] The analytical approach used was mainly deductive, and the  
6 transcribed text was analysed as manifest content.[20,30,31]  
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11 The data generated in the focus groups were audio recorded and transcribed verbatim, and the  
12 moderators also took field notes. NVivo10 was used for analysis. The transcription was primarily  
13 coded by the two moderators. The interview guide provided an initial structure for identifying units  
14 of meaning. The text was then reread and analysed to derive unanticipated units of meaning. The  
15 next step involved recoding and dividing the material into ISS and OSS to identify trends related to  
16 the simulation setting. The principal investigator (JLS) independently interpreted the data, after  
17 which the three authors (LEN, HMM, JLS) discussed, reread and validated the interpretations. The  
18 themes then underwent a selection process. The initial transcripts from the four focus groups were  
19 also read by CKA, BWP, both of whom are experienced clinicians and work with simulation. The  
20 purpose of their involvement was to integrate their interpretations into the themes. Finally, the  
21 transcripts were reread to identify crosscutting themes and perspectives. The participants did not  
22 receive a copy of the transcripts or the quotations taken from them.  
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## 32 RESULTS

### 33 Sample characteristics and composition of focus groups

34 We recruited 31 healthcare professionals, but three of them could not participate at the scheduled  
35 time and three others cancelled at the last minute. Every effort was made to meet the principles of  
36 composition of the focus groups described above. The final number of participants was 25 (table 2).  
37 The moderators described the group dynamics in the four focus groups as good and did not  
38 experience any tensions between participants. The moderators and principal investigator discussed  
39 data saturation and concluded it was achieved.  
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Table 2. Distribution of recruited healthcare professional groups and dropout after recruitment in the four focus groups and baseline characteristics of participants in in situ simulations (ISS) and off site simulation (OSS)

	Recruited	Participated	Mean age (minimum-maximum)	Mean years of obstetric work experience (minimum-maximum)	Healthcare professional groups	Previous simulation experiences	ISS/OSS
						No experience/ simple simulation/ full-scale simulation	
Focus group 1	6	6	44 (34-55)	10 (2-16)	1 midwife 1 specialised midwife 2 consultant obstetricians 1 nurse anaesthetist 1 trainee anaesthesiologist	0/4/2	3/3
Focus group 2	7	7	50 (36-64)	17 (1-39)	1 midwife 1 specialised midwife 1 trainee obstetrician 2 consultant obstetricians 1 operating theatre nurse 1 trainee anaesthesiologist	1/5/1	5/2
Focus group 3	7	7	42 (31-62)	12 (2-38)	1 midwife 1 specialised midwife 1 trainee obstetrician 1 consultant obstetrician 3 trainee anaesthesiologists	0/3/4	2/5
Focus group 4	8	5	46 (39-54)	14 (2-26)	2 auxiliary nurses 1 specialised midwife 1 trainee anaesthesiologist 1 consultant obstetrician	0/4/1	2/3
Did not show up due to clinical duties or illness	3				3 cancellations (all focus group 4): 1 consultant anaesthesiologist 1 nurse anaesthetist 1 trainee obstetrician		
Recruited but a scheduling issue precluded participation	3				3 midwives		
Total	31	25	45(31-64)	13 (1-39)	31	1/16/8	12/13

## Units of meaning and identification of themes

The text was analysed and units of meaning were identified (table 3). The overall research question addressed the influence of setting (OSS or ISS) on what the participants experienced, which provided an overarching structure for establishing the following six themes and subthemes (table 4).

Table 3. Units of meaning derived from the interview guide and from repeatedly reading and discussing transcripts from the focus groups

- In situ versus off site
- Expectations for the simulation
- Expected benefits
- Realism in the simulation
- Significance of setting
- Significance of the manikin
- Significance of sounds
- Tempo
- Identifying oneself with the simulation
- Multidisciplinary training
- Training in own role and the role of others
- Authentic roles
- Routines
- Implication for practice
- Debriefing
- Performance
- Authenticity

Table 4. Themes and subthemes

1. Initial participant expectations for in situ and off site simulation
2. Importance of simulation site
3. Preference for simulation in authentic roles in own workplace
4. Positive and negative factors in simulation
  - 4a. Practical organisation of the simulation
  - 4b. Cases in simulation scenario
  - 4c. Reversed hierarchies
  - 4d. Involvement in simulation
  - 4e. Debriefing
5. Individual and team learning
6. Suggested organisational changes

### *Theme 1: Initial participant expectations for in situ and off site simulation*

When asked about their expectations in the beginning, participants predominantly responded that prior to participating in the randomised controlled trial intervention they had a preconceived preference for participating in ISS because they believed that ISS better matched reality and assumed that this would affect their ability to involve themselves. They also thought that ISS would enhance their ability to transfer learning to everyday practice. An initial preference for ISS was visible in the four focus groups, but as discussion progressed this preference waned and the amount of value participants put on an ISS setting as a crucial factor for their experience of learning in simulation shifted as other factors were deemed as more crucial (box 1, quotations 1–3).

Box 1, Theme 1: Initial participant expectations concerning in situ and off site simulation as illustrated by quotations

1. In the beginning I was excited about whether I would be in situ or off site. I don't really know which one I would have preferred. In a way, in situ because then you know where everything is. But the other way would be a challenge. I thought that getting a grip on the room, which was quite different, happened fast, you very quickly get an impression of what was where [...] Even though it was an off-site simulation, everyone was aware of each other, of whether there was something that needed to be done that you could do. I think it was actually pretty exciting. I thought, who knows how I'll react? Maybe it wouldn't get my adrenalin going because it wasn't the real thing. But that's not what it was like [...] (OSS participant).
2. I had absolutely no idea whether it would be in situ or off site. Practicing in the conference room was fine. It could have also been in the hallway or somewhere else. My experience with scenario training in situ is that the artificial aspects will always be there, in contrast to a real situation. I know full well that it's scenario training and that no one is lying there bleeding to death, but I can totally get into it regardless of the surroundings [...] The same things that I work with are there. The room didn't interfere with how well I concentrated on the situation. I simply didn't give it a single thought [...] (OSS participant).
3. I didn't have very many expectations, but I hoped that I'd be able to do in situ training because I thought it would be the most educational. But I have to agree with you [another participant] about that, because I participated in off-site training and when I left, I'd learned a lot anyway. Distancing yourself a bit from everyday life makes you even more aware that you're in fact practicing communicating. It might perhaps even be a tad bit easier to remember that you're practicing in that situation. I didn't think it was a disadvantage. Of course it's artificial, but I'm not sure that that has a negative impact (OSS participant).

### *Theme 2: Importance of simulation site*

Some OSS participants mentioned that being in an unfamiliar location had some unexpected positive effects, as it forced the participants to practice their ability to adapt to new places and people, which several participants emphasised as an important skill in clinical practice and in emergencies. Both ISS and OSS participants experienced practical challenges or barriers, but argued that this could produce learning outcomes of their own. Some argued that the OSS setting in a small room, where things were organised differently and not in their normal place, forced them to see their own routines from the outside. This was considered positive even though it increased the risk of failing to follow normal procedures (box 2, quotation 1 and 2).

The discussions about ISS and OSS seemed to vary between healthcare professional groups. Auxiliary and operating theatre nurses appeared to have a greater need to have equipment in the right place. They felt that unfamiliarity with where items were located meant they had trouble finding, for example, medicine, thus taking their attention away from their main tasks: teamwork and communication. Because the professional groups were not well represented in all the focus groups, the differences between them can only be viewed as a trend (box 2, quotation 2).

Box 2, Theme 2: Importance of simulation site as illustrated by quotations

1. Maybe we ended up not talking about other things because we were on the third floor [OSS setting]. But there were, for example, some ordinary practical things that didn't go so well [...], but there are of course some things that you more or less do on autopilot and in the correct order when you're in your everyday surroundings (OSS participant).
2. [...] But for me, it wasn't all that different from working at another department, for example, working at the trauma centre. I'm pretty used to being in lots of different places and just using what's available. So it didn't really bother me to be in a strange place [...] (OSS participant).

