Master Thesis

Master programme in advanced practice nursing –

Operating Theatre Nursing

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Prewarming of the surgical patient implemented by theatre nurses.
- A specified educational programme

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Preface

During our education in theatre nursing, we were exposed to the barriers surrounding prewarming and determined that this was an area in which we wanted to focus and make a difference. We personally learned how difficult it was to incorporate prewarming into routine practise, which only strengthened our desire to write a master's thesis about the subject and use the chance to look deeper into how we can effect change.

Working on this master's thesis has been a demanding and, at times, difficult journey filled with many eureka experiences that have been both exciting and educational. This subject has been an important one for us for several years, as the project proposal was first presented in 2016 during our theatre nursing education. Being able to now, almost seven years later, continue on with a master's degree and work on a specified educational programme that could be used to influence change in practice has been very rewarding. However, this could not have been completed without a lot of help and support from teachers and family.

A very big thank you goes to our supervisor, Stein Ove Danielsen, who took on the challenge of helping us write this thesis in English without a second thought. His insights, constructive criticism, and continued optimism have been greatly appreciated. We would like to thank our respective workplaces, Bærum Sykehus, Martina Hansen, and UNN Harstad, for allowing us to test our pilot lecture and gain further insight into what might work and what could be adjusted according to which group is taking part in the specified education programme. Writing a thesis while working full time, combining family life, and travelling between homes has been a challenge. However, we as a group feel we have risen to the challenge and are very satisfied with our efforts and findings, despite the humps in the road. This would still not have been possible without a supportive network of friends, respective partners, and family who kept the fire burning within us.

Thank you so much, everyone.

Jenny, Iselin, and Melanie

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SUMMARY

Background:

To maintain normothermia throughout the perioperative course, prewarming is an important measure that has a well-documented effect. The operating staff has a duty and responsibility to ensure patient safety and prevent unnecessary complications. In practice, prewarming is frequently deficient, and the emphasis is placed on actively warming the patient intraoperatively as opposed to preoperative warming. This could be due to several different barriers, traditions, and a lack of support at the management level.

Aim:

The purpose of this master's thesis is to develop a specified educational programme (SEP) based on the didactical relationship model that may contribute to quality improvement by preventing inadvertent perioperative hypothermia in the operating room (OR).

Method:

Quality improvement work based on the model for quality improvement. The SEP has been created utilizing the didactical relationship model.

Results:

Questionnaires used for evaluation of the pilot lecture showed a positive response to education on the subject of prewarming.

Conclusion:

Evaluation suggests that a SEP could enhance or update knowledge and skills regarding the adoption of prewarming measures. Not all theatre nurses are aware of the benefits of prewarming the patient. After the pilot lecture, methods for incorporating prewarming into surgical procedures were developed in the workplace, bolstering the significance of this thesis and a SEP that can be implemented and modified to help standardise the level of care provided to all patients.

Keywords: Prewarming; Hypothermia; Theatre Nurse; Knowledge-based practice; specified educational programme.

Innhold

1.0 INTRODUCTION

This master's thesis presents a specified educational programme (SEP), using the didactical relationship model and quality improvement model, to improve the quality of the services provided in the operating room (OR) during surgery by preventing inadvertent perioperative hypothermia (IPH). Additionally, a pilot SEP was created as a secondary objective for this thesis for evaluation purposes.

1.1 Presentation of the topic

Inadvertent perioperative hypothermia (IPH) is a common complication in patients undergoing surgery and easy to prevent (Balki et al., 2020; Madrid et al., 2016; Paulikas, 2008; Simegn et al., 2021). Torossian et al. (2015) report that IPH occurs in 25 to 90% of all patients undergoing elective surgery. In addition, Munday et al. (2019) state that IPH occurs in 50 to 54% of adult surgical patients and up to 80% of obstetric patients receiving spinal anaesthesia. According to a meta-analysis by Berry et al. (2008), a 1.5 °C decrease from normothermia results in increased societal costs of $2,500 to $7,000 per surgical patient. Furthermore, according to a cost-effectiveness economic analysis by Zucconi et al. (2022), the precise application of forced air warming (FAW) technology reduced costs by 16%, or € 2,133.76 per patient.

Postoperative wound infections, delayed wound healing, an increased haemorrhage tendency, and cardiovascular conditions are potential consequences of IPH (Broback et al., 2018; Cengiz et al., 2021; Liu et al., 2019; Madrid et al., 2016; Simegn et al., 2021). In addition, postoperative tremors can result in additional complications, such as increased oxygen demands on a cellular level, an increase in metabolic rate of 400%, increased intraocular and intracranial pressure, intensified postoperative pain, and general patient discomfort (Abdallah, 2019; Sessler, 2022; Wahr, 2023). In addition, hypothermia induces systemic responses; consequently, even moderate hypothermia is associated with a number of complications (Sessler, 2022; Sessler, 2016). Although few patients are susceptible to all potential complications, the vast majority are prone to at least one (Sessler, 2016). Patients who are especially susceptible to IPH are known as "risk groups." These include the elderly, children, patients with a low body mass index, traumatised patients, burn victims, patients with large wound areas, patients enduring extensive and lengthy surgical procedures, patients

with compromised general health, and those with additional diseases (Eide, 2018; Moola & Lockwood, 2011; Sessler, 2022; Torossian et al., 2015). The duty and responsibility of the theatre nurse are to assess and enhance the quality of work and care services to ensure patient safety and prevent harm (Kunnskapsdepartementet, 2021). The Ministry of Health and Care Services (Meld. St. 11 (2020-2021), 2019) defines the quality improvement work process as a continuous method for improving systems and services in clinical practice, and it involves ensuring the quality of the healthcare services provided. The authors believe that greater national and international investment should be made in the implementation of prewarming, which strengthens their wish to develop a SEP to improve the quality of healthcare services.

1.2 The need for quality improvement

According to their professional scope, a theatre nurse has a proactive therapeutic responsibility to prevent IPH by implementing several nursing measures (NSFLOS, 2016). The most important preventive measure in surgery is prewarming (Madrid et al., 2016). Moreover, prewarming is both an economical and convenient technique for maintaining normothermia during surgery (Zheng et al., 2020). Hypothermia can increase the occurrence of surgical site infections (SSI) after surgery, and postoperative SSI increases costs and lengthens hospitalisation by up to 6.5 days. Prewarming can reduce the incidence of SSI by 26 to 40 percent (Mercado et al., 2019; Zheng et al., 2020). However, measures associated with prewarming often fail in practice, with the focus instead on active intraoperative warming. This may be due to traditions, culture, a lack of proper equipment, or a lack of expertise (Weirich, 2008). Theatre nurses mention that it can be challenging to monitor and instal the devices for preventing hypothermia (Broback et al., 2018; Simegn et al., 2021).

According to the research literature and clinical experience, prewarming must become an integral element of the perioperative phase. Based on barriers that hinder the implementation of prewarming, the authors want to promote a solution-oriented and creative practice through teaching. Teaching facilitates learning, development, and change (Tveiten, 2019). Education is an important measure for theatre nurses to ensure the quality of patient care (NSFLOS, 2016). Due to a lack of teaching and reflection, a recurring issue persists, resulting in an unfortunate trend in which the subject and one's own practice do not advance. This conflicts with the Norwegian Nurses Association's (NSF) professional ethics guidelines for nurses (2019) and can compromise patient safety.

The following thesis issue will be addressed as part of building a SEP:

Prewarming of the surgical patient implemented by theatre nurses.
- A specified educational programme.

1.3 The aim of the thesis and target group of the specified educational programme

This thesis seeks to enhance the knowledge and skills of theatre nurses by fostering self-awareness, self-reflection, and self-evaluation. Changing the traditions and attitudes of a hospital can be challenging. However, change might be possible if a minority can convince the majority. Training and education regarding prewarming are essential to establishing shared intentions among the surgical team (Knowles et al., 2015). Theatre nurses and nurse anaesthetists are the target audience for the SEP due to their close collaboration in the OR during patient preparation for anaesthesia and surgery.

1.4 The thesis' structure and delimitations

The purpose of this thesis is to describe how to proceed to improve the quality of services in an OR, in this instance through a SEP, including an evaluation of the SEP, which could contribute to enhancing prewarming practice. In the thesis, prewarming is the main focus; other temperature-regulating measures during surgery are not emphasised. All adult patients are included, as the principles for prewarming measures are almost the same for everyone, regardless of gender or age (Torossian et al., 2015). In addition, the barriers and challenges of carrying out prewarming will be addressed. Surgical variations are not determined, allowing several specialties to easily relate to the teachings. According to the Association of Perioperative Registered Nurses (AORN, 2020) and Madrid et al. (2016), there may be additional measures, especially for premature children and burn-injured patients, but this will not be addressed in this thesis. The thesis is presented as a monograph and is based on the findings of research articles, specialist articles, and literature books. In this chapter, the background for the thesis and the proposed thesis issue are presented. In Chapter 2, the authors present the theoretical background surrounding prewarming and the theatre nurses' responsibilities. Chapter 3 explains how the thesis and specified educational programme are systematised. Chapters 4 through 6 explain the process of developing the SEP and present the pilot lecture and PowerPoint slides used in the lecture. The following chapters evaluate the SEP.

To carry out targeted quality work, the quality improvement model is used to map and systematise the progress of the project. The didactical relationship model is used to develop the teaching in the SEP. Both are discussed in more detail in Chapter 3. All presentations, games, and questionnaires are presented in English in this thesis, although the pilot lecture was conducted in Norwegian. This is to ensure continuity in the thesis. However, all of the material for the pilot lecture and the SEP testing will be attached in Norwegian.

1.5 Definition of terms

- According to AORN, a theatre nurse, also known as a perioperative nurse, operating room nurse, and surgical nurse, works in invasive procedure clinics, hospital surgery departments, day surgery units, and ambulatory surgery centres. Additionally, theatre nurses operate in pre- and post-operative areas (AORN, 2020).
- Inadvertent perioperative hypothermia (IPH): Hypothermia is defined as a core temperature below 36 °C (Broback et al., 2018; Cengiz et al., 2021; Liu et al., 2019; Madrid et al., 2016; Simegn et al., 2021; Zheng et al., 2020). The condition has different terms, for instance, unplanned perioperative hypothermia, unintended perioperative hypothermia (UPH), perioperative hypothermia, and accidental hypothermia. The authors in this thesis use IPH as the chosen acronym.
- Prewarming: The act of warming a patient in the minutes or hours before the initiation of general anaesthesia. There are several ways to prewarm a patient before surgery. Forced-air warming (FAW) or convective air warming has become the standard for active pre- and intraoperative thermoregulation due to well-documented effects (Horn et al., 2012; Madrid et al., 2016; Moola & Lockwood, 2011). The convective heater draws room-temperature air through a HEPA air filter. The filtered air is heated to an appropriate temperature. The heated air is then passed through a tube to a heating blanket. Ackermann et al. (2018) list several prewarming techniques, but Zucconi et al. (2022) corroborate that forced-air warming (FAW) is the gold standard.
- Stages of surgery: Citing AORN, Whitlock (2022) defines the three stages of the perioperative period as preoperative, intraoperative, and postoperative. These are the terms the authors chose to use in this thesis.

2.0 THEORETICAL BACKGROUND

In this chapter, the basis for quality of work improvement and the theory underlying the development of the SEP will be presented.

2.1 Quality indicators

The purpose of the SEP is to increase professional knowledge and competence in the target group and to emphasise the importance of carrying out effective prewarming. Quality indicators are used to obtain measurable information that is useful for developing targeted teaching by comparing the health service's professional standards. According to the Norwegian Directorate of Health (Helsedirektoratet, 2010), there are three types of quality indicators. Structure indicators provide insight into the framework, resources, competence, and equipment that exist within the target group and teaching site. In this case, structural indicators are the workplace, the target group's level of competence, and the technical equipment needed for carrying out the lecture, for instance, computer equipment and projectors. Process indicators follow up on activities in the patient's progression. For this thesis, they are standard temperature control preoperatively as well as the patient's experience of well-being. Performance, or result indicators, tell the authors something about what the prewarming measure achieves in terms of, for instance, prevention of complications, survival, satisfaction, or anxiety (Helsedirektoratet, 2010).

2.2 Inadvertent perioperative hypothermia

The National Institute for Health and Clinical Excellence (NICE, 2016) claims that a temperature drop of only 0.2 ℃ can make a significant difference and increase the risk of postoperative complications. Normothermia is the body's normal core temperature and varies from 36.0 to 37.5 ℃ (Simegn et al., 2021). Inadvertent perioperative hypothermia can arise as a direct result of anaesthesia and is divided into three phases: redistribution, decreasing, and plateau (AORN, 2007). During the first hour after the initiation of general anaesthesia, the redistribution phase takes place; water moves from the core to the periphery and causes a drop in the core temperature of 1 to 1.5 ℃ (AORN, 2007). Necessary anaesthetic and premedication create vasodilation with subsequent thermo-redistribution, and the body's ability to protect itself against heat loss is impaired (AORN, 2020; Balki et al., 2020; Broback et al., 2018; Cengiz et al., 2021; de Brito Poveda et al., 2013; Roberson et al., 2013; Zheng et al., 2020). Furthermore, patients that receive non-preheated intravenous fluid and are in a low

temperature OR, combined with increased blood loss, are particularly vulnerable to IPH (Pu et al., 2022). In the decreasing phase, core temperature continues to drop, where the heat loss is greater than the supplied heat (AORN, 2007; Zheng et al., 2020). The imbalance between heat production and heat loss is triggered by various factors, including general anaesthesia. The core temperature reaches a plateau phase after three to four hours. Nevertheless, it rarely falls below 34.5 °C, as central vasoconstriction prevents further diminution in the core temperature, according to AORN (2007). Hypothermia can also affect the function of the platelet and reduce thromboxane B2 synthesis. This can compromise the immune system by inhibiting the phagocytosis and migration of inflammatory cells (Zheng et al., 2020). Moreover, hypothermia can lead to delayed postoperative recovery, increased mortality, and prolonged hospitalisation (Lee et al., 2020; Simegn et al., 2021). Campbell (2019) mentions increased mortality and prolonged surgical duration. However, an article by Xu et al. (2020) came to a partly contradictory conclusion when they compared postoperative outcomes in patients with and without hypothermia during surgery. The study concluded that hypothermia increased the risk of shivering, blood loss, and SSI but found no significant difference in length of hospitalisation, duration of surgery, or mortality. Interestingly, an article from 2021, co-authored by Xu, mentions longer inpatient admissions, increased care unit stays, and prolonged duration of surgery as common complications of surgical hypothermia. This calls into question the conclusion of the Xu et al. (2020) article. Notwithstanding, there is a consensus among researchers that the occurrence of complications due to hypothermia is not a matter of dispute.

