

## Student supervision using the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS-no): A qualitative study

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### ABSTRACT

**Background:** The importance of non-technical skills in the prevention of adverse events in the operating room is well documented through research. With the increased attention to non-technical skills, the need for structured training to support the development of such skills has emerged. The Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS) is an instrument for structuring observation as well as rating and feedback of non-technical skills for operating room nurses, and it can be used for student supervision and self-reflection. SPLINTS-no is the Norwegian translation and adaptation of SPLINTS.

**Objective:** To explore the experiences of operating room nurse preceptors using SPLINTS-no in the supervision of operating room students' non-technical skills.

**Design:** An explorative qualitative design was used.

**Methods:** Data were collected using semi-structured qualitative interviews with 10 operating room nurse preceptors in a Norwegian university hospital. The data were analysed by inductive qualitative content analysis.

**Results:** The operating room nurse preceptors experienced that the use of SPLINTS-no had an impact on the quality of student supervision. They improved their supervision competencies, and the use of SPLINTS-no contributed to consistency in observation and supervision. There were also findings supporting that reflection over non-technical skills contributed to building an increased awareness of these skills.

**Conclusions:** SPLINTS-no has an impact on clinical student supervision through an increased awareness on non-technical skills. It is well accepted by the operating room nurses as a supportive tool in the supervision of non-technical skills of student operating room nurses during clinical placement.

### 1. Introduction

In the last decades, worldwide interest in prevention of adverse events in health care has emerged (World Health Organization, 2004). Research shows that a majority of adverse events in hospitals occur in relation to surgery (Anderson et al., 2013; de Vries et al., 2008). Approximately 15% of patients undergoing surgery experience surgery-related adverse events, and more than 60% of these events are preventable (Nilsson et al., 2016). The preventable surgery-related adverse events are largely caused by a failure in non-technical skills (NTS) in the surgical team (Flin et al., 2008; Flin and Patey, 2009; Mitchell et al., 2010). Studies showed that NTS are essential competencies of the

operating room (OR) nurses, and that NTS are important in relation to patient safety, task performance, teamwork and work environment (Flin et al., 2008; Rasmussen et al., 2015). By adopting good NTS, the OR nurses may contribute to reducing the frequency of adverse events (Gillespie et al., 2009).

NTS are cognitive, social and personal resource skills that complement technical skills and contribute to safe and efficient task performance (Flin et al., 2008), and are the skills that make a health-care worker function well in a team (Sevdalis et al., 2012). The importance of NTS was first identified by the aviation industries following a series of severe accidents caused by a lack of NTS (Flin et al., 2008). A training course known as Crew Resource Management (CRM) was developed to

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enhance the NTS of flight crews. Subsequently, CRM has been used in a variety of high-risk industries, including health care, where CRM training tools are customized to suit the particular target group (Flin et al., 2008).

The development of a CRM training tool for OR nurses was initiated by Mitchell and Flin (2008). The resulting tool was the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS), which is a behavioural rating system developed to provide a common framework and language for NTS in the OR (Flin et al., 2010). SPLINTS offer structured observation, rating and feedback on the OR nurses' behaviours during surgery and aims to accelerate the development of NTS in OR nurses (Flin et al., 2010). It has three categories of NTS: situation awareness, communication and teamwork, and task management, and each category has three elements concretizing the NTS. In addition, it provides examples of good and poor practice (Flin et al., 2010). Moreover, SPLINTS has been found to be reliable and valid in simulated and clinical settings (Loh et al., 2019; Mitchell et al., 2012). SPLINTS-no is the Norwegian translation of SPLINTS (Mykkeltveit and Bentsen, 2020) (Fig. 1).

Norwegian OR nurses work in pairs and alternate between the roles of a scrub nurse and circulating nurse. The OR nurses are superior health-care providers and have independent responsibilities and rights of delegation. According to the Norwegian association of OR nurses (NSFLOS) OR nursing comprises therapeutic, pedagogical, administrative and professional development and research responsibilities (NSFLOS, 2015). One of the pedagogical responsibilities of the OR nurses is to be a preceptor for OR nursing students during clinical placements.

