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RESEARCH ARTICLE

Positioning patients for robotic-assisted surgery: A qualitative study of operating room nurses' experiences

Benedikte Bjøro[1,2] | Ingvild Ballestad[3] | Tone Rustøen[2,4] | Monica Hetlesæther Fosmark[5,6] | Signe Berit Bentsen[1,3]

[1]Department of Operating Services, Division of Emergencies and Critical Care, Oslo University Hospital, Oslo, Norway

[2]Department of Nursing Science, Faculty of Medicine, Institute of Health and Society, University of Oslo, Oslo, Norway

[3]Department of Health and Caring Sciences, Western Norway University of Applied Sciences, Bergen, Norway

[4]Department of Research and Development, Division of Emergencies and Critical Care, Oslo University Hospital, Oslo, Norway

[5]Faculty of Health Sciences, University of Stavanger, Stavanger, Norway

[6]Operating Department, Helse Stavanger HF, Stavanger, Norway

Correspondence
Benedikte Bjøro, Department of Operating Services, Division of Emergencies and Critical Care, Oslo University Hospital and Department of Nursing Science, Faculty of Medicine, Institute of Health and Society, University of Oslo, Oslo, Norway.
Email: berabj@ous-hf.no

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Abstract

Aim: One of the challenges of robotic-assisted surgery is related to positioning of the patient on the operating table. Technological developments place increased demands on operating room nurses' competence to prevent positioning injuries and ensuring care quality. Therefore, the aim of the present study was to describe operating room nurses' experiences when positioning the patients for robotic-assisted surgery.

Design: A descriptive qualitative design.

Methods: Seven operating room nurses with experience in robotic-assisted surgery were included at a university hospital. Data were obtained through individual interviews and analysed using qualitative content analysis. The Consolidated Criteria for Reporting Qualitative research COREQ checklist was used.

Results: We identified three categories, (a) patient positioning is challenging during robotic-assisted surgery, (b) operating room nurses take responsibility for patient positioning during robotic-assisted surgery, but teamwork is important and (c) operating room nurses aim to achieve safe patient positioning during robotic-assisted surgery.

KEYWORDS
operating room nurse, patient positioning, patient safety, qualitative study, robotic-assisted surgery

1 | INTRODUCTION

During the last decades, the use of robotic-assisted surgery (RAS) has increased worldwide and especially in gynaecology and urology where it has become more common (Bouquet de Joliniere et al., 2016; Eswara & Ko, 2019). RAS is a type of 'minimally invasive surgery' where a computer is placed between the surgeon and the patient, and a camera with two 'eyes' provides both depth of vision and a stable three-dimensional picture. The surgeon directs the robotic arms using hand and foot controls on a console but is physically separated from the patient and the surgical team (Kadioglu et al., 2018; Zelhart & Kaiser, 2018). The introduction of RAS has several advantages when compared with conventional surgery. RAS enables more patients to have invasive surgery performed with less postoperative pain, reduced surgical trauma, shorter hospitalization, reduced blood loss and earlier return to daily activities (Bouquet de

Joliniere et al., 2016; Takmaz et al., 2018). Whilst RAS is less stressful for the patients, there are challenges for the surgical team associated with positioning of the patients (Maerz et al., 2017). During RAS, the positioning of patients cannot be altered for the entire robotic part of the procedure. The patient must be properly secured to avoid any movement during the surgery to prevent injuries (Kaye et al., 2013). Therefore, it is even more important to ensure safe patient positioning before the operation (Myklebust et al., 2020).