2.3 Prewarming

According to the professional procedure at Oslo University Hospital (2023), AORN (2020), and Torossian et al. (2015), if body temperature is measured below 36°C before initiating general anaesthesia, it needs to be determined if the procedure should be postponed until normothermia is restored. However, there is contradictory evidence regarding the benefits of prewarming, according to AORN (2020), but they do agree that high-quality evidence suggests that prewarming results in higher core-body temperatures intraoperatively, higher postoperative temperatures, and a lower incidence of IPH. The goal of prewarming is to maintain the patient's body temperature at an adequate level during anaesthesia and surgery by minimising cooling, evaporation, and heat loss (Madrid et al., 2016; Roberson et al., 2013). This is done by increasing the heat in the peripheral tissue beyond what is usually

redistributed during the first hour of anaesthesia (de Brito Poveda et al., 2013; Roberson et al., 2013). Several prewarming measures can be implemented before initiating general anaesthesia, for example, forced-air warming (FAW), warm blankets, or electric heaters. Active prewarming, as pointed out by NICE (2016), Simegn et al. (2021), and Wahr (2023), is more efficient than passive heating. Paulikas (2008) and Wagner et al. (2006) report that several patients mentioned tremors and the cold sensation postoperatively as being worse than the pain after a surgical procedure. Prewarming can decrease anxiety, increase overall thermal comfort, provide a reduction of 49% in blood transfusions, and significantly decrease SSI (Mercado et al., 2019).

Forced air warming has become the standard in many hospitals for active pre- and intraoperative thermoregulation due to its well-documented effect (Madrid et al., 2016; Moola & Lockwood, 2011). Moreover, De Witte et al. (2010) state that prewarming is the technique that has been shown to be most effective in reducing IPH in the intraoperative phase. This is confirmed by Horn et al. (2012), who point out that as little as 10 to 15 minutes of active prewarming is sufficient. Broback et al. (2018) recommend 10 to 30 minutes of prewarming. Horn et al. (2012) state that prewarming for more than one hour might lead to sweating and patient discomfort. The optimal time is 20 to 30 minutes of prewarming (Bräuer et al., 2014; Simegn et al., 2021; Torossian et al., 2015; Zheng et al., 2020). NICE (2016) has clinical guidelines for preventing and managing hypothermia in adults having surgery. They recommend prewarming 30 minutes before initiation of general anaesthesia if the patient's temperature is 36°C or above. If the patient's temperature is below 36 °C, active warming should start preoperatively at the ward. However, Yoo et al. (2020) contend that just 10 minutes of active prewarming is sufficient. In their analysis, the researchers conducted a study to prove that 10 minutes was enough to prevent IPH. The conclusion was that 10 minutes of prewarming had the same effectiveness as 30 minutes of prewarming in preventing IPH. Another randomised controlled trial by Lee et al. (2020) highlights that most previous research has shown clear beneficial effects of prewarming for preventing IPH. However, they claim there are few studies of the effects of a short prewarming period. In their trial, they concluded that FAW for 10 minutes before initiation of general anaesthesia, combined with intraoperative warming, was an effective method of preventing hypothermia. In surgery lasting less than an hour, De Witte et al. (2010) state that prewarming, in just 30 minutes, leads to a reduced need for additional heating measures intraoperatively. Weirich (2008) claims that patients undergoing brief surgeries frequently develop IPH because active

prewarming is usually not initiated. Weirich (2008) mentions prewarming for this patient group as being just as crucial as for those undergoing prolonged surgeries. Balki et al. (2020), who demonstrate patient benefits with increased temperature using prewarming, also support this. Without prewarming, intraoperative warming alone might not prevent a drop in germination temperature in the first hour after initiating general anaesthesia (De Witte et al., 2010; Lee et al., 2020). Prewarming the patient on the ward or in a waiting zone is considered the most optimal (Bräuer et al., 2014). If this is not possible, Bräuer et al. (2014) suggest prewarming the patient as soon as they arrive on the operating table, despite the relatively short period before initiating general anaesthesia. However, Lee et al. (2020) suggest that it is preferable for patients to be prewarmed on the operating table, as heat loss may occur during transfer if the patient is prewarmed elsewhere. From the patient's perspective, research shows that prewarming provides greater satisfaction and helps to reduce anxiety as the patient gets a sense of security and care (Balki et al., 2020; Broback et al., 2018; Wagner et al., 2006). The act of being hospitalised, regardless of the medical condition, is recognised to elicit feelings of anxiousness in patients admitted for surgical procedures (Wang et al., 2022). Preoperative anxiety is often associated with lack of control, anaesthesia-related concerns, diagnosis, postoperative pain, and fear of death (Wang et al., 2022). According to Wagner et al. (2006) and Wang et al. (2022), preoperative anxiety occurs in up to 80% of adult patients. Additionally, up to 24% of patients, according to Wang et al. (2022), report having severe preoperative anxiety. So, through prewarming, the theatre nurse can tend to at least one of the patient's basic needs.

2.4 Barriers to implementing prewarming

Barriers occur despite many established clinical guidelines and research studies showing that perioperative normothermia is crucial in the prevention of complications (Munday et al., 2019; Weirich, 2008). Kimberger et al. (2008) claim that FAW does not constitute a large cost, is fairly easy to administer, and is safe to use. On the other hand, Weirich (2008) believes that the OR staff reject the use of FAW because they believe it contributes to pollution in the surgical field, makes the working environment too warm, and generates unnecessary noise. In addition, some surgeons refuse to use FAW until the patient is completely prepared for surgery out of concern for infection (Munday et al., 2019). Kimberger et al. (2008) refer to two studies that conclude there is no basis for the claim regarding pollution as long as the hose is connected to a blanket.

Other barriers described by Weirich (2008) include variations in internal and external procedures for the use of FAW, staff turnover, and inconsistent temperature monitoring. Weirich (2008) points out that the differences are due to people, not procedures. In the study by Munday et al. (2019), some participants expressed uncertainty about the existence of applicable guidelines and the need for additional education. Equipment can also contribute to imprecise temperature measures, which do not reflect the patient's accurate core temperature, so that prewarming is not prioritised (AORN, 2020; Weirich, 2008). Xu et al. (2021) conducted a cost-benefit analysis and meta-analysis to compare the value of active warming versus passive warming devices for preventing hypothermia in surgical patients. One case involving a patient with hypothermia cost $363.80 and demonstrated that around $152.80 could be recovered through the use of FAW perioperatively. However, the study concluded that the cost of hypothermia can be overestimated as the procurement of medical products and equipment varies with different healthcare organisations (Xu et al., 2021). The budget and tender for warming devices can also vary between hospitals and countries, as can the willingness to pay. The cost of warming equipment may pose a potential barrier for hospitals. In addition, the article emphasises the significance of understanding hypothermia's potential consequences, which must be factored into the decision to purchase warming devices. While the evidence regarding cost savings varies, the fact that prewarming reduces costs is not disputed in the article. However, the study concluded that more research in this field is warranted (Xu et al., 2021).

Lack of comprehensible, research-based guidelines for prewarming surgical patients may also be a barrier. The American Society of Anesthesiologists (ASA) classifications are general and vague, which provide individual variations for the OR staff's clinical assessments without standardising the associated prewarming measures (Weirich, 2008). In many institutions, traditions and a lack of immediate visible results make changing present practice challenging. The effect of patient prewarming is often not evident until some hours later; therefore, the immediate physiological effect is difficult to observe (Weirich, 2008). Weirich (2008) believes that OR staff may conclude that the measure is ineffective and decide against implementing it. Additionally, other surgical complications that appeared were often seen as more important than focusing on preventing IPH (Munday et al., 2019). Inadequate knowledge of IPH and the effects of various heating measures can have a negative impact on prioritisation, as can a lack of comprehension of equipment and the threat of IPH from improper usage (Moola & Lockwood, 2011; Roberson et al., 2013).

2.5 The theatre nurse's professional scope to prevent IPH

The theatre nurse has a professional duty to keep up-to-date on research, development, and documented practice within their subject area (NSF, 2019). IPH prevention is a continuous procedure that requires knowledge of hypothermia and precipitating factors. Using an evidence-based (also known as knowledge-based), critically reflected, and interdisciplinary approach, the theatre nurse must obtain information, be aware of potential risks during the procedure, and strive to prevent them (NSF, 2019; Torossian et al., 2015).

The Health Personnel Act (1999) places the duty and responsibility of the theatre nurse on the provision of proper health care, and the prevention of IPH becomes part of maintaining patient safety (Helsedirektoratet, 2018b). The theatre nurse has a preventive function within their professional scope of work that aims to prevent or reduce patient health disparities (NSFLOS, 2016). In addition, the theatre nurse has a pedagogical responsibility to ensure that colleagues and students are aware of up-to-date evidence-based knowledge when applicable or shown to be lacking in clinical practice (NSFLOS, 2016). Ensuring that evidence-based practice is at the forefront of health care will contribute to preventing unnecessary health inequality, including IPH.

In the OR, a checklist for safe surgery is used. A responsibility of the theatre nurse is to fulfil the checklist in conjunction with the surgical team. Preventing hypothermia is listed. It includes monitoring the patient's body temperature, the risks of developing hypothermia, and what measures should be implemented to prevent this. The checklist aims to avert injuries and unnecessary complications during surgery (Haugen & Dåvøy, 2018). The focus and goal for all theatre nursing is the patient, and as recorded in the Health Personnel Act (1999), the patient is entitled to professionally sound healthcare. This is also written in the national guidelines for theatre nurse education §2 (Kunnskapsdepartementet, 2021). To provide the best possible care to the individual patient, professional competence must be continuously developed (Helsepersonelloven, 1999; Kunnskapsdepartementet, 2021). In other words, the theatre nurse must contribute to innovation and be able to participate in change processes in their own clinical practice.

3.0 QUALITY IMPROVEMENT

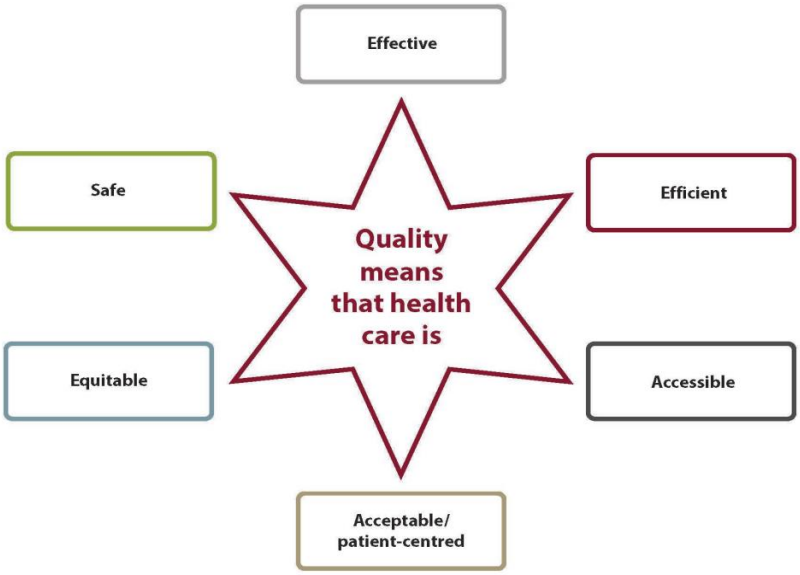
Working on quality improvement is a continuous process to develop and improve health services with a focus on patient safety. Systematic work to improve the quality of services to patients means continually identifying areas for improvement, introducing changes, and ensuring that the desired effect takes place (Helsebiblioteket, 2021b; Helsedirektoratet, 2018b). Quality improvement can be divided into two main categories: quality improvement and quality control (Stubberud, 2018). This thesis focuses on quality improvement.

3.1 Quality in healthcare

The Norwegian Health Library (Helsebiblioteket, 2021b) defines quality in healthcare services as being effective and safe, involving the users of said services and giving them influence, being available and fairly distributed, having coordination and continuity, and making efficient use of resources. The health library devised the quality star based on this information (see Figure 1). When working to improve healthcare quality, one must evaluate and include all aspects of the quality star (Helsebiblioteket, 2021b; Helsedirektoratet, 2018a). Prewarming with FAW satisfies all requirements of the quality star, making it a quality improvement technique of high standard.

Figure 1

The Quality Star



Note: Helsebiblioteket (2021): The Quality Star based on the six dimensions of the quality improvement strategy. Downloaded from Kvalitetsforbedring, Helsebiblioteket, Modell for kvalitetsforbedring - English.