In Norway, a postgraduate or master's degree is required for OR nursing. Since 1952, the education of OR nurses have been formalized and the prerequisite for admission into the education was, and still is, to be a registered nurse. Over the years, OR nursing education has developed from a 12-month hospital-driven education programme to an 18-month postgraduate education programme (90 European Credit Transfer and Accumulation System (ECTS) credits) (Norwegian Ministry of Education and Research, 1998). Since 2012, an optional master's degree (120 ECTS credits) in OR nursing is offered in accordance with the Bologna process for higher education (Norwegian Ministry of Education and Research, 2009), and this is the highest credited OR nurse education in Europe (EORNA, 2019). The postgraduate and the master's degree have the same amount of in-hospital clinical training (45 ECTS credits) (Norwegian Ministry of Education and Research 2005a, 2005b).

Despite the passing of a century since SPLINTS was developed, very little research has been done on the use of the tool in a clinical setting. The aim of this study was to describe the experiences of OR nurse preceptors using the SPLINTS-no tool during supervision of OR nursing

students in the real OR setting.

## 2. Methods

### 2.1. Design, setting and participants

An explorative qualitative study design was selected, which is an appropriate method for exploring the participants' experiences and extracting information (Brinkmann and Kvale, 2015).

The study was conducted in a large acute care and teaching hospital, which serves a population of 370,000. The participating OR department employs approximately 80 OR nurses and serves 16 ORs with six specialities. In preparation for the data collection, co-operation between the university and the hospital was established. The management sampled eligible OR nurse preceptors who were invited to attend a 1-h training and information session held by two authors (IS and KHA).

The inclusion criteria for the study were OR nurse preceptors who had attended the training session. Eleven participants fulfilled the criteria. Of these, 10 returned a signed informed consent form, while one declined participation. All participants were, by coincidence, female and their experience as OR nurses varied from 5 to 20 years (mean = 11 years). Their experience as preceptors varied from 1 to 12 years (mean = 7 years).

In preparation for the study, all 10 participants were asked to use the SPLINTS-no tool as frequently as possible in supervision of OR nurse students during the following 9-week clinical placement period.

### 2.2. Data collection

Upon completion of the clinical placement period, 10 semi-structured interviews, including one pilot interview, were conducted. The quality of the pilot interview was adequate for inclusion in the study, and no changes were made to the interview guide. Two of the authors (IS and KHA) conducted the interviews in an office separate from the OR department to avoid interruptions, and the interviews lasted between 30 and 60 min. The theme of the interview was the OR nurse's experience and challenges in using SPLINTS-no in supervision of OR nursing students.

### 2.3. Analysis

All interviews were transcribed verbatim by two authors (IS and KHA) and analysed by all authors using inductive qualitative content analysis (Graneheim et al., 2017; Graneheim and Lundman, 2004). The transcribed text was read thoroughly to obtain an overall sense of the content, and meaning units addressing the aim were identified. Through condensation, the meaning units were shortened while preserving the core. The condensed meaning units were translated into English by IS and KHA prior to further analysis. During translation, preservation of the content of the meaning units was ensured. Each meaning unit was coded, sorted and abstracted into subcategories. The subcategories were grouped, combined and further abstracted into categories. Figure 2 illustrates the analysis from condensed meaning unit to category. Due to the manifest content of the data, the analysis has a low grade of interpretation. Therefore, the findings are presented at category level (Graneheim et al., 2017).

### 2.4. Trustworthiness

Research findings should be as trustworthy as possible, and trustworthiness is described by Graneheim et al. (2017) as credibility, dependability, confirmability, transferability and authenticity. During this analysis, all authors discussed the text to ensure trustworthiness and dependability in the interpretation. Great care was taken to assure that the voice of the informant was retained throughout the abstracting in the analysis. The dependability is also strengthened by the researcher's