2 | BACKGROUND

Robotic-assisted laparoscopic gynaecological, colorectal and urological surgical procedures often require that patients be placed in steep Trendelenburg position with lithotomy on the operating table (Hortman & Chung, 2015; Rothrock & McEwen, 2019). Steep Trendelenburg positioning is a variation of the supine position in which the patient lies face up with the head and body tilted 25°–45° downwards (Takmaz et al., 2018). In lithotomy position the legs are placed in stirrups and knees bent flexing the leg on the operating table. Lithotomy positioning can be graded in four levels according to what access the surgeon needs (low, standard, high and exaggerated) (Rothrock & McEwen, 2019). The arms are often tucked and padded parallel to the body or the arms are left on arm boards at an angle of <90° (Rothrock & McEwen, 2019). Steep Trendelenburg positioning is used to keep abdominal viscera away through a gravity effect and to minimize blood loss at the surgical site, whilst lithotomy positioning has been used to provide surgical access to deep structures (Hortman & Chung, 2015).

Since surgical procedures have become increasingly complex and technically challenging more advanced patients positioning on the operating table are required. Consequently, this have made the profession of operating room nurses (ORNs) more challenging through the introduction of technologies that may affect patient safety (Carlos & Saulan, 2018; Martins et al., 2019). ORNs need to expand their skills to manage the combination of technology and person-centred care (Uslu et al., 2019). The whole surgical team (i.e. surgeon, operating room nurse, anaesthesiologist and anaesthesia nurse) is responsible for correct positioning of the patient on the operating table, but the ORNs play a key role in positioning the patient and thereby protecting him/her from injury (Blomberg et al., 2018; Brooker et al., 2020). In two recent studies, it has been demonstrated that the ORN took overall responsibility for planning the patients' positioning on the operating table, and that the right equipment was adapted individually for the patients (Blomberg et al., 2018; Brooker et al., 2020).

Hence, by ensuring the quality of care when positioning patients for surgery, increased demands are placed on ORNs competence and professional currency. That may suggest that ORNs must focus on quality of care to prevent complications related to patients positioning and to ensure optimal results of the surgical procedure (Blomberg et al., 2018). The ORN profession includes knowledge of perioperative nursing, technical skills and training in complex practical performance and non-technical skills. Norwegian ORNs work in pairs and alternate between the roles of a scrub nurse and circulating nurse. The ORNs are superior healthcare providers and have independent responsibilities and rights of delegation. According to the Norwegian association of ORNs (NSFLOS, 2015; REHTOS, 2021). ORN in Norway are Registered Nurses with bachelor's degree with a postgraduate specialist or master degree in ORN of respectively, 120 or 90 credits (REHTOS, 2021). The Norwegian ORN programme consists of both theoretical and clinical rotation and results in both a professional title and master degree (REHTOS, 2021).

As far as we know, there has been little attention about ORN's own experiences with patient positioning during RAS and there is a need for research to describe ORNs' experiences when positioning the patients undergoing RAS, which in turn will give valuable in-depth knowledge. Therefore, the aim of the present study was to describe ORNs' experiences when positioning the patients for RAS.

3 | METHODS

3.1 | Design

This study has a qualitative descriptive design and is based on seven individual interviews (Polit & Beck, 2017) subjected to qualitative content analysis with an inductive approach (Graneheim et al., 2017; Graneheim & Lundman, 2004). A 32-item checklist, Consolidated Criteria for Reporting Qualitative (COREQ) research was used when preparing the manuscript (Appendix A) (Tong et al., 2007).

3.2 | Setting

The study was conducted in an operating room department at one university hospital, at the West coast of Norway, which serves a population of 370,000 inhabitants. The operating room department had 10 years' experience performing in gynaecological, urological and gastroenterological RAS. The ORNs at the department had comprehensive experience positioning patients for RAS.

3.3 | Participants

The leadership at the operating room department gave permission to perform the study and information about the study was given to the ORNs at the department. ORNs were Registered Nurses with a postgraduate specialist degree in ORN. To include the participants, a purposive sample was used (Polit & Beck, 2017). ORNs who fulfilled the following criteria were invited to participate in the study; male and female ORNs working with both general surgery (i.e. urological, gynaecological or gastroenterological) and RAS (i.e. urological,

gynaecological or gastroenterological), with two or more years' experience as ORNs and certified working with RAS were included. ORNs were excluded if they had been on sick leave for the past 6 months. The special advisor at the hospital department recruited the informants by e-mail. The seven ORNs who fulfilled the criteria accepted the invitation to participate in the study. The characteristics of the participants in the study are presented in Table 1.