3.2 Quality Improvement

Working systematically to identify areas where quality is lacking and to discover ways to improve quality is the definition of quality improvement (Helsebiblioteket, 2021b; Helsedirektoratet, 2018a). Quality improvement can also be described as the process of implementing new measures or improving the processes, systems, and services that already exist (Meld. St. 11 (2020-2021), 2019; Stubberud, 2018). This means that quality improvement is not developing new knowledge (i.e., conducting research), but rather using valid existing research, systematic experiential knowledge, and patient experiences to implement changes that can improve the quality of healthcare services (Stubberud, 2018). Hospitals have a responsibility to work systematically for patient safety and quality improvement (Helse- og omsorgsdepartementet, 2017; Helsedirektoratet, 2018b). This necessitates that projects regarding patient safety and quality improvement be planned, implemented, evaluated, and corrected (Helsebiblioteket, 2021b). The Norwegian Directorate of Health defines patient safety as protection against avoidable harm resulting from a lack of quality healthcare services (Helsedirektoratet, 2018b). Patient safety is a key component of the quality improvement process. In other words, everything healthcare professionals do affects patient safety, either directly or indirectly. The goal of quality improvement is to ensure high-quality healthcare and, therefore, patient safety. Thus, patients can be assured that the care they receive is safe, secure, and effective. Avoiding variations in quality in the care received should be one of the main goals of healthcare departments. To do this, knowledge about quality and patient safety must be actively employed (Kunnskapsdepartementet, 2021; Meld. St. 11 (2020-2021), 2019). Combined with a SEP, improvement measures such as standardising procedures and guidelines can help achieve this goal, as healthcare professionals will be able to work from a common starting point as opposed to reinventing the wheel (Helsedirektoratet, 2018b; Kunnskapsdepartementet, 2021).

In the context of health care, competence is the application of a combination of knowledge, skills, and attitudes (Kunnskapsdepartementet, 2018). As a means of enhancing the quality of services, quality improvement should involve enhancing the competence of theatre nurses and other healthcare professionals (Stubberud, 2018). Developing competence enables a theatre nurse to operate at a higher standard of quality while maintaining efficiency (Kunnskapsdepartementet, 2018).

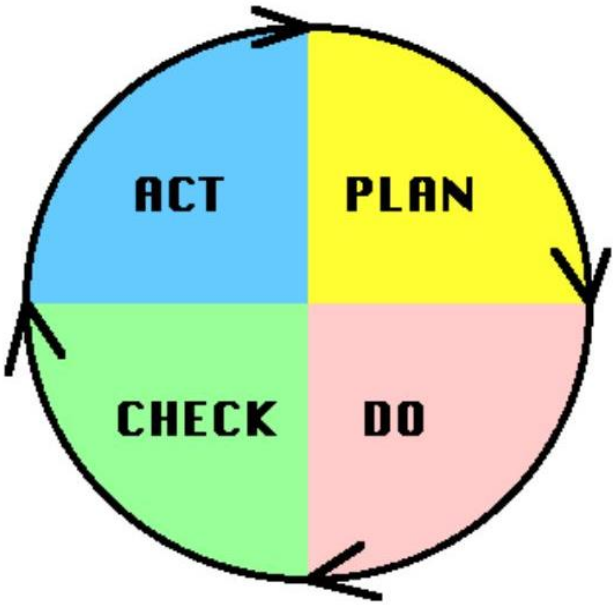
Working with an effective, safe, and reliable SEP, described as essential factors in the quality star, implies that the theatre nurse has the necessary competence to implement measures that increase patient safety. Prewarming a patient can have great benefits for both the mental and physical health of the patient, as well as reducing healthcare costs and recovery time (Broback et al., 2018; Zheng et al., 2020). Despite the evidence, prewarming is not yet a standard component of the perioperative process, according to the authors' observations.

3.3 The Deming Cycle

Systematic quality improvement work can be illustrated by the Deming Cycle, figure 2, which serves as a model for quality work (Helsebiblioteket, 2021b). It describes how to proceed to achieve improvements in four phases. The model has been further developed (see figure 3) to now include five phases that systematise the working process, called the model for quality improvement.

Figure 2

The Deming Cycle



Note: The Deming Cycle as one example from a Google search (2023).

3.4 Model for Quality Improvement

To ensure quality improvement in healthcare services, the model for quality improvement is often recommended as a systematic guide; see figure 3 below. This model can be utilised for research on both small and large scales (Konsmo et al., 2015). There are several ways quality improvement can be initiated, and an SEP is one of them. Therefore, the model for quality improvement used in this thesis is a general structural guide to help systematise the progress. The model is an acknowledged tool for systematic quality improvement and describes the steps used in improvement processes: Prepare, Plan, Execute, Evaluate, and Follow Up (Helsebiblioteket, 2021b). The model's circular shape serves as a representation of continuous quality improvement.

Figure 3
The Model for Quality Improvement

Note: Helsebiblioteket (2021): model for quality improvement. Downloaded from Kvalitetsforbedring, Helsebiblioteket, Modell for kvalitetsforbedring - English.

3.4.1 The five phases in the model for quality improvement

Phase 1: The preparatory phase involves a common recognition of the need for change and the anchoring and organisation of the improvement work. It then clarifies what knowledge base, user knowledge, research, and experience are present or missing (Helsebiblioteket, 2021b). It is expected that the target group is proficient. Nevertheless, in practice, the experience has been that prewarming is frequently not initiated before initiating general anaesthesia, despite the target group being proficient employees.

Phase 2: The planning phase focuses on mapping requirements and current practice. Based on this, a template is formed, and improvement measures can be identified and developed (Helsebiblioteket, 2021b). Traditions, established routines, the department's culture, and time constraints mean that the target group's competence is not always optimally utilised in patient care, according to experience. This phase aims to arouse the interest and motivation of the target group to aid in changing current practice. To help achieve this, the didactical relationship model was chosen, as elaborated in Chapter 5.3, to develop a SEP that potentially reaches as many participants as possible, regardless of background. During this work, participants can identify and develop assessment measures.

Phase 3: The executive phase includes testing and facilitating new practice (Helsebiblioteket, 2021b). Through targeted teaching, feedback, and response, issues can be identified and the participants can be motivated to change and improve their own practice. The pilot lecture was performed as part of this phase, and the feedback and response were generally favourable. Several relevant issues were identified, and some immediate measures were implemented.

Phase 4: In the evaluation phase, observations and reflections on results and assessment determine whether the improvement measure, hereunder teaching, is sufficient or should be adjusted. Since this is an immediate process where one alternates between the different phases, it is important to be aware of barriers that counteract the improvements or if the structure or framework is inadequate. Input from the participants becomes important, as they can aid in identifying relevant barriers (Helsebiblioteket, 2021b). Additionally, if the participants observe that their suggestions have an impact, it might encourage lasting change.

Phase 5: The implementing phase involves initiating new practices and ensuring their continuation, in addition to sharing the experiences of the improvements that were initiated. If it is observed that the teaching has a positive effect, it can be further developed to reach additional healthcare personnel beyond the OR. However, research reveals that up to 70% of quality improvement work does not continue because important prerequisites in the implementation of the measure are downgraded or forgotten, especially if the project manager leaves the department (Wagner et al., 2006). Management must assume responsibility for maintaining and sustaining the improvements achieved (Helse- og omsorgsdepartementet, 2017; Helsebiblioteket, 2021b; Helsedirektoratet, 2018c; Orvik, 2022).

Following these five phases can help secure the quality of the SEP's development as well as the follow-up of any measures initiated in everyday working practice. Table 1 explains the steps in the model for quality improvement and shows how they are relevant for this thesis.

Table 1
Model for quality improvement and the five phases (Helsebiblioteket, 2021b)

The five phases	Steps with recommendations	Relevance for this thesis
Prepare	● A common recognition of a need for improvement. ● Anchor and organise the improvement work. ● Clarify the knowledge base, research, experience, and user experiences.	● In this thesis, the authors acknowledge a need for improvement, as presented in Chapter 1. ● The thesis is part of the master's degree at OsloMet University. The didactical relationship model is used to plan and implement the specified educational programme. ● A systematic search of available literature has been conducted and is presented in Chapter 4.4. In addition, research, experience, and patient knowledge are explained in this chapter.
Plan	● Map current practice. ● Set goals. ● Choose measuring tools. ● Find or develop improvement measures.	● Prewarming is not currently provided to all surgical patients at any of the hospitals where the authors work. Ambulatory surgery is primarily performed without prewarming. ● Increase awareness and knowledge on prewarming and how this can benefit the patient, as presented in Chapter 2. ● Measuring tools are, in this case, defined quality indicators and are not elaborated due to the nature of the thesis. ● The improvement measure chosen for this thesis is the specified educational programme. The design is presented in Chapter 5, and a version of the programme is presented in Chapter 6.
Execute	● Try out and facilitate new measures in day-to-day practice.	● An evaluation of the specified educational programme is presented in Chapter 6.
Evaluate	● Measure and reflect on the results. Assess whether the improvement is adequate and adjust if needed.	● A pilot lecture was conducted and is presented in Chapter 6.
Follow Up	● Implement the new measures in practice, ensure continuation, and share the experiences with improvement.	● Not applicable for this thesis since this is a measure that must be followed up over time. However, the authors hope that the pilot SEP and any further presentations of the SEP leave the participants with knowledge and competence that will encourage lasting change.

3.5 Education as a form of quality improvement

The overall goal for Norwegian healthcare departments is to have sufficient healthcare professionals with enough competence in their field to ensure patient safety. Developing this competence and ensuring that it is up-to-date is therefore defined as an important part of quality improvement (Helsebiblioteket, 2021a; Helsedirektoratet, 2018b). SEPs are one method to accomplish this objective. Sometimes participants will not learn anything despite an entire day of education (Knowles et al., 2015; Sylte, 2021). This could be explained by the information presented as being past knowledge, poor teaching methods, or individual learning abilities. Learning the theory should not be the sole aim of the SEP, but rather ensuring that participants can be motivated to retain knowledge through varying forms, for instance, practical workshops, quizzes, game-based learning platforms like Kahoot!, and active participation. In other words, ensure quality learning situations (Hiim & Hippe, 2022). As Harden & Lilley (2018) state, learning should create permanent change and a lasting increase in competence, and the lecturer must be the one to lead this process.

Competence is not static; it can and should be something to continuously develop. However, there is also a clear line between knowing something and being able to use it to master concrete work tasks. For example, there is a big difference between knowing why a lack of prewarming can lead to SSI, slow the anaesthetic breakdown, increase pain and shivering, and result in unnecessary patient discomfort and actually deciding to prewarm the patient. Competence is a term that is closely tied to being able to use knowledge and skills correctly and effectively in concrete clinical situations (Helsebiblioteket, 2021a; Kunnskapsdepartementet, 2018). Having the necessary competence means being flexible and adjusting to suit what is required, depending on the situation (NSF, 2022). One of the most important factors when it comes to quality, patient safety, availability, work environment, and effective use of resources in the health sector is the level of competence theatre nurses have (Helse- og omsorgsdepartementet, 2021; Helsebiblioteket, 2021a, 2021b; Helsedirektoratet, 2018b).

All institutes that provide health care are required by law to provide training, continuing education, and further education as necessary to ensure that all employees can perform at the required level (Helse- og omsorgsdepartementet, 2021). Theatre nurses are, in addition, required to keep themselves updated on the latest research, laws, procedures, and guidelines

within their field of work (NSF, 2022; Spesialisthelsetjenesteloven, 1999). The level of competence the theatre nurse has directly affects the quality of the services offered, as the measures they initiate are continually based on their expertise and knowledge (Helse- og omsorgsdepartement, 2014; Helsebiblioteket, 2021a; Kunnskapsdepartementet, 2018).

3.6 The professional scope of a theatre nurse to ensure quality improvement

There are two types of functions and responsibilities a theatre nurse has when ensuring quality improvement: directly and indirectly patient-centred. Direct patient-centred responsibilities include treatment, rehabilitation, health promotion, preventing injury, relieving pain, and ensuring psychological, physical, social, and spiritual support and comfort. Direct patient measures also involve supporting family members and documentation (NSFLOS, 2016). Indirect patient-oriented responsibilities include education, professional development, interdisciplinary cooperation with other healthcare professionals, research, continual critical evaluation of practice, leadership, and preparedness (NSFLOS, 2016). Ensuring quality improvement is therefore an important factor in a theatre nurse's everyday function and responsibility. The law requires workplaces to continuously enhance quality and patient safety (Spesialisthelsetjenesteloven, 1999). In addition, the Norwegian ministry of health and care services (Helse- og omsorgsdepartement, 2014; Helse- og omsorgsdepartementet, 2021) emphasises the need for ongoing research to improve the quality and credibility of healthcare.

A theatre nurse should show commitment, ability, and innovation to change practice for the better based on the development of the profession and the patient's needs, as well as have an analytical approach to their own work (NSFLOS, 2016). The hospital and the theatre nurse have a responsibility to contribute to increased knowledge and experience (Helse- og omsorgsdepartementet, 2017). Understanding this, a theatre nurse has a responsibility to initiate and implement SEPs whenever necessary to increase the quality of services provided. The authors believe that a combination of theoretical and practical education is beneficial for strengthening evidence-based practice. Therefore, a SEP based on systematically found and critically evaluated research can contribute to the development and strengthening of the professional quality of work in theatre nursing.

3.7 The theatre nurse's pedagogical function

Theatre nurses use their pedagogical function every day when they educate and help students, coworkers, other members of the surgical team, patients, or family members. Theatre nurses often do this without being aware of their role as educators; however, this is an active part of their professional scope (NSFLOS, 2016). The Patient and User Rights Act (Pasient og brukerrettighetsloven, 1999) requires nurses to have pedagogical skills. This law also states that patients have the right to their personal health information. This information should be provided in a language that the patient can comprehend so that they feel in control of their situation while remaining safe enough to enable the surgical team to perform the necessary procedures. Ensuring that the surgical team is working together to help the patient requires that everyone agree on the different measures that are implemented. A pedagogical approach, with the necessary education of colleagues, may be needed to achieve a higher standard of teamwork. Accomplishment is grounded in theatre nurses ensuring that they emphasise the need for prewarming and that the evidence is based on the latest and best research available (Dåvøy, 2018).