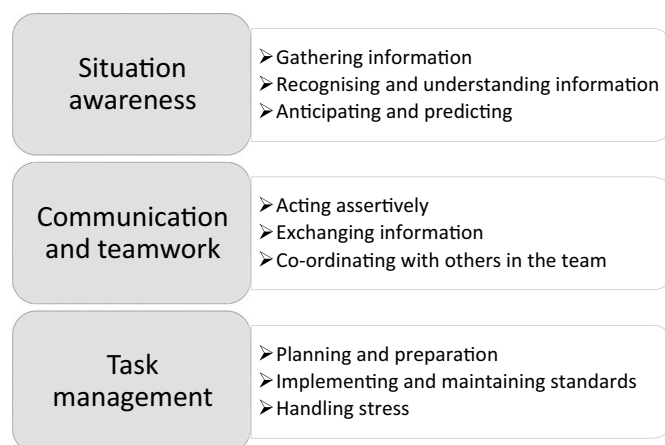


Fig. 1. Categories and elements of SPLINTS-no (Mykkeltveit and Bentsen, 2020. URL: [https://www.nsflos.no/Filer/Posts/2020\\_Mai/SPLINTS-no.pdf](https://www.nsflos.no/Filer/Posts/2020_Mai/SPLINTS-no.pdf)).

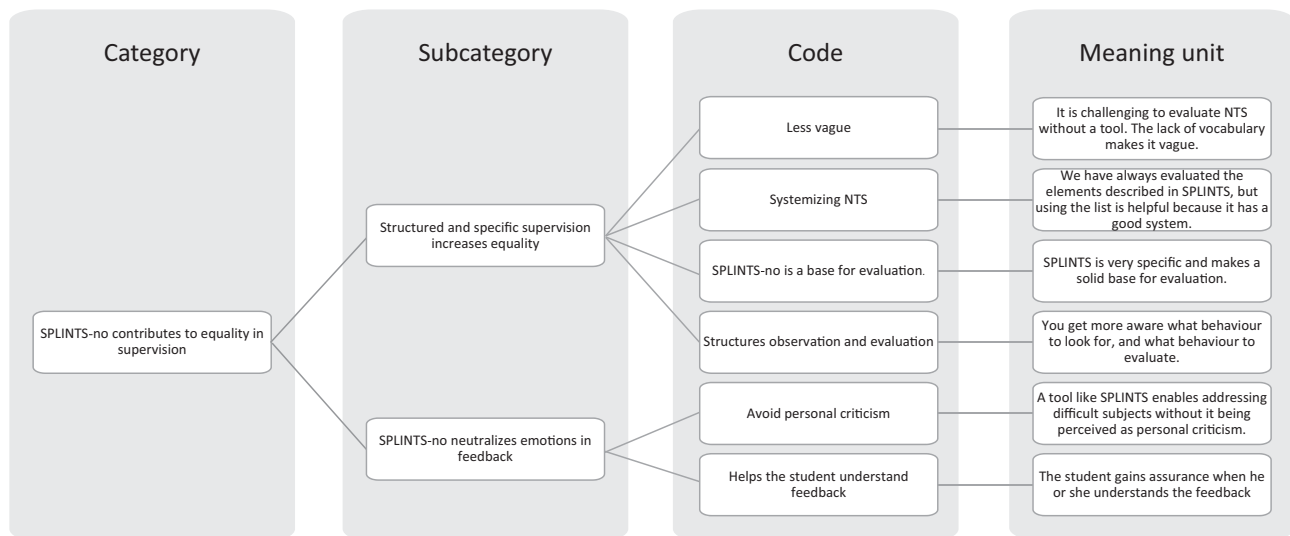


Fig. 2. Illustration of analysis from meaning unit to category.

pre-understandings as OR nurses, which provided a deeper understanding of culture and language. To ensure credibility, we found a sufficient number of participants with experience in using SPLINTS-no to cover significant variation in the data. Representative quotations are used to illustrate the voice of the informants in relation to the findings. Together with descriptions of abstraction level this increases the authenticity of the study. We have provided the reader with information needed to determine the level of transferability. As the taxonomy of SPLINTS is maintained in SPLINTS-no, the results of this study are considered transferable to the users of SPLINTS. The analysis and presentation are a result of thorough consideration and are not absolute but an expression of the perspectives of the authors.

## 2.5. Ethical considerations

The study followed the principles of the Declaration of Helsinki as well as national ethical guidelines and research legislation (The Norwegian National Research Ethics Committees, 2019; World Medical Association, 2013). It was approved by the Research Department and the Data Protection Officer at Helse Stvanger HF (registration number: MA 167). The participants were guaranteed anonymity and confidentiality. They were informed that the participation was optional, and that they were free to withdraw at any time without any ramifications. All the participants signed the consent form, and all of them completed the study. After the transcription of interviews, all data were anonymized, and the informants are not identifiable in the article as their identifying characteristics have been removed.