3.4 | Data collection

Individual interviews were used to collect data (Polit & Beck, 2017). To encourage ORN to talk freely about their experiences positioning patients during RAS the interviews began with the open-ended question: 'Can you describe your experiences when positioning patients for RAS?' In order to obtain a complete description from participants, they were asked to elaborate on their statements using questions, such as 'Can you describe that in more detail?' and 'Can you give an example?' (Magnusson & Marecek, 2015; Polit & Beck, 2017). Seven interviews, including one pilot interview, were conducted. The quality of the pilot interview was adequate for inclusion into the study. The second author (IB) performed all interviews, carried out short field notes and transcribed the interview verbatim. She was not colleague of the participants. The interviews were conducted in Norwegian during December 2019 and January 2020 in an office separate from the operating room department to. The interviews lasted from 20 to 30 min.

3.5 | Data analysis

The interviews were analysed using qualitative content analysis as described by Graneheim and Lundman (2004), which is an objective and systematic method to analyse qualitative interview data (Graneheim & Lundman, 2004). The analysis was inductive referring to ORNs experiences of positioning patients for RAS (Graneheim et al., 2017; Graneheim & Lundman, 2004). First, the transcribed text was read repeatedly by three researchers (BB, IB, SBB) independently to obtain an overall sense of the content of the interviews (Graneheim et al., 2017; Graneheim & Lundman, 2004). Next, the text was read in detail and meaning units addressing for patient positioning were identified and condensed independently by the authors (BB, IB, SBB). Then, the condensed meaning units were translated into English by a native speaker. During the translation procedure, the authors (BB, IB, SBB) ensured that the content of the meaning units was preserved. The condensed meaning units were then reduced to descriptive labels (codes) (BB, IB, SBB). The researchers (BB, IB, SBB) compared the codes according to similarities and differences and consolidated into sub-categories and categories (Graneheim & Lundman, 2004).

TABLE 1 Characteristics of the operating room nurses

Characteristics	*N* (%)
Gender (female)	7 (100)
Department	
Urology	1 (14.3)
Gynaecology	1 (14.3)
Urology/gynaecology	1 (14.3)
Urology/gynaecology/gastroenterology	4 (57.1)
Experience	Mean (Range)
Experience as operating room nurse (years)	16.6 (2.5–33)
Experience with robotic-assisted surgery (years)	6 (2.5–10)

3.6 | Trustworthiness

Trustworthiness is described as credibility, dependability, confirmability and transferability (Graneheim & Lundman, 2004; Polit & Beck, 2017).To ensure credibility a pilot interview was performed. Increased credibility is also achieved by summarizing the interviews and obtain feedback on the summaries from the ORN. To reinforce the credibility of the analysis, the sub-categories and categories were identified and formulated during discussion among the authors. Credibility is strengthened by ensuring that the statements and experiences communicated by the participants were clearly represented. Actual statements are represented in the text. The dependability is ensured by using the same interview question with each ORN, which was useful when analysing the data and enabled us to perform comparison between the participants. The interviews were audiotaped and transcribed verbatim. Field notes were also taken during the interviews. The dependability was also strengthened by the researcher's experience as ORN, which provided a deeper understanding of patient positioning and confirmability was strengthen using representative quotations to illustrate the voice and the information in relation to the findings. The transferability of our findings to another context is enhanced by providing description of the participants and data collection. Only female ORNs from a single medical centre were interviewed, which may reduce the study's transferability, but it is the reader's decision whether or not the findings are transferable to another context.