3.8 The didactical relationship model

While the model for quality improvement has been used as a general structural guide for this thesis, the didactical relationship model has been used in the planning and development of the SEP itself. Bjørndal and Lieberg are credited as the originators of the didactical relationship model in 1978. However, for the purposes of this thesis, the version of the model developed by Hiim and Hippe in 1997 will be used (Figure 6). The model is a tool for planning, analysing, and reflecting on education and learning. It shows a dynamic understanding of the education process and can be used to plan, implement, and evaluate. The diamond shape serves as an illustration of how all of the different categories in the didactical relationship model are equal. The circle that encloses the diamond represents the importance of thinking holistically so that all factors are considered in relation to each other (Hiim & Hippe, 2022).

4.0 PREPARE AND PLAN

This chapter will describe the preparations and planning for the SEP, the search for evidence-based information in the literature, and the critical appraisal of the findings. Although the didactical relationship model falls under this phase, it will be presented in Chapter 5.

4.1 Work Group

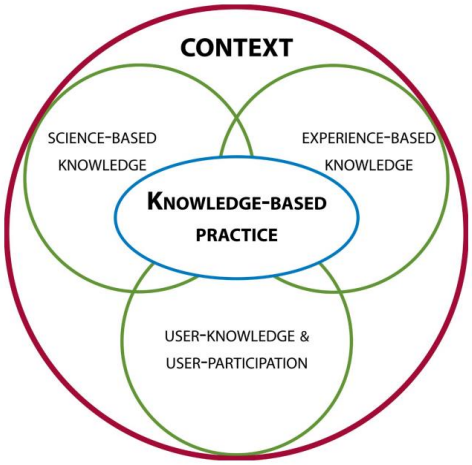
The work group was a collaboration of this thesis's three authors with support from a specialist supervisor. Ideally, a quality improvement project should include all the central professions, in this case, theatre nurses, anaesthesia personnel, and surgeons. In addition, it is recommended to include the patient as a source of valuable information and feedback (Folkehelseinstituttet, 2023). This thesis focuses on developing a SEP for theatre nurses and nurse anaesthetists due to their close collaboration in the OR. Involving patients directly in this process was not considered at this time. However, some articles include patient experiences, which are referred to in the thesis and are the foundation on which the psychological aspect of prewarming is based.

4.2 Evidence-based practice and documentation

Quality improvement work should be evidence-based (Helsebiblioteket, 2021a). Different peer-reviewed sources should serve as the basis for everyday practice. Evidence-based practice for healthcare professionals combines research, practice expertise, and patient involvement (Helsebiblioteket, 2021a), and it is necessary to prioritise knowledge derived from established and credible research when determining measures for healthcare services (Nortvedt et al., 2021).

Figure 4

Evidence-based Practice



Note: Evidence-Based Practice Kvalitetsforbedring - Helsebiblioteket, Modell for kvalitetsforbedring - English.

In figure 4, the context of a situation or problem area is represented by a large ring surrounding the three sources of knowledge. This could be different work cultures like attitude, beliefs, or behaviour, a framework of understanding, resources, ethical issues, politics, or priorities (Nortvedt et al., 2021). The OR serves as the context for this thesis, and consequently, the majority of these points are addressed to varying degrees. Hospitals and wards have their own unique cultures and traditions, framework of understanding, and priorities; therefore, it can be beneficial to learn how other hospitals have addressed prewarming issues (Helsebiblioteket, 2021a). Smaller hospitals may have fewer resources with a greater focus on ethical issues, while larger hospitals may have considerable resources, but politics take precedence. All healthcare services are nevertheless obligated to focus on continual quality improvement and evidence-based practice (NSFLOS, 2016).

Research used to support different measures in practice can be a guideline for healthcare professionals like theatre nurses. However, research-based knowledge alone is not enough to ensure that evidence-based decisions are implemented in everyday practice. Evidence-based practice is characterised by the methodical acquisition of knowledge from three distinct sources: research, experience, and patient experience. This knowledge is then contextualised and aligned with the necessary requirements to determine what constitutes "good practice." (Nortvedt et al., 2021). This thesis makes extensive use of primary literature (i.e., research articles), secondary literature (i.e., school curricula), laws, standards, and more. The results of the literature review are presented below.

4.3 Previous quality improvement on prewarming

To systematise the search for previous quality improvement work on teaching about prewarming to prevent IPH, the authors chose to use the Problem/Patient Intervention Comparison Outcome (PICO) form, illustrated in Table 2 below. PICO represents one way to divide the thesis question up in a structured manner to ensure a relevant literature search (Nortvedt et al., 2021). The PICO form helps pinpoint which search words are relevant for the chosen topic by clarifying which patient groups, interventions (here SEP), comparisons (if relevant), outcomes, and types of studies are of interest for the topic. English MeSH words were found using Cochrane.

Table 2
PICO-table

PICO	**Search words**
Problem/ Patient	Implementation of prewarming/ Prevent hypothermia Surgical
Intervention	Education, Teaching, Lecture, Instruction, Interprofessional
Comparison	-
Outcome	Quality control of clinical practice

A comprehensive search of the literature regarding prewarming revealed a large number of results; however, no SEPs on prewarming of surgical patients were found. This does not imply that such programmes do not exist, but it does suggest that this form of SEP may be reserved for internal use rather than public use. For example, searches in the Norwegian nurses' trade union for theatre nurses (NSFLOS) resulted in two lectures about the prevention of IPH given at seminars. These do not fall under the knowledge pyramid, but they do suggest topic focus. It is important that SEPs are kept up-to-date with the latest research available. Sandersen (2016) discussed hypothermia and risk factors, emphasising perioperative temperature measurement and a flow chart to ensure its application. Ræder (2014) contends similarly to Sandersen but also discusses FAW, the standard for active warming, and offers a self-heating blanket as an alternative. There are guidelines, both nationally and internationally, that specify the importance of normothermia perioperatively but do not suggest a teaching plan. Using the newly updated Joanna Briggs Institute (JBI) Critical Appraisal Tools, the quality of the main research articles included in the thesis for the SEP is evaluated, ensuring the theory presented is of high quality and relevance. The detailed critique is found in Appendix 2.

4.4 Literature search

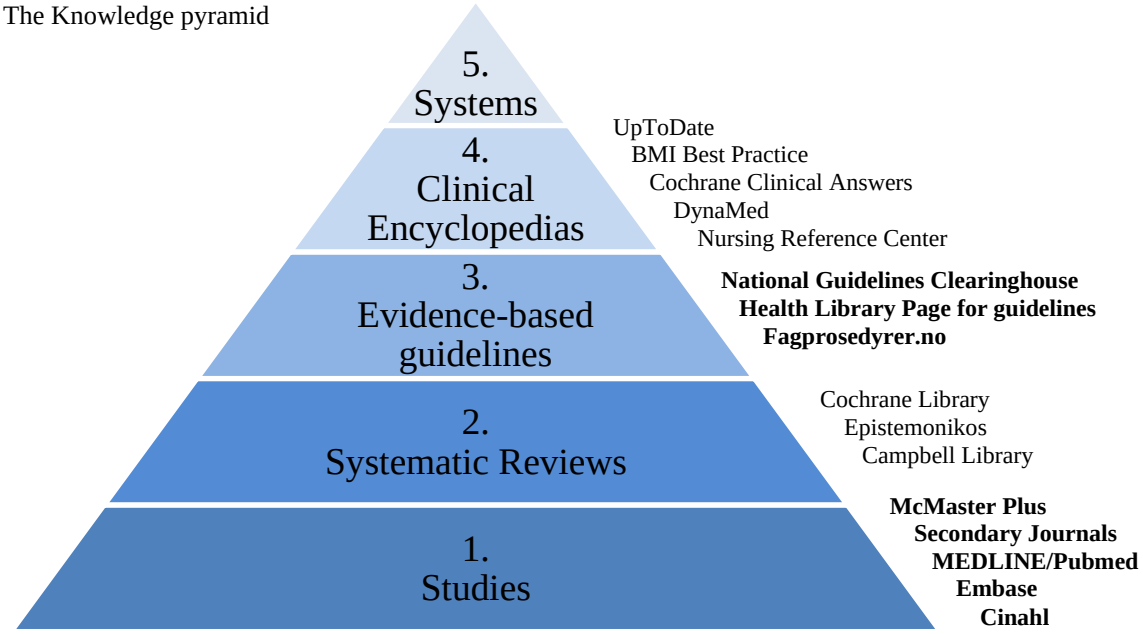
For this thesis, the authors wanted to find literature and articles that discussed how to implement prewarming procedures through education. If there were no findings on that topic, the authors wanted articles containing reasons for the non-implementation of prewarming, knowledge about prevention of IPH, prewarming, interdisciplinary teaching, pedagogy, and how to set up a specified educational programme. According to Nortvedt et al. (2021), the use of summarised research is an important principle in evidence-based practice. To clearly illustrate the hierarchy of knowledge, the knowledge pyramid was produced, as shown in figure 5 below. The pyramid emphasises the importance of summarised, pre-assessed, quality-controlled research. It divides the different forms of research into five levels that are synergistic with each other and is useful when categorising the findings in a literature search. The higher up on the pyramid the research lies, the better the quality, applicability, and validity of the findings.

Systems are found at the top of the pyramid, at level five. These are clinical decision systems and electronic journal systems that integrate individual patient data with knowledge from all levels of the pyramid. At level four, one would find clinical encyclopaedias where summarised and integrated research in large subject areas is included. They compile research from systematic reviews and single studies within a topic and give suggestions and recommendations on how to implement them in practice. Level three includes evidence-based guidelines and procedures pertaining to different healthcare areas. The guidelines and procedures are high-quality, evidence-based recommendations that aim to optimise and standardise patient treatment. Systematic reviews that gather and summarise all relevant research referencing a specific question are found on level two. A systematic review of high quality has a transparent approach to how the literature was found, critiqued, compared, evaluated, and presented so that the research itself, not the authors, answers the relevant question. They are developed following strict criteria, and peer reviews have a high-quality, transparent method for finding, critiquing, and summarising single studies regarding a specific topic relevant for everyday practice (Nortvedt et al., 2021). At the bottom of the pyramid are primary studies, where results from research on a specific topic are presented. These must be quality-reviewed before referring to them in practice or for citing in an article or review (Helsebiblioteket, 2021a; Nortvedt et al., 2021). The size of each level is also representative of the number of studies found. There are many primary studies done globally;

however, there are fewer systematic reviews, even fewer guidelines and encyclopaedias, and almost no systems to speak of. The initial search of the literature yielded results on all levels, but with varying degrees of relevance for this thesis. The higher up on the pyramid, the more generic the topic, and therefore with less direct relevance. With this in mind, the authors initially conducted searches on all levels to ensure all relevant literature was found.

Figure 5

The Knowledge pyramid



Note: Original found at Helsebiblioteket.no, translated from Norwegian to English by the authors of this thesis. https://www.helsebiblioteket.no/innhold/artikler/kunnskapsbasert-praksis/kunnskapsbasertpraksis.no

Searches were performed in the databases Helsebiblioteket.no, McMaster Plus, UpToDate, Dare, Medline Ovid, Cochrane, PubMed, AORN journals, Epistemonikos, and Google Scholar with several combinations of the keywords, as presented in the PICO form (Table 2). If the authors applied for prewarming in a teaching context, there were no results. The keywords "interprofessional education" and "prevent hypothermia" gave the most results in the various databases (see Appendix 1 for an in-depth search history). The search was limited to articles published after 2005 and included people, not animals. In addition, the authors included all languages, professional groups, and types of surgery. The authors excluded articles aimed at patient- and disease-related teaching as well as heating the patient after IPH had occurred. This is because it goes beyond the focus area, namely teaching about prewarming for specialist nurses. To ensure high source-critical progress, the authors used the additional criteria proposed by McMaster Plus for the assessment of articles that present quality improvement and education. These included randomised sampling, more than 10

participants in each group, and more than one specified outcome in more than 80% of cases, regardless of control time and statistical relevance. Included research articles must be peer-reviewed, relevant to the problem, and fall within the inclusion criteria. The articles had been assessed individually and reviewed in plenary to avoid bias and ensure a common understanding. Findings are presented in Tables 3 and 4 below.

In December 2022, the authors, with the assistance of a librarian at OsloMet University, conducted an updated search for additional literature. This was done to ensure that the quality of the literature search was up-to-date and to increase the chances of finding relevant literature. Prewarming was used as the free text search word. With the help of the librarian, searches were done in the different databases with a combination of "prewarming" and "hypothermia." To ensure the best results, "prewarming" was changed to "prewarm*." During the literature search with the librarian, limitations were set to no articles older than five years, literature in Scandinavian and English, and systematic reviews. Within those criteria, Epistemonikos gave the best results, as shown in Table 3 below. The result was several systematic reviews showing that prewarming surgical patients is not a standard procedure, despite the vast research done on the subject. This shows that the problem lies elsewhere, perhaps in traditions, a lack of knowledge in the workplace on how to incorporate prewarming into the surgery schedule, or misconceptions surrounding FAW. Therefore, the authors are confident that a specified educational programme is long overdue. In table 3 below, the articles that were deemed most relevant for this thesis are presented in the order found in the knowledge pyramid.