3. It matters where things are, if the room is different, things aren't in their usual place. I was off site and we were on top of each other in an on-call room and couldn't really access things. We would've been much more on the ball in a delivery room (OSS participant).

### *Theme 3: Preference for simulation in authentic roles in own workplace*

The participants emphasised a heavy preference for simulation in authentic roles in their own professional groups. Some participants created a hierarchy of important factors in the simulation, prioritising individuals before location and ranking realistic teamwork ahead of a realistic location. Describing negative prior experiences with simulation in professional roles other than their own, they argued that they felt their roles became too much of a caricature and that this was not helpful for learning (box 2, quotation 1-3).

Box 3, Theme 3: Preference for simulation in authentic roles in own workplace as illustrated by quotations

1. [...] But I was looking forward to being with the professionals I work with on a daily basis. Because we play different roles in anaesthesiology [...] (ISS participant).
2. [...] It's more important that it's the right professionals. Because that hasn't been the case with the other simulations we've had. Then it's of course also important that it's the right place. So you're able to find where things are [...] The people are the most important and then perhaps the place (ISS participants).
3. [...] If you have to play other roles then it becomes too much of a caricature. You don't really feel at home in the role [...] It's not just you. It's also the others – you might end up giggling a bit because you're taking on another role (OSS participants).

### *Theme 4: Positive and negative factors in the simulation*

The statements from participants about positive and negative factors were not related to the ISS or OSS setting but rather to other factors, which are presented in subthemes 4a–4e.

#### *Theme 4a: Practical organisation of the simulation*

Some of the important positive factors mentioned that contributed to a realistic simulation were wearing an ordinary uniform, working with a patient (actress), and using an appropriate full-scale manikin. The researchers who observed the simulations (LEN, HMM) and the instructors (CKA, BWP) observed examples of the participants comforting the actress and the manikin, touching them gently, which exemplifies the level of authenticity. Participants stated, for example, that they were not always aware of whether it was an actress or a manikin, which also supports the interpretation that the level of authenticity experienced was high. These observations were similar for ISS and OSS participants (box 4, quotations 1–2).

A recurring topic in the focus groups was phones and call procedures. During ISS and OSS participants were given a list of telephone numbers but found that calling numbers other than the ones they were used to in the clinical setting was difficult and caused confusion. For example, they called the wrong number, forgot to call staff members, called in the wrong order or phones were



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4 disconnected. ISS and OSS participants described the provided list of telephone numbers, which  
5 failed to give the intended authenticity and had the opposite effect, as a disruptive element that  
6 added negatively to the artificiality of the simulation. This was mentioned by both ISS and OSS  
7 participants (box 4, quotations 3).  
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11 *Theme 4b: Cases in simulation scenario*

12 The ability of the cases to contribute to a realistic simulation was discussed. The participants had  
13 different approaches, some arguing for the necessity of highly realistic cases in simulation, where  
14 others saw this as less important, arguing that it did not matter if cases were artificial. These  
15 discussions were not related to ISS or OSS. Some participants emphasised the relief they felt  
16 because the simulated patient, i.e. the actress or manikin, was not actually in real danger, which thus  
17 contributed to creating a comfortable setting for learning. Others argued that they would like to  
18 have experienced a more complex, infrequent clinical scenario because they believed that would  
19 have encouraged greater learning (box 4, quotations 4).  
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26 *Theme 4c: Reversed hierarchies*

27 Challenges to traditional professional hierarchies were a central aspect of the negative experiences  
28 of some participants. Some participants said that when the instructors or participants asked a junior  
29 doctor to take on the role of team leader it negatively influenced the simulation and their  
30 involvement in the simulation. Reversed hierarchies occurred in both ISS and OSS (box 4,  
31 quotation 5).  
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36 *Theme 4d: Involvement in simulation*

37 Participants thought that it was disruptive if participants or facilitators laughed, giggled or joked  
38 during the simulation as this behaviour influenced how seriously they became involved in  
39 performing the simulation, which in turn affected their learning outcome negatively. This was the  
40 case for both ISS and OSS (box 4, quotation 6).  
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45 *Theme 4e: Debriefing*

46 ISS and OSS participants viewed debriefings as a central, exceedingly positive factor for ensuring  
47 learning. During the focus groups participants talked about what they learned and described how the  
48 simulation, followed by a debriefing, encouraged them to see their own healthcare group as part of  
49 an entire team. The participants stressed the importance of the debriefing process to ensure learning  
50 and to facilitate the transfer of that learning to clinical practice. Some of the participants even saw  
51 the focus groups as an extra debriefing. The participants also indicated that they would like to see  
52 debriefing applied in everyday work situations (box 4, quotations 7–9).  
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Box 4, Theme 4: Positive and negative factors in the simulation as illustrated by quotations

Theme 4a: Practical organisation of the simulation

1. We were asked to show up dressed for work, which helps set the tone that this is realistic training [...] We were given phones so that we could call the right people [...] And there was a manikin in the bed that looked like a patient. The lower part was a manikin, but there was also a live model [actress] in the bed. That worked really well. And there was blood on the sheet and the pads were heavy. This made it [seem quite realistic] (ISS participant).
2. With regard to the manikin, I have a hard time remembering when it was a manikin and when it was a patient. It must mean that it's close to reality when you can't tell the difference (ISS participant)
3. [...] There were also some OP personnel that didn't get called. The phones were generally a mess. Which is probably why some people thought it was a bit more baffling (ISS participant)

Theme 4b: Cases in simulation scenario

4. [...] This time I was kind a expecting [...] it to go crazy! I practically expected them [the actress and the manikin] to die. So I was a bit disappointed that it didn't involve more than that. I really thought that we'd have to go through everything, that we'd have to use HELLP and DIC and who knows what else. Which means that every time we stopped, I thought, but we just got started?! Things were in fact pretty acute and it looked like more, but it's actually very, very rare that things run the entire gamut. It's just that this is what I was mentally prepared for (ISS participant).

Theme 4c: Reversed hierarchies

5. [...] Two obstetricians in our session had a secret agreement that we didn't know anything about. They had set up a training situation within the training situation that the attending physician wouldn't respond. The trainee obstetrician was supposed to be in charge. They didn't tell anyone, which created a lot of confusion. At least for me because I talked to the attending senior obstetrician when I came in [...] it was a muddle [...] (ISS participant).

Theme 4d: Involvement in simulation

6. I think that throwing yourself into things is absolutely essential to learn something. You have to be willing to play the game that's being played. Because sometimes you meet people who refuse to do that. And you expose yourself when you play a role – will I know what to do? What if I say something wrong? But if people hold back, are too inhibited and start to giggle, then the whole thing's a wash. It's really important that people give it their best shot. That's nearly the most important (ISS participant).

Theme 4e: Debriefing

7. It's [debriefing] still really on my mind and it was also an eye-opener for me to see how other professionals work. During the debriefing various tasks were explained that I wasn't totally sure about (OSS participant).
8. But then you take the time afterwards [at the debriefing] to break it down and get input from other groups. And you really get a better understanding of each other and where misunderstandings arise [...] (OSS participant).
9. I think that I often experience situations [in clinical practice] where we need to talk things through so we can do better next time. The problem is that there isn't time for that. During training, time is set aside for debriefing and that's wonderful. It would be great if we had time to do that on a daily basis (ISS participant).

*Theme 5: Individual and team learning*

The participants stated that their inter-professional communication, collaboration and teamwork skills had improved greatly. Focus group discussions showed that ISS and OSS offered participants the opportunity to gain new perspectives on their own work practices and areas of responsibility, as well as those of their colleagues. They gained a new understanding and respect for the efforts of other team members. Some people expressed a new understanding of why other team members did not have time for the tasks they previously had expected them to carry out. The simulation process can thus be seen as a way of crossing professional boundaries. Participants stated that the simulation process reminded them of their own and colleagues' roles as important contributors to the entire team (box 5, quotations 1–3).