3.7 | Ethical considerations

The participants were informed of the authors' confidentiality agreements, the assurance of participants' anonymity, and how the data would be presented. In addition, it was emphasized that the participation was optional. The participants were asked for permission to audiotape the interviews. After that all interviews were transcribed, and resulting data were anonymized, so that the participants are not identifiable in the article. The study was approved by the Social Science Data Services (No. 325269) and the research department and protection office at the participating hospital (registration number: MA 217).

4 | RESULTS

During the structured analysis, three categories were identified, (a) patient positioning is challenging during RAS, (b) ORNs take responsibility for the patient positioning during RAS, but teamwork is important and (c) ORNs aim to achieve safe patient positioning during RAS. Furthermore, we identified three sub-categories: ORNs emphasize to prevent positioning injuries, ORNs prefer positioning the patient awake and ORNs lack routines for detecting positioning injuries postoperatively.

4.1 | Patient positioning is challenging during RAS

All ORNs experienced challenges when positioning the patient on the operating table in steep Trendelenburg with lithotomy during RAS. They reported that one of the major challenges, is that the patient must be tilted with the head 30° downwards (steep Trendelenburg) and in lithotomy positioning with the legs placed in stirrups. The patient must also be placed in an extreme position for an extended period of time. They also explained that if the patient's position should be altered; the robot must be 'undocked'. Thus, it is particularly important that the patient is correctly positioned before commencing the surgical procedure.

> Positioning for robotic surgery is challenging. Patients are tilted up to 30 degrees, with their head down and legs in holders (
>
> Participant 1).

> Patients need to lie completely still, not be touched and often lie in an extreme position (
>
> Participant 3)

4.2 | ORNs take responsibility for the patient positioning during RAS, but teamwork is important

All the ORNs said that positioning the patient on the operating table is an important individual role and all participants felt responsible for ensuring that the positioning was safe for the patient during the procedure of RAS. ORNs are also responsible for using the right equipment according to patients' needs and providing padding to prevent positioning injuries.

> As a coordinator you have a very important task to position the patient. I think responsibility, yes position (
>
> Participant 7)

Some of the ORNs stated that safe positioning requires planning and good communication with the anaesthesiologist and anaesthesia nurse. In RAS, the ORNs report that the anaesthesiologist and anaesthesia nurse are more involved in the positioning of the patient and that there is a common understanding that it is very important that the patient is safely positioned on the operating table.

> With Da Vinci (the robot), I feel the anesthesia nurses are much more involved in relation to positioning compared with regular laparoscopy or laparotomy, then they don't take as much responsibility and are more "hands off ". With Da Vinci, I feel there is a common understanding that the patient should be laying correctly on the operating table (
>
> Participant 2)

The surgeons are responsible for the patient and they decide when the patient should be 'undocked' if the duration of the surgical procedure exceeds what was expected. After 2–3 h the patient should be placed in a supine position to relieve and rest the extremities (Rothrock & McEwen, 2019). Some ORNs state that it can be challenging when they see that the surgical procedure will last longer than anticipated as the surgeons have a strong inclination to continue operation to complete the surgery. The ORNs expressed a wish to improve the routines for deciding when to consider lowering the legs to the level of the body and to neutralization of positioning.

> ... if we see that it runs overtime by 2-3 hours, we must give the message. If it is possible technically one can "dock" off and straighten the patient and let the patient's extremities rest a while. However, this is challenging, the surgeon may say there is only a little time remaining and suddenly it takes another hour and a half. I see that we may need to be even clearer on behalf of the patient... (
>
> Participant 3)

4.3 | ORNs aim to achieve safe patient positioning during RAS

4.3.1 | ORNs emphasize the need to prevent positioning injuries

ORNs emphasized that injuries related to positioning on the operating table are a well-known phenomenon, but that they are relatively rare. ORNs knew that the consequences of positioning injury can be severe and can lead to pain and other symptoms affecting patients' function and activity of daily life. All the ORNs emphasized the importance of preventing positioning injuries, providing good and safe care for the patients during the surgical procedures. They explained the importance of checking the positioning, padding and straps during the surgical procedure. Several were concerned that the positioning should not cause additional problems for the patients.