Table 3
Findings through a systematic search

Level	Findings
Systems:	● Regjeringen.no: 1. Meld. St. 11 (2020-2021) – Kvalitet og pasientsikkerhet 2019 2. Meld. St. 7 (2019-2020) – Nasjonal helse- og sykehusplan 2020-2023
Reference works and Guidelines:	● NSFLOS: 1. Operasjonssykepleiernes ansvar- og funksjonsbeskrivelse (NSFLOS, 2016) ● AORN.org: 1. Recommended practices for the prevention of unplanned perioperative hypothermia (AORN, 2007) ● UpToDate: 1. Patient safety in the operating room (Wahr et al., 2023) 2. Perioperative temperature management (Sessler, D., 2022) ● Best Practice: 1. Hypothermia – prevention and management in adults having surgery (NICE, 2016) ● EBM Guidelines 1. Effects of interprofessional education on professional practice and healthcare outcomes (EBM, 2011) ● Helsebiblioteket.no: 1. Hypotermi perioperativt – forebygging og behandling (Oslo universitetssykehus, 2015) ● Medline.no: 1. Preventing inadvertent perioperative hypothermia (Torossian et al., 2015)
Quality appraised systematic review	● DARE: 1. Effectiveness of strategies for the management and/or prevention of hypothermia within the adult perioperative environment (Moola & Lockwood, 2011) 2. Interprofessional collaboration to improve professional practice and healthcare outcomes (Review) (Reeves et. al.,, 2017) 3. Interprofessional education: effects on professional practice and healthcare outcomes (Reeves et. al., 2013) 4. The effectiveness of interprofessional education: key findings from a new systematic review (Reeves et. al., 2010)
Systematic review	● PLUS Syntheses: 1. A systematic review on the effectiveness of prevarming to prevent perioperative hypothermia (review) (Poveda et al., 2012) 2. Active body surface warming systems for preventing complications caused by inadvertent perioperative hypothermia in Adults (Review) (Madrid et al., 2016) ● Cochrane Library: 1. Educational games for health professionals (Review) (Akl et al., 2013) ● Epistemonikos:

	1. Pre-operative warming with a forced-air warming blanket prevents hypothermia during surgery (Broback et al., 2018) 2. Prevention and management of perioperative hypothermia in adult elective surgical patients: A systematic review (Simegn et al., 2021) 3. Effect of perioperative active body surface warming systems on analgesic and clinical outcomes: a systematic review and meta-analysis of randomised controlled trials (Balki et al., 2020) ● Medline: 1. Effects of pre-operative warming on the occurrence of surgical site infection: A systematic review and meta-analysis (Zheng et al., 2020)
Quality appraised primary studies	● AORN Journal: 1. Prevention of unplanned perioperative hypothermia (Paulikas, 2008) 2. Hypothermia/Warming protocols: why are they not widely used in the OR? (Weirich, 2008) 3. Effects of comfort warming on pre-operative patients (Wagner et al., 2006) 4. The effect of pre-operative warming on patients' postoperative temperatures (Cooper, 2006) ● Medline: 1. A review of the evidence for active pre-operative warming of adults undergoing general anaesthesia (Roberson et al., 2013) 2. Resistive-heating or forced-air warming for the prevention of redistribution hypothermia (De Witte et al. 2010) 3. Effects of 10-min prewarming on core body temperature during gynecologic laparoscopic surgery under general anesthesia: a randomized controlled trial (Lee et al., 2020) ● Pubmed: 1. Prewarming. Yesterday's luxury, today's minimum requirement (Bräuer et al., .2014). 2. The effect of short time periods of pre-operative warming in the prevention of perioperative hypothermia (Horn et al., 2012) 3. Barriers and enablers to the implementation of perioperative hypothermia prevention practices from the perspectives of the multidisciplinary team: a qualitative study using the Theoretical Domains Framework (Munday et al., 2019) 4. Resistive polymer versus forced-air warming: comparable heat transfer and core rewarming rates in volunteers (Kimberger et al., 2008)
Single studies	● Not relevant due to findings higher up on the knowledge pyramid

4.5 A critical appraisal of the included literature

After accumulating sources, one must evaluate their relevance in terms of quality and subject matter (Dalland, 2010). According to Dalland (2010), being more critical of sources means examining the sources and assessing them based on the credibility of the assertions made in the information. The authors believe that research articles found in the various databases are considered reliable and quality-assured since they have been peer-reviewed. Nevertheless, the authors remained critical of the material and used the Joanna Briggs Institute's (JBI) Critical Appraisal Tools to guide the source criticism. A significant number of the research articles found were based, primarily and secondarily, on randomised controlled trials (RCTs) as study designs, which increase reliability and validity. Although they often refer to homogeneous results, heterogeneous variables can impair reliability. For in-depth source criticism, see Appendix 2.

4.5.1 Inclusion criteria

The literature search resulted in extensive results, and adding inclusion criteria was necessary. The author's initial search included articles from the last 20 years. The recent literature search with the librarian included articles from the past five years. The initial search was not limited to the higher levels of the knowledge pyramid, as the authors wished to find all relevant information, and not all the articles found further down the pyramid were included in clinical encyclopaedias and guidelines. The search conducted with the librarian included only systematic reviews, or higher up on the knowledge pyramid. However, a number of articles from lower on the pyramid were discovered during separate inquiries for pertinent information or explanation. Some of these were subsequently incorporated as relevant sources. The included articles had to either directly address the prewarming of patients to prevent hypothermia or contribute to the development of a SEP.

4.5.2 Exclusion criteria

The exclusion criteria for the search in the databases entailed the exclusion of children under the age of 18, animals, articles lower on the pyramid than the systematic reviews (latter search), no foreign literature other than Scandinavian and English (latter search), and articles that only touched on the topic of prewarming rather than having it as their primary focus. However, some of these limitations, for instance, age and only humans, could not be entered into the search as some relevant articles disappeared, so articles that involved those were

manually excluded. Exclusion factors can affect the search, especially if the publication is new and has not yet been assigned keywords. This became apparent while working with the OsloMet librarian and limiting it to humans in the search engine. Several systematic reviews of newer publications disappeared; therefore, removing the limitation was important. In addition, relying solely on MeSH terms could reduce results, which were otherwise improved when adding free text terms, such as "Prewarm*." Limiting languages is another consideration, but it did not affect the results in the latter search. One article from the initial search was translated using translation tools. However, this was deemed too resource-intensive for the authors, so no additional articles containing a language the authors did not understand were translated. This limitation may result in the absence of essential information, but the undiscovered research was deemed acceptable due to the number of results discovered despite the limitation.

4.6 Research knowledge

The authors discovered six primary studies used in this thesis. Five of the studies found were applied research studies that focused on the prevention of IPH through prewarming: Lee et al. (2020), De Witte et al. (2010), Horn et al. (2012), Kimberger et al. (2008), and Wagner et al. (2006). They present the importance of prewarming the patient before initiating general anaesthesia, compared to warming the patient intraoperatively. The strengths of the articles are that they have a large study population, randomised groups, and include both genders, except for Lee et al. (2020), who focused solely on gynaecological patients. A limitation is that blinding is impossible, as it is clear who is prewarmed and who is not. The sixth primary study, Munday et al. (2019), identifies barriers to IPH prevention and identifies IPH as a significant global concern for surgical patients. A weakness of this article is the small number of participants, and the article focuses predominantly on the barriers without offering any clear solutions other than education. Some of the mentioned barriers are surgeons' apprehension about prewarming and a lack of distinction regarding who has the primary responsibility, be it the anaesthetist or the theatre nurse. The article emphasises the significance of temperature monitoring but does not highlight any specific warming method. The strength of the article is that they discuss participants' self-identification of a lack of knowledge and a need for education regarding perioperative hypothermia in terms of the condition's cause as well as the proper recommended IPH prevention.

The age of some of the other articles could be considered a limitation, but these articles are widely used and frequently cited. See table 5 below.

Table 5
Primary studies of older dates included as main articles in the thesis and citation references

Article	Citations
De Witte et al. (2010)	The publication in Anesthesia & Analgesia has been cited 62 times. 20% of its citations have been received in the past two years (Dimensions, 2023h).
Horn et al. (2012)	The publication in Anaesthesia has been cited 108 times. 22% of its citations have been received in the past two years (Dimensions, 2023j).
Kimberger et al. (2008)	The publication in Anesthesia & Analgesia has been cited 44 times. 6% of its citations have been received in the past two years (Dimensions, 2023i).
Wagner et al. (2006)	Describes prewarming as an anxiety-reducing measure for the surgical patient and has been cited 185 times, most recently in 2021 (Pubmed, 2023).

Several articles argue for the prevention of IPH, its associated complications, and which measures are most effective (Bräuer et al., 2014; de Brito Poveda et al., 2013; Madrid et al., 2016; Moola & Lockwood, 2011; Paulikas, 2008; Roberson et al., 2013; Torossian et al., 2015). The strength of these articles is that they show the same result, supporting each other's findings, namely that prewarming is the most important measure in IPH prevention. The literature search revealed an absence of articles focusing on a SEP for prewarming, which may be viewed as a limitation on the one hand but emphasises the need for a SEP on the other. An additional limitation with the articles is that not all declare supplementary measures, for instance, warm liquid infusions, that may have occurred intraoperatively and thus affected the results. Akl et al. (2013), Reeves et al. (2017), Reeves et al. (2013), and Reeves et al. (2010) argue for interdisciplinary teaching methods and their subsequent effects. The strength of the articles is that they address didactic components and discuss recent research, in addition to having clear methodological progress. Unfortunately, the results cannot be generalised since they are all based on minor studies with heterogeneous results.

Several systematic reviews were included that argue for the importance of prewarming, and they concluded that FAW was the most effective way to prevent IPH (Broback et al., 2018; Simegn et al., 2021). A subgroup analysis by Balki et al. (2020) concluded that the effects of prewarming combined with intraoperative warming are recommended versus only intraoperative warming. Prewarming also helps preserve the immune response by maintaining oxygen transport and circulation at the incision; therefore, it may also help

decrease the chance of SSI after surgery. This was concluded in the article by Zheng et al. (2020), where the emphasis was on prewarming and the risk of SSI post-surgery. Broback et al. (2018) argue for the duration of prewarming. Some studies concluded that one hour of prewarming was optimal, while others concluded that 20 to 30 minutes was adequate, whereas another concluded that 10 minutes was sufficient. This is a wide range, and the authors were critical of the findings. The variety of heat settings on the warming devices may account for the range, demonstrating the need for more study on the duration of prewarming.

4.7 Experiential knowledge

Continuing research has been conducted on the effects of prewarming, and several guidelines have been revised at the same time. In daily clinical practice, prewarming is frequently omitted or not incorporated (Becerra et al., 2019; Cooper, 2006). According to the author's observations, today's prewarming routines are still inadequate. The authors identified two specialist articles that consider the reasons. Cooper (2006) and Weirich (2008) examine the possibility that this may be due to the absence of current professional knowledge, improper prioritisation, inadequate equipment, procedures, and guidelines. Moreover, Weirich (2008) emphasises an essential reason why the measure has not been implemented: barriers and obstacles. For instance, nurses prioritise other complications over the prevention of IPH (Munday et al., 2019). Notably, the publication date of the articles may be a limitation, as one would expect the implementation of the measure to have evolved and improved over time. In contrast, Madrid et al. (2016) concluded in their systematic review that this is not the case, even after the publication of NICE's exhaustive guideline in 2016. An AORN home study is based on Cooper's article, which is regarded as a strength. In addition, the article is still extensively used and has been cited in around 99 publications, the most recent of which appeared in 2023. Weirich's article has been cited 125 times, with the most recent citation occurring in 2023.

Important and necessary to evidence-based practice, experiential knowledge concentrates on the theatre nurse's understanding of the patient's wants and needs in the given situation. This knowledge is acquired and developed through reflective processes in daily practice and is frequently transmitted by colleagues or patients themselves (Dåvøy, 2018). Combining this information with research ensures that any proposed measures are based on quality-approved data as well as meeting the individual needs of the patient (Nortvedt et al., 2021). The authors of this thesis have worked as theatre nurses for several years, two of them in different

hospitals. Oftentimes, this is an advantage since the various cultures and traditions can be combined to produce high-quality everyday practice and aid in influencing necessary change. Additionally, two of the authors have previously effectively planned a separate SEP and presented it at a workshop for theatre nurses and nurse anaesthetists.

4.8 Patient Knowledge

According to Simegn et al. (2021) and Broback et al. (2018), hypothermia is one of the most unpleasant aspects of surgery for the patient, making prevention even more crucial. Balki et al. (2020), Broback et al. (2018), Cooper (2006), Paulikas (2008), and Wagner et al. (2006) state that prewarming calms and reassures patients. They emphasise that OR staff should be aware of this and include it when identifying the patient's basic needs during the perioperative phase. Moreover, this should be done in consultation with the patient (Nortvedt et al., 2021). Some of these articles are older and are not based on primary research, so the literature they are based on is also older. However, according to more recent publications, the authors believe that the patient's mental needs during the perioperative phase have not significantly changed, so the findings should still be relevant. The patients' experiences should be considered and accommodated as much as possible when determining what measures are necessary (Nortvedt et al., 2021). Utilising experiential and evidence-based knowledge to guide and enlighten the patient, the role of the theatre nurse is to facilitate the patient's involvement in making sound decisions.

In their study, Balki et al. (2020) included 3,976 patients, three of whom perspired during prewarming, while four reported feeling uncomfortably warm. Also, and presumably for other reasons, one patient developed a fever. During prewarming, it is essential to inquire about the patient's comfort level. Those who find the temperature too warm can have it adjusted. Those who are chilly may desire a higher temperature. It is difficult to know unless the patient is asked or voluntarily informs the staff. Many patients do not express their discomfort because they do not want to be a burden. Therefore, theatre nurses must be vigilant and actively assess patients' requirements and desires (NSFLOS, 2016).