## 3. Results

The collected data provided detailed descriptions on the OR nurses' experience using SPLINTS-no supervising OR nursing students during clinical studies, and the findings of the analysis showed that SPLINTS-no influenced several areas. Two categories were developed through the analysis: "Impact on supervision" and "Increased awareness of NTS". In the following section, the findings are illustrated using quotations (preceptors 1–10, abbreviated as p1, etc.).

### 3.1. Impact on student supervision

The preceptors experienced that SPLINTS-no had an impact on their supervision "It is difficult to supervise on NTS, and without a tool the feedback becomes vague" (p3). The preceptors indicated that SPLINTS-

no changed how they supervised students regarding their NTS by making feedback less vague. The preceptors shared that they have identified a need for a resource like SPLINTS-no in the past, thus, SPLINTS-no fills a gap in their "toolkit" for supervision. This category consists of three subcategories: "Training is required for correct use of SPLINTS-no", "SPLINTS-no builds supervision competencies" and "SPLINTS-no contributes to equality in student supervision".

#### 3.1.1. Training is required for correct use of SPLINTS-no

Some of the preceptors were unsure about how to use SPLINTS-no. We found that training is essential to prevent lack of confidence in how to use SPLINTS-no and that the provided training was considered insufficient by the OR nurses. One OR nurse confirmed the need for training by stating: "I want more training, because if I am going to use SPLINTS-no, I need to know how to use it and that I am using it correctly" (p1). It was acknowledged that the preceptors needed training and to make a personal effort to familiarize themselves with SPLINTS-no. "That is how it is with new stuff; you have to get to know it and test it a bit, and try using it, before you understand it properly" (p6). Although the SPLINTS-no tool was perceived as beneficial to the preceptors, some of them also identified challenges. Our informants expressed that their workdays were busy and that there was a shortage of time for taking care of the students' needs. For some, it proved to be challenging to find time to learn a new tool when the available time already felt insufficient. "The workdays are busy, and we are not assigned enough time take care of the students" (p2).

#### 3.1.2. SPLINTS-no builds supervision competencies

Although the use of SPLINTS-no was limited to 9 weeks, the OR nurses experienced that it affected them as preceptors. The formal preceptor qualifications varied among the informants, and some of the less-experienced preceptors reported that SPLINTS-no provided them with assurance in their supervision. This increased their competence as preceptors, and one informant stated: "SPLINTS-no gives me confidence in my supervision" (p9). Others considered SPLINTS-no as a supportive tool when time was scarce: "It has helped me to systemize. And I need systems to be able to take care of my students while doing my own tasks as well" (p3). SPLINTS-no provides an assessment scale but using the scale for assessment was not included in this study due to the level of training needed to use it as intended. However, some of the OR nurses identified benefits from alternative use of the assessment scale. The preceptors identified that the scale can be used to determine the level of professional development during the clinical placement period, and they

wanted to use it to promote development, as one informant confirmed: *"I want to use SPLINTS-no to assess progress, because progress is the essence" (p7).*

### 3.1.3. SPLINTS-no contributes to equality in student supervision

The skills described as NTS have formerly lacked a vocabulary. The informants expressed concern that supervision and assessment of these skills may be dependent on the judgement of the preceptors. Based on the findings, it appears that the taxonomy and structure of SPLINTS-no made the supervision of NTS more manageable for the preceptors. They became more aware of what to observe and obtained a uniform system for providing feedback to the students. One informant stated: *"We have always supervised on the elements described in SPLINTS-no, but using the list is helpful because it has a good system. ... It is very specific" (p10).* After using SPLINTS-no during supervision, the preceptors stated that the evaluations became more systematic and equal when they analysed and assessed the same behaviours: *"The students are supervised on the same behaviours, independent of the experience of the preceptor" (p4).* The participating preceptors recognized that SPLINTS-no provides a tool for making supervision specific and neutral. When the student understood what behaviour led to the feedback, the student was less defensive and easier to supervise. One informant described the advantage of SPLINTS-no as: *"Sometimes I struggle to explain something to the student, but when I use SPLINTS-no I am able to provide a precise explanation" (p5).*

### 3.2. Increased awareness of NTS

Increased reflection about NTS due to SPLINTS-no use increased the awareness and development of such skills. This appeared to have influenced how the OR nurses communicated and how they described their own profession.