> The main challenge is to position them so that they do not sustain any injuries afterward. Positioning is actually the main thing I think about when I go into robotic surgery (
>
> Participant 2)

4.3.2 | ORNs prefer positioning the patient awake

Some of the participants indicated that they positioned the patient on the operating table whilst the patients were awake. The advantage is obviously that they can communicate with the patient and determine if the patient is uncomfortably positioned on the operating table or experiencing pain. Issues like shoulder pain or hip problems are not regularly documented in the patients' records. The patient can then participate actively whilst being positioned.

> In relation to positioning it is important that this happens whilst the patient is awake. They are then able to inform us if they feel something pressing or feel their arm is not lying in a good position (
>
> Participant 4)

4.3.3 | ORNs lack routines for detecting positioning injuries postoperatively

Several of the ORN felt a wish to meet the patients postoperatively to improve their preventive work against positioning injuries. They pointed out that a postoperative visit should be routine to see the patients the day following the surgery.

> In cases of extreme positioning we should actually be able to speak with the patient afterward. They have mentioned there should be a routine visit to the patient the following day (
>
> Participant 2)

Some of the participants stated that symptoms of injuries may not necessarily be observed the day following surgery and that symptoms could present themselves after discharge from the hospital. They wanted a system that could record and register complications due to positioning also after the patient has been discharged.

> We don't always see the damage that the robot inflicts on the patient, it may come afterward, or even after they have gone home. We need a system that can capture this information, maybe it can be traced back not necessarily to the robot, but to the positioning (
>
> Participant 3)

5 | DISCUSSION

The aim of the present study was to describe ORNs' experiences when positioning the patients for RAS. According to the interviewed ORNs in the present study it was a major challenge that patient was tilted with the head downward (steep Trendelenburg positioning) and could not be moved during the surgery. During RAS the positioning of patients cannot be changed once the robot is docked, it is important that the patient are properly secured to avoid any movement during surgery (Kaye et al., 2013). To prevent patients from sliding down on the operating table, shoulder braces that in some instance could actually injure to the patient are applied (Rothrock & McEwen, 2019). Previous studies demonstrate that the use of shoulder braces may cause injury of the brachial plexus (Abdalmageed et al., 2017). Several studies have found that intraoperative peripheral nerve injuries and compartment syndrome may follow incorrect positioning, inadequate fixation or prolonged time in steep Trendelenburg with lithotomy positioning (Bjøro et al., 2019; Tourinho-Barbosa et al., 2018). In our study the ORNs obviously were aware of this phenomenon despite it being a rare complication. Several of the ORNs were also concerned that positioning could cause additional sequels and problems for patients postoperatively.

According to WHO patient safety care is to prevent errors and adverse effects to patients associated with health care and is fundamental in care quality (WHO, 2005). To ensure patient safety in a perioperative setting ORNs have a sole responsibility (von Vogelsang et al., 2020). The ORNs in the present study pointed out that they were responsible for preventing nerve or pressure injuries and for positioning the patient safely on the operating table. Therefore, the ORN is responsible for having adequate knowledge of anatomical structures, patients' physiology and mechanisms involved in possible pathophysiological processes to perform correct patient positioning on the operating table (Blomberg et al., 2018; REHTOS, 2021; Rothrock & McEwen, 2019). All ORNs pointed out that they took responsibility (moral, cognitive and behavioural) when positioning the patient for surgery. This is in accordance with two studies (Brooker et al., 2020; Kelvered et al., 2012) where the participants stated that the ORNs were leading the work throughout the operation by interacting with other members of the team to ensure safe care of the patient. In the study by Myklebust et al. (2020) the authors emphasized the importance of having a clear leader, in particular during the start-up phase when positioning the patient for RAS. Surgical teamwork performance is an important element of patient safety and it aims to prevent unnecessary harm to the patients (Carlos & Saulan, 2018). Teamwork is described as 'a set of interrelated cognitions, attitudes and behaviours contributing to the dynamic processes of performance' (Salas et al., 2008). Thus, all team members are responsible for the patients' care and each member is competent in their specific area of expertise. Optimal teamwork will ensure safety in the care of the patient (Myklebust et al., 2020; Sandelin & Gustafsson, 2015).