Box 5, Theme 5: Individual and team learning as illustrated by quotations

1. [...] The day after we had something acute at OP-theatre and three of us had participated ... which means we knew each other much better [...] It was a nice situation [...] The atmosphere is much friendlier and more pleasant (OSS participant).
2. [...] it occurred to me along the way, [...] something that I might have let frustrate me on a daily basis. It's that a team consists of many small sub-processes. And you know what the others are doing, but not in any detail (ISS participant).
3. It dawned on me how differently we hear what's being said in the OP-theatre. How the anaesthesiologist hears anaesthesia things and the obstetrician hears the midwife (OSS participant).
4. Once again this just shows that you have to talk to people, look at them, say their names, ask them to do something and then note whether they've actually understood. Because that's the only way that we can work together as a team. We bury ourselves in our own tasks (OSS participant).

*Theme 6: Suggested organisational changes*

The participants discussed the opportunities available for changing some everyday organisational practices and routines based on experiences from the simulation. Most of the learning points were mentioned by both ISS and OSS participants, for example, communication, cooperation, teamwork, situations with unclear responsibility, feedback, a lack of general observation forms and a lack of specific observation forms for e.g. postpartum haemorrhage. Some issues were only mentioned by ISS participants, such as where operation caps were located or messy corridors, which complicated the transport of beds in emergency situations, and poor access to some medicines. These discussions indicate what kind of information is required to promote more practical organisational learning (box 6, quotation 1).

Box 6, Theme 6: Suggested organisational changes as illustrated by quotations

1. We couldn't get the bed out the door because a porter had put a bed in the way and they were in the middle of moving a bunch of cabinets. We had to spend a lot of time moving the bed out of the delivery room. So there were lots of times where you thought, this is just unbelievable (ISS participant).

## DISCUSSION

Our analysis indicates that authenticity in all aspects of simulation is important and that the physical setting in simulations was of less significance, indicating that OSS is just as useful if other elements of authenticity in the simulation are respected. ISS played a role at the system level and the focus group provided information pointing toward possible organisational changes. For individual and team learning, however, ISS and OSS seemed to contribute equally. Findings in the randomised controlled trial support these conclusions (*Submitted BMJopen, March 2015: Sørensen JL et. al. Simulation-based multi-professional obstetric anaesthesia training conducted 'in situ' versus off site leads to similar individual and team outcomes; a randomised educational trial*).

Viewed straight forwardly, the context is just the setting, but the concept of context can be expanded to also include the three dimensions physical, semantic and commitment context. [33]

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4 One of the arguments in favour of ISS is the contextual similarity to the context for  
5 working.[7,8,34,35] Learning in context is a highly discussed topic in medical education.<sup>2,12,38</sup>  
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7 Learning is said to be better recalled when the learning environment resembles the retrieval  
8 environment.[12,14,15] Whether this traditional finding [36] can be generalised to medical  
9 education is debated, and empirical findings increasingly question it.[10,26,33,37] In medical  
10 education, the context may be physical, as in this study regarding the physical surroundings in ISS  
11 versus OSS.[12,33] Physical surroundings or context appear to be parallel to the aspect of fidelity  
12 described as physical, i.e. the degree to which the simulator resembles the appearance and  
13 perception of the real system.[26,38] Conclusions from the present focus groups indicate that  
14 healthcare professionals think that the physical context and physical fidelity of ISS and OSS were  
15 not the most important aspects for learning.  
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24 This also indicates that the semantic context, which reflects how well the context contributes to the  
25 learning task, and the commitment context, which reflects motivation and responsibility, are  
26 important aspects distinguishable from the physical context.[33,37] The semantic and commitment  
27 dimensions of context resemble the psychological fidelity dimension, i.e. the degree to which the  
28 trainee perceives the simulation to be an authentic surrogate for the task being trained.[26,38]  
29 Factors in the ISS and OSS, such as problems with practical organisation, case scenarios, changes in  
30 hierarchies and engagement were considered important elements in the simulations. These factors  
31 were related to interaction between participants in the simulation, but they were not related to the  
32 physical ISS or OSS setting, which is why they appear to better represent a more complex  
33 perception of context that includes semantic and commitment elements and that can also be viewed  
34 as a part of the psychological fidelity.  
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44 The participants in the focus groups highlighted the importance of participating in authentic teams  
45 in their own roles as healthcare professionals. This emerged in the focus groups as participants  
46 reflected upon previous negative experiences of simulation in other professional roles. The concept  
47 of training in other roles, i.e. cross training, is recommended in the simulation literature and  
48 considered a strategy for simulation-based medical education.[3,39] Cross training is defined as “an  
49 instructional strategy in which each team member is trained in the duties of his or her  
50 teammates”. [40] It is argued that if all team members have a shared understanding of other  
51 people’s roles then the risk of making errors decreases.[41] Although there are examples of  
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4 empirical studies that address cross training, they only comprise small teams in an experimental  
5 laboratory setting and mainly use computer-based simulation, and there are no medical studies that  
6 involve multi-professional teams.[40-42] Because the simulations in the present study were  
7 complex and included teams of ten from six different healthcare professional groups, we concluded  
8 that the authenticity and psychological fidelity would have been damaged by changing professional  
9 roles. This finding on cross training, however, will need to be confirmed in future studies using  
10 outcomes other than the perceptions of participants.  
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17 The current concept of fidelity is under debate,[10,26,43,44] and may not be adequate enough to  
18 explain the fidelity practiced in inter-professional simulation. The simulation literature tends to  
19 overlook the importance of social practice,[44] hierarchy, power relations and other factors  
20 affecting inter-professional teamwork.[45] The concept “sociological fidelity” has thus been  
21 introduced and aims to enhance the quality of inter-professional simulation and to improve its  
22 transferability to inter-professional practice.[45,46]  
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29 The inter-professional teams in our study were highly appreciated by the participants in the focus  
30 groups and can have contributed positively to the sociological fidelity. Planning simulation for  
31 inter-professional groups is challenging, especially with regard to planning and designing case  
32 scenarios that provide each profession with a significant, balanced role.[28,46] Even though we  
33 appointed a multi-professional working committee with representatives from each healthcare group  
34 to avoid conflicts,[16] disagreement concerning the complexity of cases still arose.  
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### 41 **Strengths and limitations**

42 The present study adhered to criteria for focus groups[20,23] to support the transparency and add to  
43 the credibility of the study findings from the focus groups. The study was performed in the  
44 obstetrics and anaesthesiology departments of a high-risk hospital. Its transferability[20] to other  
45 settings can be discussed, but our impression is that the findings are transferable to other emergency  
46 medical specialities. The findings from the focus groups in this study show that staff in obstetrics  
47 and anaesthesiology appear to be more familiar with working in different places, which they see as  
48 an important skill, but we cannot say whether study findings are transferable to other groups of  
49 healthcare professionals working in medical areas with less emergency work.  
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4 Findings in the present focus group were comparable with the results in the randomised controlled  
5 trial conducted prior to this qualitative study. (*Submitted BMJopen, March 2015: Sørensen JL et.*  
6 *Simulation-based multi-professional obstetric anaesthesia training conducted in situ versus off site*  
7 *leads to similar individual and team outcomes; a randomised educational trial*). To the best of our  
8 knowledge no other studies exist that focus on comparing ISS and OSS.[8]  
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14 To avoid bias, only moderators who had never worked with the participants were selected. One  
15 element of the study with the potential for bias, however, was recruitment of participants for the  
16 focus groups because they were enlisted from among participants in the randomised controlled trial.  
17 They may have had a special interest in simulation and inter-professional activities, perhaps making  
18 them more motivated and less representative of all staff. Co-construction in the focus groups,  
19 however, meant that a broad variety of views were presented.  
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25 Half of the people in the focus groups participated in ISS and the other half in OSS. The central  
26 purpose of the focus groups was to bring out the differences in what people experienced and to  
27 enable them to co-construct and make indirect comparisons between the learning outcomes they  
28 experienced from doing either ISS or OSS. The participants also used their previous simulation  
29 experiences to mirror their new experiences. Many of the participants knew each other, which may  
30 have prevented them from openly providing sensitive information or completely expressing their  
31 opinions and feelings. The heterogeneity of the groups may have influenced the group dynamics  
32 and the potential power relationships between groups. Experienced moderators were used in the  
33 attempt to avoid this.  
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42 Another limitation was the composition of the focus groups, which did not entirely mirror the  
43 distribution of healthcare professionals during the clinical work, and some groups were  
44 underrepresented.  
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## 49 **Conclusion**