The OR nurses experienced improved team communication when using the vocabulary and structure provided by SPLINTS-no. Even the experienced OR nurses, who were familiar with NTS, had more difficulties describing these skills compared with technical skills, as one stated: *"This is a useful tool. It verbalizes skills we have previously struggled to describe" (p8).* The OR nurses expressed an understanding of the importance of communication within the surgical team and that a shared vocabulary enhanced the co-operation. According to the participating OR nurses, communication also influenced patient safety. Some mentioned that being unable to detect changes in the surgical procedure was a safety risk, as supported by this quote: *"Communication is essential to create a shared situation awareness within the team. If all team members communicate appropriately, and we keep calm, we achieve control over the situation sooner. ... It is important to apprehend essential information in order to communicate precise information" (p5).*

During the interviews, it became clear that some of the preceptors had used SPLINTS-no sparingly or not at all, while some had used it on a daily basis. This led to an interesting finding that the vocabulary for describing NTS differed between the two groups. The non-users were able to describe the effects of increased emphasis on NTS, but lacked the words to describe the skills: *"It is very important, yes it is part of the planning of the operations, like be prepared, what can happen, what cannot happen. Planning the work and ... it is important. A lot of what we do are NTS" (p3).* This description was correct, but the informant displayed a lack of vocabulary. The group with the most experience in using SPLINTS-no demonstrated a deeper understanding of NTS and had a richer vocabulary when describing the skills: *"First of all, it is to have situation awareness, and to scan the OR to see what is happening. What do I have to do and how do I prioritize? I constantly work to be assertive, both in the circulating and scrub nurse roles" (p10).* This description contained new vocabulary for describing familiar skills. After using SPLINTS-no, the preceptors experienced an increased awareness and self-reflection about NTS. This increased awareness had the potential to improve the quality of their performance. The OR nurses described their profession as complex, where NTS are the basis for their choice of actions. One

informant described the importance of NTS as: *"It is relatively easy to learn the technical skills [of OR nursing], but the NTS define the complexity of OR nursing and demonstrate your development as an OR nurse" (p5).*

## 4. Discussion

Safe, efficient and capable OR nurses are identifiable by their ability to stay calm and handle problems while serving the OR team, even when the surgery differs from the plan. These OR nurses demonstrate good NTS in addition to their technical expertise (Flin et al., 2010). This description is similar to how the informants described the importance of NTS in OR nursing. A distinct nursing presence in the OR is essential to achieve safe and therapeutic care of patients (Gillespie et al., 2009). According to the preceptors in our study, NTS constitute the complexity in OR nursing, and research supports that NTS are important in relation to patient safety, task performance, teamwork and work environment (Flin et al., 2008; Rasmussen et al., 2015).

The informants described NTS as familiar skills, but that those were previously difficult to concretize and teach. According to Flin et al. (2008), NTS are not new skills, but skills that the best practitioners use every day. Benner et al. (2011) described these skills as expertise and wisdom in practice, and as knowledge that people are aware of but have struggled to explain. After using SPLINTS-no during the trial period, the preceptors showed an increased level of accuracy when describing NTS. The improved vocabulary for NTS has created a common language between the students and preceptors. According to the preceptors, having a common language and using the framework of SPLINTS-no helps them identify the students' level of NTS and enable training in NTS. This is consistent with the intentions of SPLINTS (Flin et al., 2010).

The impact of SPLINTS-no on supervision has the potential to increase the quality of clinical practice education. The structure of SPLINTS-no leads to more consistent and equal supervision, which may contribute to an unbiased evaluation of the students. A literature review confirmed that use of measurement tools predefining behaviours may lead to an objective description of the observed behaviours (McClelland, 2015), and these objective descriptions are the basis for evaluations in student supervision. The use of a uniform system for observation and evaluation will enable non-confronting discussions that promote reflection and self-evaluation. This may lead to effective performance in OR nursing (Flin et al., 2010; McCulloch et al., 2009).