Our participants emphasized communication and planning as being important in patient positioning.

By positioning the patient whilst awake the ORN may communicate with the patient during this procedure. In this case, patients can participate actively whilst being positioned and indicate if they are uncomfortable on the operating table or experience pain. Whilst in general anaesthesia patients are unable to indicate that the positioning causes pain or other symptoms (Rothrock & McEwen, 2019). It is important to adjust the positioning of each patient in order to prevent injuries (i.e. nerve injury, compartment syndrome, pain) (Bjøro et al., 2019; Takechi et al., 2018). Therefore, as some of the ORNs emphasized, the importance of being able to speak with patients before the operation is essential so that the patients can identify pain or discomfort due to suboptimal positioning.

According to some of the ORNs, a particular challenge was that surgery sometimes lasted longer than expected. Some of the ORNs found it difficult always being the one who requested neutralization of positioning while the surgeon stated they only had a little time left, but the surgery lasted for one extra hour. It has been found that the incidence of intraoperative peripheral nerve injuries, and compartment syndrome after steep Trendelenburg positioning with lithotomy is associated with increased operating time (Bjøro et al., 2019; Pridgeon et al., 2013), and even one extra hour can significantly increase the risk of nerve injury (Warner, 1998). In addition, there is a risk of developing pressure injuries with a prevalence of 8.5% among patients who undergo surgical procedures lasting more than three hours (Engels et al., 2016). In RAS, the surgeon performs the operation separated from the patient, and in some extended cases, they may lose the time perspective because they are not in direct contact with the patient (Song et al., 2013; Zelhart & Kaiser, 2018). Therefore, communication between the surgical team members about the status of the patients is even more important throughout the surgical procedures in RAS (Randell et al., 2019)—for example routines for taking neutralization of positioning when necessary as expressed by our ORNs.

ORNs and anaesthetic nurses collaborate when positioning the patients on the operating table. In RAS, the ORNs reported that the anaesthesia nurse is more involved in the positioning of the patient compared to traditional surgery and that there is a common understanding that it is very important that the patient is safely positioned on the operating table. Patients are placed in an extreme position with the head tilted down 30°. With this positioning, it is assumed that the anaesthesia nurse can observe whether the patient's head is correctly positioned, (Hortman & Chung, 2015), and also observe whether the patient's arm is adequately positioned for when the patient is to be injected with drugs. The ORN must communicate with the anaesthesia nurse to ensure optimal positioning of the patient. Collaborating in this way, both the ORN and the anaesthesia nurse ensure optimal patient safety (Brooker et al., 2020; Myklebust et al., 2020). In the study by Sandelin and Gustafsson (2015), the authors emphasized that conferring before the surgical procedure, discussing nursing measures and creating a common understanding of patient care will contribute to an optimal collaboration between the ORN and other members of the surgical team. If there are expected challenges with positioning, information must be shared between all members of the team.

Some of the ORNs in our study claimed that symptoms of nerve injury could appear later in the postoperative course. In contrast, in a recent systematic review (Bjøro et al., 2019) the authors found that injury symptoms appeared immediately after the surgical procedures. The ORNs in our study pointed out that patients should be seen the day following the surgery to observe and to identify any signs or symptoms of positioning injuries. This will enable them to improve feedback to the ORNs about possible positioning injuries that can then be used to improve the quality of the ORNs' patient care. The ORNs in the present study expressed a need for systematic registration of complications related to positioning also following discharge from the hospital. In Norway, there are different systems for reporting adverse events but none of these report data related to patients positioning injuries specifically. Therefore, there is a need for systematic documentation and reporting systems for adverse events following patient positioning. This may improve care quality when positioning patients for RAS and thus secure healthcare systems to capture patients with positioning injuries.