50 This study presents a new finding, which is that, in the eyes of healthcare professionals, OSS can be  
51 used just as well as ISS if other authenticity elements are taken into consideration and respected.  
52 This finding needs to be confirmed in other settings, in other kinds of medical specialities and  
53 among other kinds of healthcare professionals.  
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6 Analysis of the focus groups indicates that cross training is not an optimal solution, but additional  
7 testing of the concept[39-41] among larger medical teams composed of a larger variety of  
8 healthcare professionals in more complex simulations needs to be carried out to confirm and  
9 explore this conclusion further.  
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14 The present study and the randomised controlled trial (*Submitted BMJopen, March 2015: Sørensen*  
15 *JL et. Simulation-based multi-professional obstetric anaesthesia training conducted in situ versus*  
16 *off site leads to similar individual and team outcomes; a randomised educational trial*). compared  
17 ISS to OSS conducted as in-house training at the hospital in rooms allocated to training. The results  
18 from this study on the setting of simulations adds knowledge that may be useful in the planning and  
19 decision-making process for building and rebuilding new hospitals, facilities for training and  
20 simulation centres.  
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27 The study findings were based on focus groups and on the participants' immediate perceptions.  
28 Measuring the outcome of medical education[47] is a complex process, which is why including  
29 long-term feedback from participants in future studies, as well as the effect on outcome in patient  
30 care practices or patient outcomes would be useful.  
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36 This study concludes that the psychological and sociological fidelity elements of the simulation are  
37 important and that the physical context of the simulation is least important. Based on findings from  
38 the focus groups, OSS can be employed if other authenticity elements are considered and respected.  
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48 informed consent. Participants were assured that their personal data would remain anonymous  
49 during reporting and were asked to respect the confidentiality of everything said in the focus group.  
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55 **Data sharing:** No additional data available.  
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# BMJ Open

## Clarifying the learning experiences of healthcare professionals with in situ and off site simulation based medical education: a qualitative study

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**TITLE PAGE**

**Title: Clarifying the learning experiences of healthcare professionals with in situ and off site simulation-based medical education: a qualitative study**

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For peer review only

## ABSTRACT

**Objective:** To examine how the setting in in situ simulation (ISS) and off site simulation (OSS) in simulation-based medical education affects the perceptions and learning experience of healthcare professionals.

**Design:** Qualitative study using focus groups and content analysis.

**Participants:** Twenty-five healthcare professionals (obstetricians, midwives, auxiliary nurses, anaesthesiologists, a nurse anaesthetist and operating theatre nurses) participated in four focus groups and were recruited due to their exposure to either ISS or OSS in multi-professional obstetric emergencies in a randomised trial.

**Setting:** Departments of obstetrics and anaesthesia, Rigshospitalet, Copenhagen, Denmark.

**Results:** Initially participants preferred ISS, but this changed after the training when the simulation site became of less importance. There was a strong preference for simulation in authentic roles. These perceptions were independent of the ISS or OSS setting. Several positive and negative factors in simulation were identified, but these had no relation to the simulation setting. Participants from ISS and OSS generated a better understanding of and collaboration with the various health professionals. They also provided individual and team reflections on learning. ISS participants described more experiences that would involve organisational changes than the OSS participants did.

**Conclusions:** Many psychological and sociological aspects related to the authenticity of the learning experience are important in simulation, but the physical setting of the simulation as an ISS and OSS is the least important. Based on these focus groups OSS can be used provided that all other authenticity elements are taken into consideration and respected. The only difference was that ISS had an organisational impact and ISS participants talked more about issues that would involve practical organisational changes. ISS and OSS participants did, however, go through similar individual and team learning experiences.



## ARTICLE SUMMARY

### Strengths and limitation

- In situ simulation is fairly new and involves conducting simulations in the actual patient care unit, and based on the much-discussed topic of learning in context, in situ simulation is expected to increase fidelity and thereby learning. We had been unable to identify any qualitative studies exploring participant experiences of in situ versus off site simulation (i.e. simulation in training rooms).
- Based on findings from these focus groups the simulation settings in situ and off site had the same effect on individual and team learning. In situ simulation had more organisational impact and provided more information for practical organisational changes than off site simulation.
- Conclusions from the present focus groups indicated that healthcare professionals think that the physical context and physical fidelity of ISS and OSS were not the most important aspects for learning provided other psychological and sociological authenticity elements were respected. The participants in the focus groups highlighted the importance of participating in authentic teams in their own roles as healthcare professionals. This emerged in the focus groups as participants reflected upon previous negative experiences of simulation in other professional roles.
- The findings from the focus groups in this study show that staff in obstetrics and anaesthesiology appeared to be more familiar with working in different places, which they saw as an important skill, but we cannot say whether study findings are transferable to other groups of healthcare professionals working in medical areas with less emergency work or or health-care professionals without simulation experience .
- A limitation was the composition of the focus groups, which did not entirely mirror the distribution of healthcare professionals during the clinical work, and some groups were underrepresented.

## INTRODUCTION

Simulation-based medical education is an important training modality for training skills, teams and how to perform in emergency situations.[1-4] If emergencies are rare and hence can be difficult to learn about in real life, simulation-based medical education is warranted, for instance in obstetric emergencies.[5] Simulation-based medical education involves “devices, trained persons, lifelike virtual environments, and contrived social situations that mimic problems, events, or conditions that arise in professional encounters”. [4] There are many unanswered questions as to how simulation-based medical education is best conducted, one of which concerns the fidelity of the setting. An unresolved issue is how in situ simulation (ISS) versus off site simulation (OSS) affects learning. ISS involves simulation-based medical education in the actual patient care unit.[6,7] OSS, on the other hand, entails training in facilities outside the patient care unit. ISS is believed to increase fidelity and thereby learning because it takes place in the clinical setting.[7-9] In a classic sense fidelity refers to the degree of faithfulness that exists between two entities, and these entities are fundamental for the transfer of simulation-based medical education and performance in the clinical settings.[10] The rationale behind this idea on the authenticity of simulation is the traditional assumption that the closer the learning context is to the context of practice, the better the learning, and situativity theory argues that knowledge, thinking and learning are situated in experience.[11-15] Therefore ISS is believed to increase learning because it takes place in the clinical setting, where the learning context is more similar to the context of practice.

We conducted a randomised controlled trial to reveal whether ISS was superior in facilitating learning compared to OSS.[16] We concluded that participant perception of the authenticity of ISS and OSS differed significantly but did not find any differences between knowledge, safety attitudes, motivation, stress, perceptions of the simulation and team performance.[17] We were unable to identify any qualitative studies exploring how participants experience differences in the simulation setting and found that studies clarifying participants’ experiences were of relevance.[18] Consequently we determined that carrying out qualitative research in combination with the randomised controlled trial, which involved a complex intervention, would provide deeper insight into the learning experience of healthcare professionals participating in ISS and OSS.[19]

This study attempts to shed light on the general assumption that context and fidelity are a determinant for how different kinds of simulation-based medical education are experienced and to

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4 determine the veracity of the common assumption that ISS is a more effective learning tool than  
5 OSS.[8] The research question was: How does the setting in simulation-based medical education  
6 (OSS or ISS) affect the perceptions and learning experience of healthcare professionals?  
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## 10 **METHOD**

### 11 **Design**

12 We chose to do a qualitative study using focus groups, deeming this to be an appropriate method  
13 with regard to the research question. Focus groups, which can be defined as “a form of group  
14 interview that capitalises on communication between research participants in order to generate  
15 data”, [20] are useful for gathering information about the points of view of different participants and  
16 can be used to explore and explain phenomena.[21] We also wanted to examine data from the  
17 randomised controlled trial more closely [16] and using focus groups is described as a valuable way  
18 of further analysing and interpreting data subsequently.[19-21] The focus groups were conducted  
19 based on criteria in the literature.[20-25]  
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### 29 **Participant selection and intervention before the focus groups**