5.0 DEVELOPING A SPECIFIED EDUCATIONAL PROGRAMME

Education is essential for reducing resistance to change and ensuring long-term progress (Stubberud, 2018). The objective of the SEP is to increase participants' knowledge of prewarming while also encouraging them to engage in discussion, provide feedback, and share their thoughts and experiences. Actively involving them in education can help reduce resistance to change (Stubberud, 2018). The authors utilised the model for quality improvement to guarantee the quality of the work process. By employing additional pedagogical and didactic methods, such as the didactical relationship model, the quality of the subject group's information and instruction is enhanced.

5.1 Quality assurance

In practice, the constant implementation and maintenance of quality improvement methods is known as "quality assurance." Quality assurance focuses primarily on correcting problems in the quality of patient care, while quality improvement focuses on identifying opportunities to improve quality by modifying systems as well as the behaviour of individual healthcare professionals. In addition, quality assurance includes standards for care structures and processes and extensive case evaluation, whereas quality improvement uses statistical profiles of outcomes, structures, and processes to monitor improvement (Schyve & Prevost, 1990). The Ministry of Health and Care Services (Meld. St. 7 (2019–2020)) presented the government's comprehensive plan for quality and patient safety initiatives to reduce patient injuries and associated societal costs. The plan emphasises improved patient safety with fewer unintended incidents, a greater emphasis on systematic quality development, and more user-oriented healthcare services (Meld. St. 7 (2019-2020)). Faced with ever-increasing demands for quality in health care, OR staff must implement evidence-based practice in a systematic manner (Nortvedt et al., 2021). The model for quality improvement is a useful tool for ensuring a systematic, high-quality approach to clinical practice through planning, action, evaluation, and reflection.

5.2 Professional development

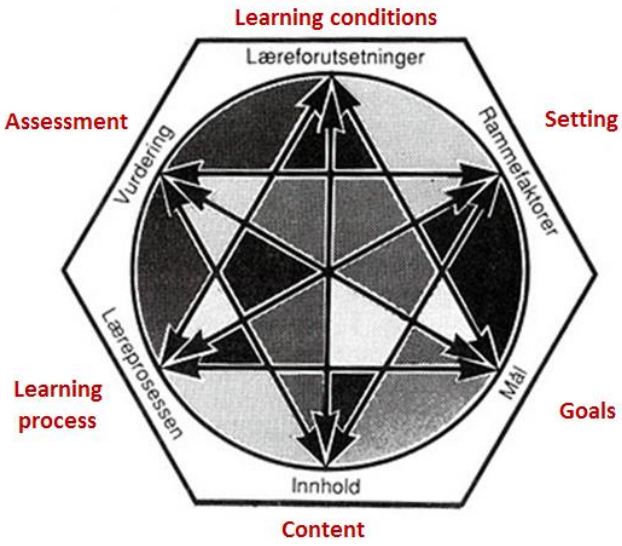
Theatre nurses are expected to demonstrate interchangeable competence and dedication to patient care and the advancement of the profession. To contend for measures and treatment of patients, it is necessary to apply current professional knowledge in a critically reflective and analytical manner (NSFLOS, 2016). Teaching can enhance interactions between co-workers

and foster a propensity to adapt, and by challenging co-workers, their motivation to innovate and reflect may increase (Hiim & Hippe, 2022). Thus, the authors can contribute to innovation in clinical practice and the international development of the subject.

5.3 The didactical relationship model

An essential pedagogical practice is integrating a positive and professional relationship. Influence, as well as students' motivation and behaviour, will have an impact on their academic performance (Killian, 2019). The fundamental tenet of evidence-based pedagogy is the preference for credible research over popular opinion as a pedagogical belief. The pedagogical practices of the teacher will encourage students to be open to change or to abandon some of their existing beliefs (Killian, 2019). Didactic is the planning, implementation, evaluation, and critical evaluation of instruction and learning (Hiim & Hippe, 2022). The didactical relationship model (Figure 6) seeks to facilitate learning by highlighting the ongoing interaction between the individual's various aspects. The model addresses the participant's teacher prerequisites, framework factors, goals, content, the teacher process, and evaluation (Hiim & Hippe, 2022). According to Hiim and Hippe (2022), learning based on the didactical relationship model places the emphasis on the learner rather than the teacher. Active learning, which Reeves et al. (2017) refer to as the most effective form of learning, is ensured by this action. This model is used to analyse, plan, implement, and justify the various pedagogical actions presented in teaching (Hiim & Hippe, 2022). It provides an overview of significant factors that should be considered, with the intention of continuously shifting between them based on how they interact. The purpose of all teaching is learning, and learning occurs through participant engagement (Reeves et al., 2017). Typically, the starting point is the participant's teacher's prerequisites.

Figure 6
The didactical Relationship Model by Hiim and Hippe



Note. The didactical relationship model. Hentet fra https://mariis.net/2010/01/17/connective-models-for-didactic-design/ (01.05.2023)

5.3.1 Learning conditions

The knowledge, attitude, and abilities theatre nurses bring to the SEP serve as their learning conditions (Hiim & Hippe, 2022). Motivation, life circumstances, level of competence, interests, resources, needs, cultural heritage, and expectations affect these conditions (Sylte, 2021). Their background, interests, level of knowledge, and skills should be considered a resource for generating dynamic and engaging classroom discussions (Hiim & Hippe, 2022; Tveiten, 2019). Theatre nurses are typically a large group that is not homogeneous in the sense that the aforementioned characteristics vary greatly from nurse to nurse. Therefore, it is essential, whenever possible, to identify the group's learning prerequisites beforehand or to be able to modify the SEP accordingly after a quick question round at the beginning of the lecture.

Such questions could be:

- What do they know from before?
- What could be new to them?
- What outcome are they interested in?
- Are there any unique issues or resources that must be considered in relation to the learning activity?

Having an understanding of potential barriers facilitates the planning and execution of the SEP (Sylte, 2021). A theatre nurse should have extensive knowledge of anatomy and the physiological effects of hypothermia. In addition, they should be aware of how the patient reacts to preoperative preparations and provide appropriate treatment to alleviate any anxiety. Moreover, it is essential to consider the patient's comfort and safety throughout the perioperative procedure in order to facilitate a faster recovery (Helsedirektoratet, 2018b). Some theatre nurses have a balance of theoretical knowledge combined with experience, while others are newly graduated and rely more on theory. The SEP should be presented in a manner that imparts or refreshes knowledge without becoming monotonous and rather piques the interest of individuals on all levels (Hiim & Hippe, 2022; Sylte, 2021). However, it must be adaptable enough to accommodate changes based on the requirements of the participant group (Hiim & Hippe, 2022; Sylte, 2021).

Starting with theory provides context for actual activities or discussions and refreshes or improves knowledge and competence. This is necessary for people with limited knowledge of prewarming and its impacts, but it may also spark interest in others who have lost or outdated knowledge. Practical activities and active discussions promote interest and engagement, reducing reluctance to change and increasing the likelihood of permanent change (Helsebiblioteket, 2021b). Active participation also improves learning and information retention at the conclusion of the SEP. Discussion encourages dialogue between coworkers, which may lead to the development of new perspectives, problem solving, and the exchange of experiences, which in turn may result in change (Helsebiblioteket, 2021b; Sylte, 2021).

Based on the authors' experience, a theatre nurse will quickly become habituated to the department's routines, making it challenging to alter established procedures. By exchanging opinions and posing queries in a secure environment, the participant can become aware of their own weaknesses and work to improve them. Communication and interaction skills are essential to generating dialogue, so group input serves as the foundation for learning opportunities (Helsebiblioteket, 2021a; Sylte, 2021). In addition, the lecturer should be able to steer the conversation in the correct direction so that the participants discover how to solve the problem on their own. Through the replenishment of professional knowledge, many can learn something new about solution-oriented work; however, only through active participation will such knowledge promote improvement permanently (Helsebiblioteket, 2021a; Helsedirektoratet, 2018b; Sylte, 2021).

5.3.2 Settings

Framework factors promote or hinder learning and instruction (Hiim & Hippe, 2022). It could be course length, applicability to clinical practice, qualifications, attitudes, or teaching competence. The venue, setting, time of day, and noise also affect learning. A nurse's working environment, restrictions, and opportunities affect information receptivity (Hiim & Hippe, 2022). Cooperation between the specialties is frequently necessary for the long-term success of the instruction; therefore, it can be advantageous to ensure that participants do not join in group discussions with only their closest counterparts. It is preferable that they acquire an understanding of how the issue can be resolved interdisciplinarily.

5.3.3 Goals

The teaching or lecture must be practice-oriented in order to be as applicable as possible to the participants' daily lives (Hiim & Hippe, 2022). The objective is to alter current practices. To accomplish this, the specialist nurse must evaluate and reflect on their own attributes so that, at the conclusion of the SEP, their functionality within the topic is enhanced. The learning objectives can be divided into three categories: skills, knowledge, and attitudes (Hiim & Hippe, 2022; Sylte, 2021). The learning outcomes are closely related to the learning objectives, and this, in turn, relates to what the participants acquire from the SEP. Despite having exactly the same SEP, each participant may experience a different outcome. The primary objective of this SEP is to increase knowledge of prewarming, aid in discovering a method for achieving prewarming in the perioperative phase, and, perhaps most importantly, alter attitudes regarding traditional versus evidence-based routines.

5.3.4 Content

The lecture must describe the content and how it was chosen. It is related to the instructional templates, according to Hiim and Hippe (2022). When teaching about prewarming, one must consider the demands of the intended target group. Emphasis is placed on enhancing knowledge, skills, and possibly altering attitudes so that actions are more targeted by using one's own practice as examples. The content is organised according to the prerequisites, frameworks, goals, and processes of the teacher. One must keep in mind that the participants may be both new and seasoned employees, so the teachings must be both dynamic and challenging. During instruction, attitudes and possible reluctance are revealed; therefore, the instructor must be prepared and manage the situation appropriately if it arises.

The difficulty in teaching is selecting content that imparts the necessary knowledge and skills to accomplish the desired outcomes (Hiim & Hippe, 2022).

5.3.5 Learning Process

The teaching strategy must be closely aligned with the goals. Multiple senses can be stimulated in the target group through the use of a variety of methods, thereby enhancing their learning potential. In addition to participant input, a pedagogical principle is to play on the senses of sight, hearing, and childhood remembrance (Hiim & Hippe, 2022; Tveiten, 2019). Figure 7 depicts the learning pyramid, which illustrates the impact of various instructional strategies on the learning process. However, a 2013 article by Strauss questions the validity of the pyramid. Strauss (2013) argues that the percentages depicted in the pyramid depend on a number of variables, including student interest, prior knowledge, age, how recall was tested, and how long after learning the test was administered. Straus advises that these numbers are unreliable. However, Strauss (2013) acknowledges that the retention outcomes of the various methods vary. Therefore, if one does not rely solely on the percentages presented, the learning pyramid could be used more as a guide for which methods, combined with others or alone, may have the greatest influence on retention and learning.

Figure 7

The Learning Pyramid

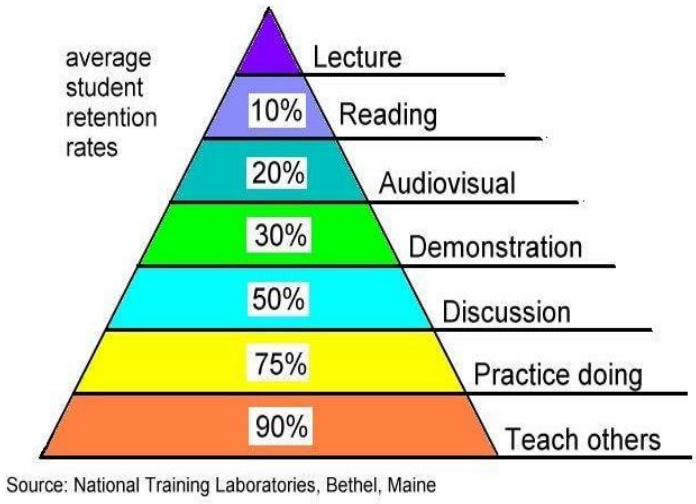


Figure 7: The Learning Pyramid (Straus, 2013) http://www.washingtonpost.com/blogs/answer-sheet/files/2013/02/pyramid.png

Due to the instructor's didactic approach, all aspects of the lesson plan are considered. The lecturer considers what is to be taught, how it is to be taught, and why; reflects on their own knowledge; and examines the prerequisites for the target group's instructors. Diversified methods increase the efficacy of a SEP. The teaching content is founded on the templates, which can be concretised based on the teacher's knowledge, disposition, or ability. To accomplish the goal of prewarming, it is essential that the target group participate in the development of measures and problem solving through discussion and brainstorming (Sylte, 2021; Tyng et al., 2017). This creates engagement, which improves learning and increases the likelihood of long-term change (Tyng et al., 2017). The didactical relationship model promotes a more holistic educational development process. As collaboration is a central theme and the emphasis is on quality-assured patient care, the measure becomes more attainable when developed interdisciplinarily. In addition, it necessitates the lecturer's participation through the use of effective pedagogical techniques, ensuring learning on both a social and personal level.