5.1 | Limitations

One limitation in the present study is the small sample size. However, the participants have long term clinical experience and comprehensive knowledge about patient positioning for RAS and the interviewer is also an ORN. This might create high qualitative interview dialogue and reflect important information about ORNs' experiences when positioning for RAS. In addition, the aim in the present study is narrow. This may indicate that a less sample size is sufficient to offer necessary informational power (Malterud et al., 2016). Malterud et al. (2016) claim that a purpose sample is needed to provide sufficient information. Furthermore, there was little variation in the findings given by the interviewed ORNs. The interviews were conducted in Norwegian and the derived meaning units, were translated into English. Therefore, a limitation could be that meaning units, were influenced by the translation from Norwegian to English. However, three of the authors carefully checked and agreed on the translation from Norwegian into English language. Despite these limitations, our findings may provide important insight into ORNs´ experiences when positioning the patients during RAS.

6 | CONCLUSION

Surgical technologies have become increasingly complex, as is the case in RAS. One of the challenges with RAS is related to patient positioning on the operating table. Positioning of patients on the operating table to prevent complication thus ensuring patient safety is one of the important responsibilities of ORNs. Participants in this study emphasize the importance of focusing on positioning and

patient safety. ORNs are aware of positioning injuries even though they occur rarely. Previous studies have demonstrated that positioning injuries do occur and that there is a continues need for increased knowledge and attention to factors that can contribute to positioning injuries. Collaboration among the different professions being present in the operating theatre is essential both for the planning and execution of patient positioning. Communication in the surgical team is of importance in RAS because the surgeon is physically separated from the patient. It is apparent from the study that ORNs would like documented routines, including neutralization of positioning to prevent the patient from remaining in the same position for a too extensive period and thus avoiding injuries related to positioning. According to the ORNs, it would be beneficial if the ORNs could interview the patient on the first postoperative day to record if the patient has symptoms related to the positioning on the operating table. They also call for a system that can register and record signs and symptoms due to positioning following discharge from the hospital that can be used to improve the quality of the ORNs' patient care.

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CONFLICT OF INTEREST

The Authors declare that they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the finding of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

The Regional Committees for Research Ethics in Norway found that the study was not regulated by the Health Research Act. The Norwegian Social Science Data Services approved the study (NSD, ID 52324). The study followed the Helsinki Declaration, and all participants gave their informed consent.

ORCID

Benedikte Bjøro https://orcid.org/0000-0002-4752-275X

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APPENDIX A

A.1 | CONSOLIDATED CRITERIA FOR REPORTING QUALITATIVE STUDIES (COREQ): 32-ITEM CHECKLIST

Developed from:

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

You must provide a response for all items. Enter N/A if not applicable

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

No. Item	Guide questions/description	Reported on Page #
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	Results page 7
25. Description of the coding tree	Did authors provide a description of the coding tree?	Results page 7
26. Derivation of themes	Were themes identified in advance or derived from the data?	Methods page 5-6
27. Software	What software, if applicable, was used to manage the data?	N/A
28. Participant checking	Did participants provide feedback on the findings?	Methods page 6
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Results page 7-10
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Results page 7-10
31. Clarity of major themes	Were major themes clearly presented in the findings?	Results page 7-10
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Discussion page 10-14

Once you have completed this checklist, please save a copy and upload it as part of your submission. When requested to do so as part of the upload process, please select the file type: *Checklist*. You will NOT be able to proceed with submission unless the checklist has been uploaded. Please DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.