30 Prior to the present qualitative study a randomised trial was conducted that recruited individuals  
31 from among 265 healthcare professionals working shifts on a labour ward. After giving written  
32 informed consent, randomisation was performed by the Copenhagen Trial Unit using a computer-  
33 generated allocation sequence concealed to the investigators. The randomisation was conducted in  
34 two steps, first, 1:1 to the ISS or the OSS group, then randomisation into 10 teams for either the ISS  
35 or OSS. Based on a power calculation one hundred participants were randomised, and of these 97  
36 participated in the randomised controlled trial.  
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43 The focus group participants, recruited from among 97 healthcare professionals enrolled in an  
44 randomised controlled trial, comprised consultant and trainee obstetricians, midwives, consultant  
45 and trainee anaesthesiologists, auxiliary nurses, operating theatre nurses and nurse anaesthetists.[16]

46 The trial included two multi-disciplinary simulation cases conducted using ISS or OSS: an  
47 emergency caesarean section and the management of postpartum haemorrhage. A simulated patient  
48 was given instructions and then acted as the patient in the real labour room (ISS) and in the  
49 simulated labour room (OSS). When the simulation was transferred to the operating theatre, a full-  
50 scale birthing simulator (SimMom) was the patient in the real operating theatre (ISS) and in the  
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4 simulated operating theatre (OSS). The simulated emergency scenarios were designed to allow  
5 standardised training in both the ISS and OSS groups.[16] The instructors running the simulation  
6 scenarios also carried out the debriefing sessions.[26]  
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### 10 **Recruitment and composition of the focus groups**

11 Eligible participants were informed by email and a personal letter. If they agreed to participate they  
12 were contacted by the principal investigator (JLS) and enrolled after informed written consent.  
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17 Only very few minor conflicts occurred during the randomised controlled trial and they did not  
18 involve anxiety or power dominance, indicating that using homogenous focus groups was not a  
19 necessity. Hence we also determined that the participants would feel comfortable in multi-  
20 professional focus groups. We also expected heterogeneous groups to add to the richness of data  
21 due to the process of co-construction. All four groups were to comprise individuals who had  
22 participated in ISS and OSS based on the assumption that this would add to the co-construction  
23 process. In accordance with recommendations in the literature [21] each focus group was limited to  
24 6-8 participants.  
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### 32 **Moderators and conduction of the focus groups**

33 Two anthropologists (LEN, HMM) with comprehensive experience in moderating and analysing  
34 data from focus groups led the focus groups. They did not have any experience with obstetric-  
35 anaesthesia emergencies or simulation-based medical education. The principal investigator (JLS),  
36 who is an experienced obstetrician and an expert in simulation, introduced the moderators to the  
37 randomised controlled trial.[16,17] LEN observed an ISS training day and part of an OSS day. In  
38 addition to viewing videos on ISS and OSS, both moderators observed clinical work in the  
39 departments of obstetrics and anaesthesia for a total of 28 hours. Neither moderators had any  
40 professional connection to the participants and did not know them personally.  
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49 The four focus groups, scheduled to begin immediately after end of the randomised controlled trial,  
50 [16] lasted 105 minutes and took place in the afternoon in a quiet room located in the same building  
51 as the labour ward and the operating theatre but on a different floor. Participant remuneration was  
52 the equivalent of the participants' normal salary per hour.  
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Scheduled to come on a specific day, participants were welcomed upon arrival by the principal investigator (JLS) or one of the midwives responsible for doing simulations. After briefly introducing the participants to the moderators, the principal investigator or midwife would leave the room.

The moderators were provided with the names of the participants in the focus groups and some of their baseline characteristics based on information from the randomised controlled trial. [17]

### Interview guide

The interview guide (table 1) was based on previous experience, the anthropologists' observations of clinical work and OSS and ISS, and the literature.[1-3,8,27-29]

Table 1. Interview guide for the focus group

- What were your expectations concerning what you would learn during the simulation (ISS/OSS)? Were these expectations met?
- What was of most importance for your learning in the simulation (ISS/OSS)? What elements of the simulation were important?
- To what degree did you find the simulation (ISS/OSS) realistic/authentic? What made the simulation (ISS/OSS) realistic and unrealistic?
- Was it possible to identify yourself with the simulation (ISS/OSS)? Examples?
- Did you find it important for your learning that the simulation (ISS/OSS) was realistic / authentic? To what degree and why?
- Which elements contributed to making the simulation (ISS/OSS) authentic / realistic? Perhaps compare your experience with previous experiences with simulation?
- Do you think that participating in the simulation (ISS/OSS) has influenced your clinical work and daily routines? Examples?
- How does, in your experience, learning through simulation-based training differ from and benefit you compared to daily clinical learning?
- Do you think that the ISS/OSS setting influenced your level of stress and anxiety?
- Do you think that the ISS/OSS setting influenced the cooperation and communication in your simulation team?
- How did you learn about roles and responsibility in the simulation? Were you influenced by the ISS/OSS setting?

#### Other suggested elements of importance in the focus groups

- The rooms
- The time spent on the simulation
- Placement and organisation of physical objects
- Sounds
- Technical equipment
- Patient surrogate or the actress
- Manikin e.g. SimMom
- Participants' clothing
- Authentic roles in the simulation teams
- Simulation with colleagues from own workplace

### Data capture, coding and analysis of qualitative data

Conventional content analysis, a method used for the subjective interpretation of written data through a classification process of coding and identifying themes or patterns, was used to study the

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4 focus group data.[30-33] The method involves repeatedly reading and discussing the text to identify  
5 units of meaning and codes, followed by a step that entails repeatedly analysing the data and  
6 condensing it into themes.[30-32] The analytical approach used was mainly deductive and the  
7 transcribed text was analysed as manifest content.[21,31,32]  
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12 The data generated in the focus groups were audio recorded and transcribed verbatim and the  
13 moderators also took field notes. NVivo10 was used for analysis. The transcription was primarily  
14 coded by the two moderators. The interview guide provided an initial structure for identifying units  
15 of meaning. The text was then reread and analysed to derive unanticipated units of meaning. The  
16 next step involved recoding and dividing the material into ISS and OSS to identify trends related to  
17 the simulation setting. The principal investigator (JLS) independently interpreted the data, after  
18 which the three authors (LEN, HMM, JLS) discussed, reread and validated the interpretations. The  
19 themes then underwent a selection process. The initial transcripts from the four focus groups were  
20 also read by CKA and BWP, both of whom are experienced clinicians and work with simulation.  
21 The purpose of their involvement was to integrate their interpretations into the themes. Finally, the  
22 transcripts were reread to identify crosscutting themes and perspectives. The participants did not  
23 receive a copy of the transcripts or the quotations taken from them.  
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## 33 34 **RESULTS**

### 35 **Sample characteristics and composition of focus groups**

36 We recruited 31 healthcare professionals, but three of them could not participate at the scheduled  
37 time and three others cancelled at the last minute. Every effort was made to meet the principles of  
38 composition of the focus groups described above. The final number of participants was 25 (table 2).  
39 The moderators described the group dynamics in the four focus groups as good and did not  
40 experience any tensions between participants. The moderators and principal investigator discussed  
41 data saturation and concluded it was achieved.  
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Table 2. Distribution of recruited healthcare professional groups and dropout after recruitment in the four focus groups and baseline characteristics of participants in in situ simulations (ISS) and off site simulation (OSS)

	Recruited	Participated	Mean age (minimum-maximum)	Mean years of obstetric work experience (minimum-maximum)	Healthcare professional groups	Previous simulation experiences*	ISS/OSS
						No experience/ simple simulation/ full-scale simulation	
Focus group 1	6	6	44 (34-55)	10 (2-16)	1 midwife 1 specialised midwife 2 consultant obstetricians 1 nurse anaesthetist 1 trainee anaesthesiologist	0/4/2	3/3
Focus group 2	7	7	50 (36-64)	17 (1-39)	1 midwife 1 specialised midwife 1 trainee obstetrician 2 consultant obstetricians 1 operating theatre nurse 1 trainee anaesthesiologist	1/5/1	5/2
Focus group 3	7	7	42 (31-62)	12 (2-38)	1 midwife 1 specialised midwife 1 trainee obstetrician 1 consultant obstetrician 3 trainee anaesthesiologists	0/3/4	2/5
Focus group 4	8	5	46 (39-54)	14 (2-26)	2 auxiliary nurses 1 specialised midwife 1 trainee anaesthesiologist 1 consultant obstetrician	0/4/1	2/3
Did not show up due to clinical duties or illness	3				3 cancellations (all focus group 4): 1 consultant anaesthesiologist 1 nurse anaesthetist 1 trainee obstetrician		
Recruited but a scheduling issue precluded participation	3				3 midwives		
Total	31	25	45(31-64)	13 (1-39)	31	1/16/8	12/13

\* A simple simulation experience is, for example skills training using a low-tech delivery mannequin and no video recording of the simulation scenario. Full-scale simulation is done in teams with fully interactive mannequins and video recorded scenarios.