The objective of the SEP is to engage each participant early on in the learning process and generate interest in the topic. After a brief overview of recent research on the topic, it may be preferable to demonstrate the various types of equipment that can be used for prewarming and then allow participants to test the equipment themselves. This stimulates the senses of sight, hearing, and touch and enables demonstration, discussion, and hands-on practice. In the case of prewarming with FAW, this step is typically unnecessary as the majority of theatre nurses are familiar with the requisite equipment. It may be more beneficial to inquire about any barriers encountered in clinical practice when prewarming patients. The lecturer may ask them to discuss amongst themselves how it might be simpler for them to prewarm, given the framework factors that are present in their workplace. The objective is to encourage creative, solution-focused thought that can aid in altering traditional practices, attitudes, and behaviours. The lecturer should be able to provide participants with potential solutions that facilitate the initiation of prewarming.

The use of quizzes and games stimulates the participants' cognitive comprehension, and quizzes not only train participants in knowledge retention but also in analytical thinking (Rothe et al., 2021). Wang and Tahir (2020) concluded from a literature review that Kahoot! is an effective pedagogical strategy for enhancing learning performance, classroom dynamics, participants' and teachers' attitudes, and even reducing anxiety. Their research revealed that

Kahoot! was one of the most popular game-based learning platforms, and a review of 93 studies led them to the conclusion that Kahoot! can have a positive impact on learning environments as a whole (Wang & Tahir, 2020). However, the research also included studies in which Kahoot! demonstrated little to no effect. The primary obstacles cited are technical issues such as unreliable Internet connections, difficulty comprehending the questions, and questions that move too quickly or too slowly. Some respondents mentioned time constraints as well as teachers who found the new technology challenging to use (Wang & Tahir, 2020).

Traditions can make it difficult to alter current practices (Orvik, 2022). Kurt Lewin (1951) devised a phase model that simplifies a complex reality into three phases in the process of change: thawing, change, and freezing (Orvik, 2022). The thawing phase involves generating new concepts. Observing the lack of prewarming in practice generates the desire to create a teaching plan. Here, according to Orvik (2022), attitudes and entrenched routines become apparent, thereby clarifying latent conflicts. If the participants themselves provide input, this can serve as a foundation for future loyalty. The change phase will occur when the template group implements prewarming practice following the conclusion of instruction. During this phase, the participants' motivation is put to the test, and it is anticipated that many will revert to previous practices due to significant fluctuations in quality and efficiency (Orvik, 2022). Resistance to change may be amplified, thereby increasing the significance of management's role in allowing employees to express their grievances and providing additional information or support as needed (Helsebiblioteket, 2021b; Orvik, 2022). The freezing phase occurs when prewarming becomes an integral component of the surgical process. The participants should have a favourable opinion of prewarming so that they feel responsible for its implementation. During this phase, intensive instruction can increase security and stimulate commitment. After that, quality and efficiency will be stabilised and increased progressively (Orvik, 2022).

5.3.6 Assessment

Critically analysing one's teaching and guidance approaches is essential to learning. To improve work and patient care, pedagogical theory and practice must be strengthened. In the lecture, participants should discuss and analyse their own practices. In addition, constructive criticism should be provided at the end of the SEP. According to the Institute of Teacher Aide Courses (ITAC, 2023), effective teaching requires effective feedback. The institute stresses that feedback must be simple and clear, singularly focused, and delivered promptly. Whether orally or in writing, formal or informal, brief or lengthy, descriptive, evaluative, peer- or self-

assessed, what matters is the quality of the feedback provided and if it is implemented according to New South Wales government education policy (Government, 2022). Oral feedback should be provided quickly following the conclusion of the intervention so that any ambiguities can be clarified and any overlooked information can be provided (Government, 2022; ITAC, 2023). This allows the participants to reflect on what they have learned while providing the lecturer with an indication of whether or not the intervention's goals were met. For the purpose of development, both positive and negative feedback should be recorded (Government, 2022). Qualitative and quantitative written feedback should be delivered as soon as possible after the SEP (Government, 2022; ITAC, 2023). Open questions permit participants to elucidate their perspectives on the intervention, but they require more time and effort to complete, so many may opt not to use them (Government, 2022; Hiim & Hippe, 2022). Quantitative forms could include fixed responses or a 1–5 rating, making them easy to fill out but without allowing for elaboration. However, the lecturer can systematically compare each participant's scores. A combination that allows for open-ended responses to predetermined queries can be a viable alternative. Written feedback is frequently preferred because those who have negative feedback can submit it privately and without group discussion (Government, 2022). For the purposes of this thesis, it was determined that a quantitative questionnaire would best facilitate systematic comparison. According to Hiim and Hippe (2022), the interaction between the model's factors is clarified, better understood, and developed through didactic instruction. By comparing the teaching to the assessments conducted as part of the model for quality improvement, a holistic picture of the change process will start to emerge. However, the need for additional education might not be identified for a considerable time.

5.4 Ethical considerations

To assure the credibility and objectivity of the work, two authors independently conducted literature searches. This was a necessary step to ensure that the need for prewarming as a quality enhancement measure is supported by credible, up-to-date, and relevant research. The relevant articles were then reviewed with the third author in plenary to ensure comprehension and validity. Based on the aforementioned articles in Table 3, the authors conclude that bias can occur in studies where additional heating measures were initiated intraoperatively, making it more challenging to measure the effect of prewarming alone. Bias in research occurs when one result or response is preferred above others through the systematic

introduction of error into sampling or testing (Pannucci & Wilkins, 2010). Any deviation from reality in data collection, processing, interpretation, and dissemination that may lead to erroneous conclusions is referred to as bias and can be either unintentional or deliberate (Simundić, 2013). The authors of this thesis wish to declare that there are no instances of partiality and an absence of conflict of interest in the form of sponsorship or consulting work in relation to the project description and education. This topic is of interest to the authors, but it provides no benefits beyond workplace knowledge. The objective is to alter current practice based on the author's personal experiences. Despite the use of a diversity of methodologies, decades of research have produced the same result: prewarming should be implemented. Unfortunately, implementation presents barriers. Research studies have concentrated on how to implement prewarming, but implementation is still lacking, so the attitude of the OR staff is seen as crucial for quality improvement. Since prewarming is still a topic of discussion, it indicates an unfortunate trend that could be reversed by emphasising the importance of education to enhance evidence-based practice.

5.5 The specified educational programmes' content

The content will include current information on prewarming and its physical and mental effects on the patient. It will direct attention toward one's own clinical practice, and strategic discussions may facilitate reflective thought that might result in modification of the content. Questions that should be posed include whether the content is pertinent, interesting, and of an acceptable level of difficulty, and whether it should be purely theoretical, purely practical, or a combination of the two (Hiim & Hippe, 2022). A theatre nurse should carry out their duties in accordance with the expected standards of professional responsibility, competence, and safe practice, taking into account their qualifications, the nature of their work, and the circumstances provided (Helsepersonelloven, 1999). This is the foundation of the SEP, as professional accountability and secure practice are fundamental to patient care. The term "responsibility" refers to a professional, ethical, and legal standard for how an individual should carry out their duties. It is important to observe that the objective is not to be optimal or perfect, but rather to strive for what should be expected of the theatre nurse in the given situation. This is likely to change over time based on new research (NSF, 2019). Therefore, the content of any SEP should always be founded on the most recent available research. The SEP will define IPH, after which participants will share their prewarming knowledge, followed by current research based on their preexisting knowledge. From there, free-flowing

discussions about barriers that prevent prewarming could begin. The participants may benefit from discussing prewarming and patient reactions. The objective is to assist in associating an emotion with the experience, as this enhances long-term memory retention. Emotion significantly influences cognitive processes in humans, according to Tyng et al. (2017). This includes perception, focus, learning, memory, deductive reasoning, and problem solving (Tyng et al., 2017). Arousing action- and behaviour-related motivation has a significant impact on attention, notably selective attention. This is closely related to the learning process (Tyng et al., 2017). Good didactic learning depends on the connection between the learning activity and the subject being taught, the objectives being pursued, the expectations of the participants, and the constraints that exist. Often, direct exposure to real-world situations provides the greatest learning foundation (Hiim & Hippe, 2022; Knowles et al., 2015).

5.6 The lecturer's role and function

Learning occurs when knowledge is created through the transmutation of experience and lecturers' ability to facilitate this effectively (Harden & Lilley, 2018). The function of the lecturer is central to the SEP, and they should strive to connect with participants while addressing their individual knowledge needs. The lecturer must be available to answer queries and provide direction (Harden & Laidlaw, 2021; Harden & Lilley, 2018). It is important, however, to allow participants to reflect and discuss without direct influence whenever possible. Without reflection, the quantity of learning will be limited (Harden & Laidlaw, 2021; Harden & Lilley, 2018; Knowles et al., 2015). The lecturer must ensure that discussion summaries are structured and aligned with the objectives of the SEP in order to facilitate constructive reflection and, consequently, learning (Harden & Lilley, 2018; Landbruk Arena, 2018). The theory presented at the beginning should support what is discussed at the conclusion (Harden & Laidlaw, 2021).

Unfortunately, there are few topics or issues that can be mastered in less than two hours (Landbruk Arena, 2018). The lecturer should consider the desired message, information, and impressions that participants should have upon completion of the SEP. During the SEP, the lecturer must modify as needed so that necessary topics are discussed in depth while others are merely touched upon. The function of the lecturer is to generate interest in the subject and accommodate, as much as possible, the need for variation in the SEP, given that people learn in different ways. Due to the patient's physiological effects of prewarming, many may find

this topic intriguing, while others may react more emotionally to the psychological effects. The lecturer's role and responsibility are to plan for every contingency and adapt the SEP accordingly. Using various methods during the lecture, such as PowerPoint, cases, group discussions, exchange of experiences, and quizzes, assists the lecturer in fulfilling their role and function as a facilitator (Landbruk Arena, 2018).

6.0 PRESENTATION OF THE SPECIFIED EDUCATIONAL PROGRAMME

A case that quickly prompts reflection could start the SEP. This will allow the lecturer to evaluate the degree of information attendees require. Hiim and Hippe (2022) define individualisation in education as modifying the lecture level to fit the learner. Adjusting to participants' levels might be difficult, especially if the gap is large. Four learning measures help bridge knowledge gaps and ensure a more uniform result in competence level. These are auditory (lecture on theory and discussions), visual (PowerPoint), kinesthetic (physical simulation, Kahoot!), and tactile (touch simulation, writing notes) (Sylte, 2021). Kinesthetic or tactile learning may help participants with auditory learning challenges. To help keep the interest of the participants, PowerPoint will be used to illustrate important factors and create visual hooks that make it easier to remember extensive amounts of information during the auditory stage (Berge, 2021). Berge (2021) has some concrete advice on how to create a PowerPoint that has been used as a guide, as shown in Table 6 below.

Table 6
Creating a PowerPoint

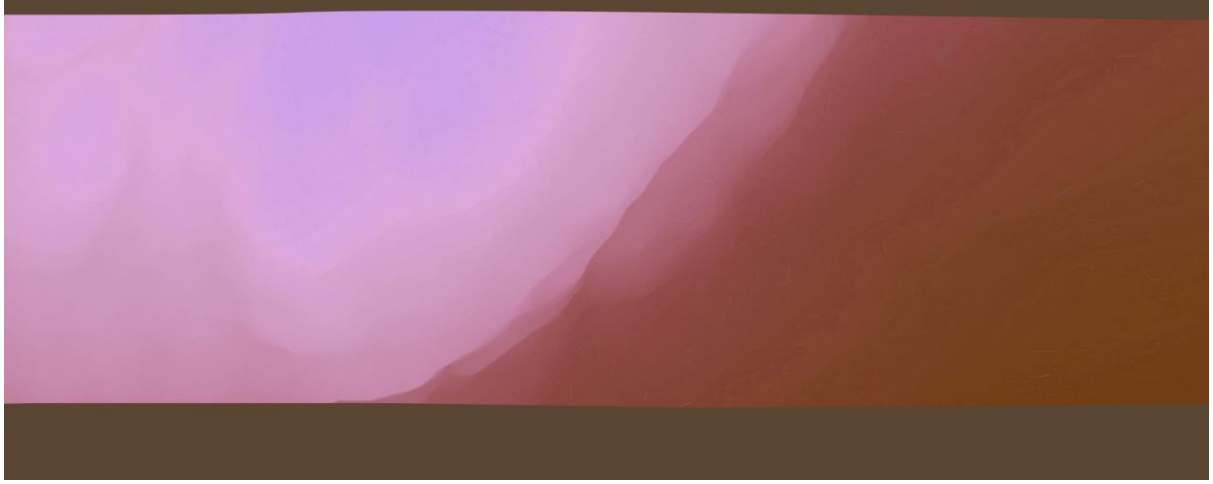
Advice	**Why**	**Consequences for PowerPoint**
Only have one message per slide.	If too many messages are presented at once, the risk of forgetting increases.	The slides have one message per slide to give the participants time to process and absorb the information.
Do not use sentences in the presentation.	The participants stop listening if they are reading text, and it is tedious listening to a lecturer who repeats what is written on the slides. The lecturer should expand on the points presented on the slide.	As much as possible, just use keywords on the slides to help the lecturer keep the interest of the participant and aid in promoting active listening.
Make the most important information on the slide the biggest.	The eye is often attracted to bold colours, contrast, and large objects. Using this can help underscore what is most important on each slide.	The slides are tailored as much as possible to ensure that all the important information catches the eye.
Use animations and a dark background.	Animations attract the eye and focus of the participant. A darker background is easier to look at over time as it is more friendly to the eye.	Animations are used throughout to keep the participants' attention without being too flashy. The slides are not completely dark, but have a varied background to encourage the participant to follow the slides.
Only have five or six objects per slide.	Having too many objects on a slide forces the brain to use time to process them all, and this can be distracting so that not all the information from the lecturer is received.	More slides are used rather than crowding information on one slide. This also gives room for animations and changes in text size and colour.