Traditionally, technical skills have been the focus of clinical OR nurse education. A single site qualitative study has shown that NTS are equally important as technical competencies for OR nurses and should be emphasized in OR nursing education (Rasmussen et al., 2015). Some students have excellent technical skills but struggle to fulfil their role in the surgical team. In such cases, SPLINTS-no has helped the preceptors in the present study to assess if lack of NTS is the reason for the students' struggle. In clinical OR nursing, both skill sets are interwoven and equally necessary. An extensive study showed that team training in NTS also improves the technical skills (McCulloch et al., 2009). In a review, Hull et al. confirms this effect regarding surgeons, but they found that further research is needed to draw conclusions for the rest of the OR team (Hull et al., 2012).

The participating preceptors experienced an improvement in their supervision competencies by using SPLINTS-no. They gained confidence, which helped them take control of the supervision. Research on the comparable tool "Nurse Anaesthetists' Non-Technical Skills" identified that the use of this tool was helpful for the preceptors to direct attention to NTS in students' clinical training (Lyk-Jensen et al., 2016). Our findings show that it takes time and effort to learn how to use rating tools for NTS correctly. Previous studies recommend novices to participate in an NTS educational programme prior to using an NTS assessment tool (McClelland, 2015; Mitchell et al., 2012). This supports our finding that the 1-h session offered by the authors was not sufficient, moreover, the implementation of tools such as SPLINTS-no requires training for correct use. It is crucial to provide formal structured training

to those who provide assessments, otherwise the assessments are unreliable (Sevdalis et al., 2012).

The experiences from using SPLINTS-no supervising OR nursing students were mainly positive. The preceptors were able to use SPLINTS-no as intended, and they considered it as a supportive tool in supervising OR nursing students in clinical practice. The development of SPLINTS is based on the NTS required for scrub nurses in the intraoperative phase (Flin et al., 2010). In Norway, OR nurses work in pairs and alternate between the roles of a scrub nurse and circulating nurse. The OR nurses who participated in this study identified the need for NTS in both roles, and this finding is supported by several single site studies (Jølstad et al., 2017; Rasmussen et al., 2015; Redaelli, 2018). A core principle for CRM training tools is that they must be customized to suit the particular target group (Flin et al., 2008). SPLINTS is customized for scrub nurses but appears to be partly applicable to circulating nurses.

#### 4.1. Limitations and further research

This study is limited to one hospital. SPLINTS-no was used for 9 weeks, and the pre-study training of the supervisors was shorter than recommended by the literature due to time limitations. The lack of proper training may have contributed to some of the participants using SPLINTS-no less than expected, and thus causing limitations for the study. Successful implementation of new instruments is dependent on support from the users, and we consider continuous research on SPLINTS-no to be justified by the experiences of the OR nurse preceptors in this study. Limited research has been conducted on the NTS of OR nurses from a nursing perspective. We recommend further qualitative and quantitative research on the tool in clinical settings on a larger scale, and that the need of training of the participants is not underestimated. Further research is also needed to customize SPLINTS-no so that it covers all roles and functions of OR nurses, including those of the circulating nurse.

Although no adverse effect was observed, the balance of power in the interview-setting may have been changed by two authors being present. One of the authors was a colleague of the informants. Although this appeared not to cause conflicts of interest, it may have influenced the overall character of the interviews.

#### 5. Conclusions

We found that the use of SPLINTS-no has an impact on clinical student supervision through an increased awareness on NTS. This study showed that OR nurses experienced increased reflection about NTS after using SPLINTS-no. This increased reflection aids in the development of such skills. Furthermore, the ability to describe NTS was improved after using the SPLINTS-no tool in a real OR setting. The preceptors experienced improved student supervision, and there were indications of good usability of SPLINTS-no. However, SPLINTS-no needs to be adapted to cover the NTS related to all aspects of OR nursing for it to be a complete tool.

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#### CRedit authorship contribution statement

**Irene Sirevåg:** Conceptualization, Methodology, Investigation, Formal Analysis, Visualization, Writing- original draft.

**Kristine H Aamodt:** Conceptualization, Methodology, Investigation, Formal Analysis, Writing- original draft.

**Ida Mykkeltveit:** Conceptualization, Methodology, Formal Analysis, Writing- Reviewing and editing.

**Signe Berit Bentsen:** Conceptualization, Methodology, Formal

Analysis, Writing- Reviewing and editing.

All authors read and approved the final manuscript.

#### Declaration of competing interest

None.

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