### Units of meaning and identification of themes

The text was analysed and units of meaning were identified (table 3). The overall research question addressed the influence of setting (OSS or ISS) on what the participants experienced, which provided an overarching structure for establishing the following six themes and subthemes (table 4).



Table 3. Units of meaning derived from the interview guide and from repeatedly reading and discussing transcripts from the focus groups

- In situ versus off site
- Expectations for the simulation
- Expected benefits
- Realism in the simulation
- Significance of setting
- Significance of the manikin
- Significance of sounds
- Tempo
- Identifying oneself with the simulation
- Multidisciplinary training
- Training in own role and the role of others
- Authentic roles
- Routines
- Implication for practice
- Debriefing
- Performance
- Authenticity

Table 4. Themes and subthemes

1. Initial participant expectations for in situ and off site simulation
2. Importance of simulation site
3. Preference for simulation in authentic roles in own workplace
4. Positive and negative factors in simulation
  - 4a. Practical organisation of the simulation
  - 4b. Cases in simulation scenario
  - 4c. Reversed hierarchies
  - 4d. Involvement in simulation
  - 4e. Debriefing
5. Individual and team learning
6. Suggested organisational changes

*Theme 1: Initial participant expectations for in situ and off site simulation*

When asked about their expectations in the beginning participants predominantly responded that prior to participating in the randomised controlled trial intervention they had a preconceived preference for participating in ISS because they believed that ISS better matched reality and assumed that this would affect their ability to involve themselves. They also thought that ISS would enhance their ability to transfer learning to everyday practice. An initial preference for ISS was visible in the four focus groups, but as discussion progressed this preference waned and the amount of value participants put on an ISS setting as a crucial factor for their experience of learning in simulation shifted as other factors were deemed as more crucial (box 1, quotations 1–3).

Box 1, Theme 1: Initial participant expectations concerning in situ and off site simulation as illustrated by quotations

1. In the beginning I was excited about whether I would be in situ or off site. I don't really know which one I would have preferred. In a way, in situ because then you know where everything is. But the other way would be a challenge. I thought that getting a grip on the room, which was quite different, happened fast, you very quickly get an impression of what was where [...] Even though it was an off-site simulation, everyone was aware of each other, of whether there was something that needed to be done that you could do. I think it was actually pretty exciting. I thought, who knows how I'll react? Maybe it wouldn't get my adrenalin going because it wasn't the real thing. But that's not what it was like [...] (OSS participant).
2. I had absolutely no idea whether it would be in situ or off site. Practicing in the conference room was fine. It could have also been in the hallway or somewhere else. My experience with scenario training in situ is that the artificial aspects will always be there, in contrast to a real situation. I know full well that it's scenario training and that no one is lying there bleeding to death, but I can totally get into it regardless of the surroundings [...] The same things that I work with are there. The room didn't interfere with how well I concentrated on the situation. I simply didn't give it a single thought [...] (OSS participant).
3. I didn't have very many expectations, but I hoped that I'd be able to do in situ training because I thought it would be the most educational. But I have to agree with you [another participant] about that, because I participated in off-site training and when I left, I'd learned a lot anyway. Distancing yourself a bit from everyday life makes you even more aware that you're in fact practicing communicating. It might perhaps even be a tad bit easier to remember that you're practicing in that situation. I didn't think it was a disadvantage. Of course it's artificial, but I'm not sure that that has a negative impact (OSS participant).

### *Theme 2: Importance of simulation site*

Some OSS participants mentioned that being in an unfamiliar location had some unexpected positive effects, as it forced the participants to practice their ability to adapt to new places and people, which several participants emphasised as an important skill in clinical practice and in emergencies. Both ISS and OSS participants experienced practical challenges or barriers, but argued that this could produce learning outcomes of their own. Some argued that the OSS setting in a small room, where things were organised differently and not in their normal place, forced them to see their own routines from the outside. This was considered positive even though it increased the risk of failing to follow normal procedures (box 2, quotation 1 and 2).

The discussions about ISS and OSS seemed to vary between healthcare professional groups. Auxiliary and operating theatre nurses appeared to have a greater need to have equipment in the right place. They felt that unfamiliarity with where items were located meant they had trouble finding, for example medicine, thus taking their attention away from their main tasks: teamwork and communication. Because the professional groups were not well represented in all the focus groups the differences between them can only be viewed as a trend (box 2, quotation 2).

Box 2, Theme 2: Importance of simulation site as illustrated by quotations

1. Maybe we ended up not talking about other things because we were on the third floor [OSS setting]. But there were, for example, some ordinary practical things that didn't go so well [...], but there are of course some things that you more or less do on autopilot and in the correct order when you're in your everyday surroundings (OSS participant).
2. [...] But for me, it wasn't all that different from working at another department, for example, working at the trauma centre. I'm pretty used to being in lots of different places and just using what's available. So it didn't really bother me to be in a strange place [...] (OSS participant).

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4 3. It matters where things are, if the room is different, things aren't in their usual place. I was off site and we were on top of  
5 each other in an on-call room and couldn't really access things. We would've been much more on the ball in a delivery  
6 room (OSS participant).  
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9 *Theme 3: Preference for simulation in authentic roles in own workplace*

10 The participants emphasised a heavy preference for simulation in authentic roles in their own  
11 professional groups. Some participants created a hierarchy of important factors in the simulation,  
12 prioritising individuals before location and ranking realistic teamwork ahead of a realistic location.  
13 Describing negative prior experiences with simulation in professional roles other than their own,  
14 they argued that they felt their roles became too much of a caricature and that this was not helpful  
15 for learning (box 3, quotation 1-3).  
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21 Box 3, Theme 3: Preference for simulation in authentic roles in own workplace as illustrated by quotations

- 22 1. [...] But I was looking forward to being with the professionals I work with on a daily basis. Because we play different roles  
23 in anaesthesiology [...] (ISS participant).  
24 2. [...] It's more important that it's the right professionals. Because that hasn't been the case with the other simulations we've  
25 had. Then it's of course also important that it's the right place. So you're able to find where things are [...] The people are  
26 the most important and then perhaps the place (ISS participants).  
27 3. [...] If you have to play other roles then it becomes too much of a caricature. You don't really feel at home in the role [...] It's  
28 not just you. It's also the others – you might end up giggling a bit because you're taking on another role (OSS  
29 participants).  
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31 *Theme 4: Positive and negative factors in the simulation*

32 The statements from participants about positive and negative factors were not related to the ISS or  
33 OSS setting but rather to other factors, which are presented in subthemes 4a–4e.  
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38 *Subtheme 4a: Practical organisation of the simulation*

39 Some of the important positive factors mentioned that contributed to a realistic simulation were  
40 wearing an ordinary uniform, working with a patient (actress), and using an appropriate full-scale  
41 manikin. The researchers who observed the simulations (LEN, HMM) and the instructors (CKA,  
42 BWP) observed examples of the participants comforting the actress and the manikin, touching them  
43 gently, which exemplifies the level of authenticity. Participants stated, for example that they were  
44 not always aware of whether it was an actress or a manikin, which also supports the interpretation  
45 that the level of authenticity experienced was high. These observations were similar for ISS and  
46 OSS participants (box 4, quotations 1–2).  
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51 A recurring topic in the focus groups was phones and call procedures. During ISS and OSS  
52 participants were given a list of telephone numbers but found that calling numbers other than the  
53 ones they were used to in the clinical setting was difficult and caused confusion. For example, they  
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4 called the wrong number, forgot to call staff members, called in the wrong order or phones were  
5 disconnected. ISS and OSS participants described the provided list of telephone numbers, which  
6 failed to give the intended authenticity and had the opposite effect, as a disruptive element that  
7 added negatively to the artificiality of the simulation. This was mentioned by both ISS and OSS  
8 participants (box 4, quotations 3).  
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#### 13 14 *Subtheme 4b: Cases in simulation scenario*

15 The ability of the cases to contribute to a realistic simulation was discussed. The participants had  
16 different approaches, some arguing for the necessity of highly realistic cases in simulation, where  
17 others saw this as less important, arguing that it did not matter if cases were artificial. These  
18 discussions were not related to ISS or OSS. Some participants emphasised the relief they felt  
19 because the simulated patient, i.e. the actress or manikin, was not actually in real danger, which thus  
20 contributed to creating a comfortable setting for learning. Others argued that they would like to  
21 have experienced a more complex, infrequent clinical scenario because they believed that would  
22 have encouraged greater learning (box 4, quotations 4).  
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#### 30 31 *Subtheme 4c: Reversed hierarchies*

32 Challenges to traditional professional hierarchies were a central aspect of the negative experiences  
33 of some participants. Some participants said that when the instructors or participants asked a junior  
34 doctor to take on the role of team leader it negatively influenced the simulation and their  
35 involvement in the simulation. Reversed hierarchies occurred in both ISS and OSS (box 4,  
36 quotation 5).  
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#### 42 43 *Subtheme 4d: Involvement in simulation*

44 Participants thought that it was disruptive if participants or facilitators laughed, giggled or joked  
45 during the simulation as this behaviour influenced how seriously they became involved in  
46 performing the simulation, which in turn affected their learning outcome negatively. This was the  
47 case for both ISS and OSS (box 4, quotation 6).  
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#### 52 53 *Subtheme 4e: Debriefing*

54 ISS and OSS participants viewed debriefings as a central, exceedingly positive factor for ensuring  
55 learning. During the focus groups participants talked about what they learned and described how the  
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simulation, followed by a debriefing, encouraged them to see their own healthcare group as part of an entire team. The participants stressed the importance of the debriefing process to ensure learning and to facilitate the transfer of that learning to clinical practice. Some of the participants even saw the focus groups as an extra debriefing. The participants also indicated that they would like to see debriefing applied in everyday work situations (box 4, quotations 7–9).

#### Box 4, Theme 4: Positive and negative factors in the simulation as illustrated by quotations

##### Subtheme 4a: Practical organisation of the simulation

1. We were asked to show up dressed for work, which helps set the tone that this is realistic training [...] We were given phones so that we could call the right people [...] And there was a manikin in the bed that looked like a patient. The lower part was a manikin, but there was also a live model [actress] in the bed. That worked really well. And there was blood on the sheet and the pads were heavy. This made it [seem quite realistic] (ISS participant).
2. With regard to the manikin, I have a hard time remembering when it was a manikin and when it was a patient. It must mean that it's close to reality when you can't tell the difference (ISS participant).
3. [...] There were also some OP personnel that didn't get called. The phones were generally a mess. Which is probably why some people thought it was a bit more baffling (ISS participant).

##### Subtheme 4b: Cases in simulation scenario

4. [...] This time I was kind a expecting [...] it to go crazy! I practically expected them [the actress and the manikin] to die. So I was a bit disappointed that it didn't involve more than that. I really thought that we'd have to go through everything, that we'd have to use HELLP and DIC and who knows what else. Which means that every time we stopped, I thought, but we just got started?! Things were in fact pretty acute and it looked like more, but it's actually very, very rare that things run the entire gamut. It's just that this is what I was mentally prepared for (ISS participant).

##### Subtheme 4c: Reversed hierarchies

5. [...] Two obstetricians in our session had a secret agreement that we didn't know anything about. They had set up a training situation within the training situation that the attending physician wouldn't respond. The trainee obstetrician was supposed to be in charge. They didn't tell anyone, which created a lot of confusion. At least for me because I talked to the attending senior obstetrician when I came in [...] it was a muddle [...] (ISS participant).

##### Subtheme 4d: Involvement in simulation

6. I think that throwing yourself into things is absolutely essential to learn something. You have to be willing to play the game that's being played. Because sometimes you meet people who refuse to do that. And you expose yourself when you play a role – will I know what to do? What if I say something wrong? But if people hold back, are too inhibited and start to giggle, then the whole thing's a wash. It's really important that people give it their best shot. That's nearly the most important (ISS participant).

##### Subtheme 4e: Debriefing

7. It's [debriefing] still really on my mind and it was also an eye-opener for me to see how other professionals work. During the debriefing various tasks were explained that I wasn't totally sure about (OSS participant).
8. But then you take the time afterwards [at the debriefing] to break it down and get input from other groups. And you really get a better understanding of each other and where misunderstandings arise [...] (OSS participant).
9. I think that I often experience situations [in clinical practice] where we need to talk things through so we can do better next time. The problem is that there isn't time for that. During training, time is set aside for debriefing and that's wonderful. It would be great if we had time to do that on a daily basis (ISS participant).

#### *Theme 5: Individual and team learning*

The participants stated that their inter-professional communication, collaboration and teamwork skills had improved greatly. Focus group discussions showed that ISS and OSS offered participants the opportunity to gain new perspectives on their own work practices and areas of responsibility, as well as those of their colleagues. They gained a new understanding and respect for the efforts of other team members. Some people expressed a new understanding of why other team members did

not have time for the tasks they previously had expected them to carry out. The simulation process can thus be seen as a way of crossing professional boundaries. Participants stated that the simulation process reminded them of their own and colleagues' roles as important contributors to the entire team (box 5, quotations 1–3).

Box 5, Theme 5: Individual and team learning as illustrated by quotations

1. [...] The day after we had something acute at OP theatre and three of us had participated ... which means we knew each other much better [...] It was a nice situation [...] The atmosphere is much friendlier and more pleasant (OSS participant).
2. [...] it occurred to me along the way, [...] something that I might have let frustrate me on a daily basis. It's that a team consists of many small sub-processes. And you know what the others are doing, but not in any detail (ISS participant).
3. It dawned on me how differently we hear what's being said in the OP theatre. How the anaesthesiologist hears anaesthesia things and the obstetrician hears the midwife (OSS participant).
4. Once again this just shows that you have to talk to people, look at them, say their names, ask them to do something and then note whether they've actually understood. Because that's the only way that we can work together as a team. We bury ourselves in our own tasks (OSS participant).

*Theme 6: Suggested organisational changes*

The participants discussed the opportunities available for changing some everyday organisational practices and routines based on experiences from the simulation. Most of the learning points were mentioned by both ISS and OSS participants, for example communication, cooperation, teamwork, situations with unclear responsibility, feedback, a lack of general observation forms and a lack of specific observation forms for e.g. postpartum haemorrhage. Some issues were only mentioned by ISS participants, such as where operation caps were located or messy corridors, which complicated the transport of beds in emergency situations, and poor access to some medicines. These discussions indicate what kind of information is required to promote more practical organisational learning (box 6, quotation 1).

Box 6, Theme 6: Suggested organisational changes as illustrated by quotations

1. We couldn't get the bed out the door because a porter had put a bed in the way and they were in the middle of moving a bunch of cabinets. We had to spend a lot of time moving the bed out of the delivery room. So there were lots of times where you thought, this is just unbelievable (ISS participant).

## DISCUSSION

Our analysis indicates that authenticity in all aspects of simulation is important and that the physical setting in simulations was of less significance, indicating that OSS is just as useful if other elements of authenticity in the simulation are respected. ISS played a role at the system level and the focus group provided information pointing toward possible organisational changes. For individual and team learning, however, ISS and OSS seemed to contribute equally. Findings in the randomised controlled trial support these conclusions.[17]



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6 Viewed straight forwardly the context is just the setting, but the concept of context can be expanded  
7 to also include the physical, semantic and commitment context.[34] One of the arguments in favour  
8 of ISS is the contextual similarity to the context for working.[7,8,35,36] Learning in context is a  
9 highly discussed topic in medical education.<sup>2,12,38</sup> Learning is said to be better recalled when the  
10 learning environment resembles the retrieval environment.[12,14,15] Whether this traditional  
11 finding [37] can be generalised to medical education is debated and empirical findings increasingly  
12 question it.[10,27,34,38] In medical education the context may be physical, as in this study  
13 regarding the physical surroundings in ISS versus OSS.[12,34] Physical surroundings or context  
14 appear to be parallel to the aspect of fidelity described as physical, i.e. the degree to which the  
15 simulator resembles the appearance and perception of the real system.[27,39] Conclusions from the  
16 present focus groups indicate that healthcare professionals think that the physical context and  
17 physical fidelity of ISS and OSS were not the most important aspects for learning.  
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27 This also indicates that the semantic context, which reflects how well the context contributes to the  
28 learning task, and the commitment context, which reflects motivation and responsibility, are  
29 important aspects distinguishable from the physical context.[34,38] The semantic and commitment  
30 dimensions of context resemble the psychological fidelity dimension, i.e. the degree to which the  
31 trainee perceives the simulation to be an authentic surrogate for the task being trained.[27,39]  
32 Factors in ISS and OSS, such as problems with practical organisation, case scenarios, changes in  
33 hierarchies and engagement were considered important elements in the simulations. These factors  
34 were related to interaction between participants in the simulation, but they were not related to the  
35 physical ISS or OSS setting, which is why they appear to better represent a more complex  
36 perception of context that includes semantic and commitment elements and that can also be viewed  
37 as a part of the psychological fidelity.  
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47 The participants in the focus groups highlighted the importance of participating in authentic teams  
48 in their own roles as healthcare professionals. The interview guide (table 1) encouraged participants  
49 to compare their current ISS and OSS experiences with previous simulation experiences. The focus  
50 groups had a clearly preferred simulation in authentic roles in their own workplace. The concept of  
51 training in other roles, i.e. cross training, is recommended in the simulation literature and  
52 considered a strategy for simulation-based medical education.[3,40] Cross training is defined as “an  
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4 instructional strategy in which each team member is trained in the duties of his or her  
5 teammates".[41] It is argued that if all team members have a shared understanding of other people's  
6 roles then the risk of making errors decreases.[42] Although there are examples of empirical studies  
7 that address cross training, they only comprise small teams in an experimental laboratory setting  
8 and mainly use computer-based simulation, and there are no medical studies that involve multi-  
9 professional teams.[41-43] Because the simulations in the present study were complex and included  
10 teams of ten from six different healthcare professional groups, we concluded that the authenticity  
11 and psychological fidelity would have been damaged by changing professional roles. This finding  
12 on cross training, however, will need to be investigated in future studies using outcomes other than  
13 the perceptions of participants.  
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22 The current concept of fidelity is under debate [10,27,44,45] and may not be adequate enough to  
23 explain the fidelity practiced in inter-professional simulation. The simulation literature tends to  
24 overlook the importance of social practice, [45] hierarchy, power relations and other factors  
25 affecting inter-professional teamwork.[46] The concept sociological fidelity has thus been  
26 introduced and aims to enhance the quality of inter-professional simulation and to improve its  
27 transferability to inter-professional practice.[46,47]  
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34 The inter-professional teams in our study were highly appreciated by the participants in the focus  
35 groups and can have contributed positively to the sociological fidelity. Planning simulation for  
36 inter-professional groups is challenging, especially with regard to planning and designing case  
37 scenarios that provide each profession with a significant, balanced role.[29,47] Even though we  
38 appointed a multi-professional working committee with representatives from each healthcare group  
39 to avoid conflicts [16] disagreement concerning the complexity of cases still arose.  
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### 46 **Strengths and limitations**

47 The present study adhered to criteria for focus groups [21,24] to support the transparency and add to  
48 the credibility of the study findings from the focus groups. The study was performed in the  
49 obstetrics and anaesthesiology departments of a high-risk hospital. Its transferability [21] to other  
50 settings can be discussed, but our impression is that the findings are transferable to other emergency  
51 medical specialities. The findings from the focus groups in this study show that staff in obstetrics  
52 and anaesthesiology appear to be more familiar with working in different places, which they see as  
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4 an important skill, but we cannot say whether study findings are transferable to other groups of  
5 healthcare professionals working in medical areas with less emergency work. We found a tendency  
6 that auxiliary and operating theatre nurses appeared to have a greater need for higher authenticity or  
7 fidelity of setting. These professional groups had very little or no simulation experience, and this  
8 finding is in contradiction with some of the literature finding showing that non-experts or novice-  
9 participants in simulation can accept a lower level of authenticity or fidelity.[3]  
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16 Findings in the present focus group were comparable with the results in the randomised controlled  
17 trial conducted prior to this qualitative study.[17]  
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21 To avoid bias only moderators who had never worked with the participants were selected. One  
22 element of the study with the potential for bias, however, was recruitment of participants for the  
23 focus groups because they were enlisted from among participants in the randomised controlled trial.  
24 They may have had a special interest in simulation and inter-professional activities, perhaps making  
25 them more motivated and less representative of all staff. Co-construction in the focus groups,  
26 however, meant that a broad variety of views were presented.  
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33 Half of the people in the focus groups participated in ISS and the other half in OSS. The central  
34 purpose of the focus groups was to bring out the differences in what people experienced and to  
35 enable them to co-construct and make indirect comparisons between the learning outcomes they  
36 experienced from doing either ISS or OSS. The participants also used their previous simulation  
37 experiences to mirror their new experiences. Many of the participants knew each other, which may  
38 have prevented them from openly providing sensitive information or completely expressing their  
39 opinions and feelings. The heterogeneity of the groups may have influenced the group dynamics  
40 and the potential power relationships between groups. Experienced moderators were used in the  
41 attempt to avoid this.  
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49 Another limitation was the composition of the focus groups, which did not entirely mirror the  
50 distribution of healthcare professionals during the clinical work, and that some groups were  
51 underrepresented.  
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## Conclusion

This study presents a new finding, which is that, in the eyes of healthcare professionals, OSS can be used just as well as ISS if other authenticity elements are taken into consideration and respected.

This finding needs to be confirmed in other institutions and medical specialities as well as among other kinds of healthcare professionals and participants with less experience in simulation-based learning.

Analysis of the focus groups indicates that cross training is not an optimal solution, but additional testing of the concept [40-42] among larger medical teams composed of a larger variety of healthcare professionals in more complex simulations needs to be carried out to confirm and explore this conclusion further.

The present study and the randomised controlled trial compared ISS to OSS conducted as in-house training at the hospital in rooms allocated to training.[17] The results from this study on the setting of simulations adds knowledge that may be useful in the planning and decision-making process for building and rebuilding new hospitals, facilities for training and simulation centres.

The study findings were based on focus groups and on the participants' immediate perceptions. Measuring the outcome of medical education [48] is a complex process, which is why including long-term feedback from participants in future studies, as well as the effect on outcome in patient care practices or patient outcomes would be useful.

This study concludes that the psychological and sociological fidelity elements of the simulation are important and that the physical context of the simulation is less important. Based on findings from the focus groups, OSS can be employed if other authenticity elements are considered and respected.

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6 BO, was responsible for acquiring funding. JLS, LEN and HMM did the initial data processing. All  
7 authors, except HK<sup>†</sup> provided critical review of the paper and approved the final manuscript.  
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16 conduct of the study.  
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35 Danish Data Protection Agency (no. 2007-58-0015) approved the study. Participants gave written  
36 informed consent. Participants were assured that their personal data would remain anonymous  
37 during reporting and were asked to respect the confidentiality of everything said in the focus group.  
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42 **Data sharing:** No additional data available.  
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46 **Transparency:** The principal investigator and lead author (JLS) affirms that the manuscript is an  
47 honest, accurate and transparent account of the study being reported. No important aspects of the  
48 study have been omitted and any discrepancies from the study as planned (and, if relevant,  
49 registered) have been explained.  
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