Discussing the PowerPoint presentation's case at the start can reveal the participants' prewarming knowledge. Suggestions might be written down and discussed immediately or later in the presentation. Participants learn best from real examples from daily practice (Hiim & Hippe, 2022). Prewarming theory follows in the PowerPoint, adjusted as necessary, in the form of what Hiim and Hippe (2022) call a monologue lecture. After the theory is provided, the first case's arguments may be discussed again or used to confirm the quality of practice. To promote cooperation between the participants and specialties, teamwork in smaller groups can be beneficial. Discussion and exchange of experiences while problem solving and reflecting on one's own practice may create a better understanding of the other's situation and stimulate creativity and change (Hiim & Hippe, 2022). Lastly, the lecturers could present a kahoot! with various questions; see table 7 for the English version and appendix 4 for the Norwegian version and link to kahoot.it. This is meant to leave the participants with the main message on a fun note to boost information retention by creating an emotional connection to prewarming (Tyng et al., 2017).

6.1 The presentation of the specified educational programme

The Norwegian Health Library advises small-scale quality improvement through SEP testing (Helsebiblioteket, 2021b). A target group's representatives attend a pilot lecture and fill out a questionnaire to improve the SEP before delivering it to a wider audience. The authors contacted their respective hospitals to get consent to perform the pilot lecture, which took place in March 2023. This helped the authors assess the lectures' strengths and weaknesses. The pilot lecture PowerPoint slides in English are presented below and in Norwegian in Appendix 3. A SEP that aims to improve patient care should develop theoretical proficiency and practice, critical reflection, and problem-solving skills. The SEP can be developed with case tasks, informative theory, teamwork, workshops, discussions, and a quiz. This can be tailored to the intended target group. Due to time constraints, the pilot lecture consisted only of case assignments, theory, discussions, and Kahoot! A workshop could be tailored to the participants' prior knowledge of FAW equipment and conducted as a simulation to encourage participation through hands-on experience. The programme as it was developed for the pilot lecture is outlined in the following PowerPoint slides, and Table 7 lists the questions asked in the Kahoot!

Welcome!



CASE

- Mia Smith (72 years old) is having surgery. From her medical history, she has a cardiac arrhythmia and low BMI.

Meeting this patient, which measures will you consider and initiate to prevent inadvertent hypothermia?

Notes from discussion

Prevention of hypothermia

Prewarming of the surgical patient implemented by theatre nurses

- A specified educational programme

Theatre nurse's professional scope

- **Preventive** function, through relevant knowledge and competence:
  - Promote the patient's health
  - Prevent complications
  - Patients physical and mental needs for comprehensive care
- **Patient** in focus!

Nurse anesthetists' professional scope

- **Preventive** function, through relevant knowledge and clinical competence:
  - Promote the patient's health
  - Prevent, observe and assess complications
  - Prioritize and implement nursing measures and medical tasks
- **Patient** in focus!

Facts about hypothermia

- Hypothermia: temperature below 36 ° C
- Drop of 0.2 ° C can make a significant difference
  - Increases risk of postoperative complications

Facts about inadvertent perioperative hypothermia (IPH)

IPH arises as a direct result of anaesthesia

Three phases:

Phase 1: Redistribution phase (First hour)	Phase 2: Decreasing phase (2 - 4 hours)	Phase 3: Plateau phase (after 3 - 4 hours)

Risk groups

- The elderly
- Children
- Low BMI
- Traumatized patients
- Burn victims
- Large wound areas
- Large and long -term operations
- Reduced general health condition
- Additional diseases

Complications:

- Which complications do you associate with inadvertent hypothermia?

(Internal discussion)

Complications

Postoperative wound infections: triples	Delayed wound healing	Increased bleeding tendency
Cardiovascular conditions myocardial complications triples	Postoperative tremors: can increase oxygen demand by 400-500%	Increased risk of pressure ulcers
Extended awakening time (due to reduced metabolism)	Prolonged halflife of anesthesia relaxants	Increased need for fluid infusions
	Are there any **other complications** that you discussed?	

Prewarming with FAW

- The most important measure to prevent IPH
- The goal is to maintain the patient's body heat during anaesthesia and surgery
  - Minimising cooling, evaporation, and heat loss
- Bair Hugger

Prewarming findings

- **Without prewarming:**
  - active warming intraoperatively will often not have an effect until 1.5 to 2 hours
  - active heating intraoperatively will often not be able to prevent a drop in core temperature in the first hour after the start of anaesthesia
- **10 to 15 minutes** of active prewarming is often sufficient
  - the optimum is 20 to 30 minutes of prewarming

Prewarming findings

- Important for short-term and for longer operations
  - Short-term often develope IPH
- Short-term operations (< 1 hour): 30 minutes of prewarming will lead to a reduced need for additional heating measures intraoperatively

Prewarming findings

- Increased patient comfort
- Does not delay the course of surgery;
- On the contrary contributes to more efficiency

The patients experience of prewarming

Gives greater comfort, and a feeling of security and care

80% of the patients have anxiety preoperatively

- Can be reduced through prewarming

Isn't this reason enough?

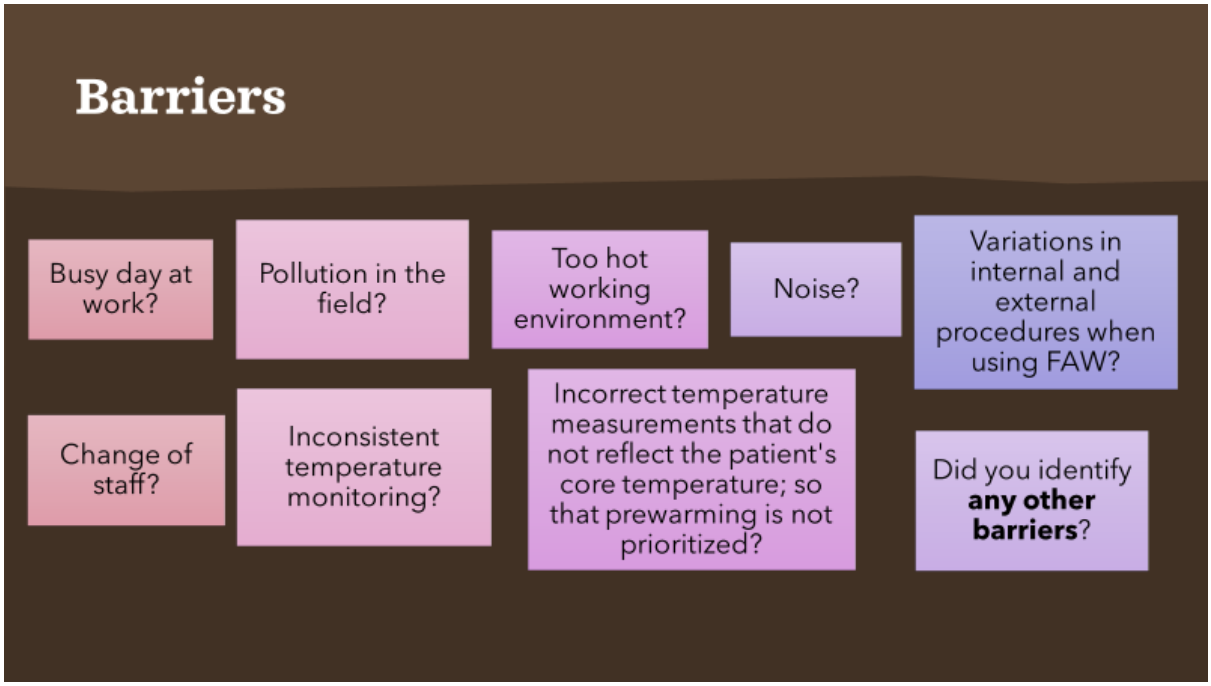
Quality improvement work

Checklist: Safe Surgery

...but what about the first part of Safe Surgery "**temperature measured**?"

What barriers, if any, do you associate with implementing prewarming?

- Discuss with the person next to you for approx. 3 minutes.


Barriers
Busy day at work?
Pollution in the field?
Too hot working environment?
Noise?
Variations in internal and external procedures when using FAW?
Change of staff?
Inconsistent temperature monitoring?
Incorrect temperature measurements that do not reflect the patient's core temperature; so that prewarming is not prioritized?
Did you identify **any other barriers**?


How can we implement prewarming in our workdays?

Notes from discussion

-
-
-
-
-
-
-

REMEMBER!

- Patient in focus
- **10 -15 minutes prewarming** is often sufficient
- Prewarming helps cover both physical and psychological basic needs
- **Together** we can do it!

Table 7: Kahoot! questions (English version) for use at the end of the lecture

Questions	**Available answers. The correct answers are in bold.**
1. At which temperature is hypothermia defined?	a) Below 36.1 °C **b) Between 34.5 and 36.0 °C** **c) Below 36.0 °C** d) Below 36.5 °C
2. Which measures are the most efficient at preventing unintended hypothermia?	a) Passive warming **b) Active warming** c) Warmed i.v. fluid **d) Active warming and warmed i.v. fluid**
3. Which temperature drop will increase the risk of developing postoperative complications?	**a) 0.2 °C below normothermia** b) 0.5 °C below normothermia c) 0.4 °C below normothermia d) 1,2 °C below normothermia
4. When is it acceptable not to prewarm the patient?	a) Short-term surgery (less than 1 hour) **b) When the patient's temperature is 37.5 °C or above** c) FAW gets in the way of the staff, even if the patient is at risk of developing hypothermia. d) To avoid noise during surgery
5. How long will it take before active warming has an effect on IPH?	**a) 1,5 to 2 hours** b) 30 minutes to 1 hour c) 1 hour to 1,5 hours d) immediately

6. How many minutes does it take from the patient's arrival at the OR until the patient is sleeping?	**a) 10 minutes** **b) 20 minutes** **c) 5 minutes** **d) 15 minutes**
7. How many minutes of prewarming will prevent a temperature loss during anaesthesia?	a) 60 minutes **b) 10–15 minutes** **c) 30 minutes** d) 5 minutes
8. The chance of getting a postoperative wound infection...	a) is very low with hypothermia **b) triples with hypothermia** c) doubles with hypothermia d) It never happens with hypothermia
9. Prewarming can prevent physical complications; what more can it prevent?	a) A cold working environment b) Missing a hot summer day c) Silence during surgery **d) Patients' anxiety**
10. Safe Surgery consists of three parts. In which part should the patient's temperature be measured?	a) Part 2 b) Part 1 c) Part 3 **d) Parts 1, 2, and 3**
11. How can prewarming be implemented more consistently?	**a) Standardise prewarming and heating measures** **b) Work as a team towards the patient** **c) Identify patients in risk groups** d) Prewarming is not necessary
12. Where is the best place to perform prewarming of the surgical patient today?	a) At the hospital ward. **b) From the patient lying on the surgical table and before initiating general anaesthesia** c) In the pre-surgery room **d) The sluice into the operating ward**
13. Was this useful and created commitment for prewarming?	**a) Yes** **b) Maybe** **c) No** **d) I don't know**

7.0 EVALUATION

Due to its dynamic approach, the didactical relationship model was utilised as an evaluation tool in order to systematically evaluate the pilot SEP and ensure that all factors were analysed and reflected upon.

7.1 Learning conditions

To deliver a lecture requires technical skills, and the personality of the lecturer influences the teaching (Harden & Laidlaw, 2021). Some may find it simpler to adapt to the role of public speaker than others. Teaching and delivering a lecture is a process, and a lecturer with little experience can become competent or even excellent over time (Harden & Laidlaw, 2021). The authors of this thesis have varying degrees of experience delivering lectures, with one having minimal experience. Regardless, the pilot lectures were successful. However, not all theatre nurses are comfortable delivering lectures. Despite this, the authors are confident that the majority will rise to the occasion when faced with the need to impart knowledge to others.

There were a total of 36 participants in the pilot lectures, including 18 theatre nurses and 8 nurse anaesthetists in group A and 10 theatre nurses in group B. 16 people from group A filled out the questionnaire. Unfortunately, group A had a 30-minute time limit compared to group B's 50-minute limit, so discussion time was shorter than intended in group A. In Group A, Kahoot! was also abandoned in favour of discussion. The groups contained nurses with varying levels of experience, so the lecturer accounted for varying levels of knowledge as well as traditionalism. The theory was deemed significant from both an informative and knowledge-refreshment standpoint without needing to go into depth on the meaning of each risk factor or complication.

7.2 Goal

When participants were introduced to the SEP, they were informed of its aim and goals, which are to increase knowledge and skills through education so that prewarming measures become standard procedure. The questions posed to participants regarding the aim and goal of the SEP are presented in Table 8.

Table 8
Questions related to the goals set for the SEP. Answers were rated from poor to excellent. In parentheses are the answers in percentages.

1. Did the specified educational programme meet the aim and goals expected from the presentation in the introduction?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			3 (19)	13 (81)
Group B				10 (100)
2. Has the specified educational programme strengthened your professional competence?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		2 (13)	9 (56)	5 (31)
Group B				10 (100)
3. To what degree was the theory presented useful for everyday practice?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			3 (19)	13 (81)
Group B			2 (13)	8 (87)
4. Were the discussions during the course relevant in relation to the aim of this lecture?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		1 (6)	6 (38)	9 (56)
Group B		1 (10)	2 (20)	7 (70)

During the presentation, there were fruitful discussions on innovative prewarming implementation strategies. Some participants are typically more active than others during group discussions. It is essential that the lecturer engage all participants without placing undue pressure on those who find public speaking challenging (Knowles et al., 2015). It is also essential to be impartial so that all reflections and opinions are evaluated objectively. Nonetheless, some of the pilot SEP's discussions veered off topic and into irrelevant topics. This may account for some of the responses to question 4. It is essential for the lecturer to guide participants back to the topic when the discussion veers off-topic. To enable this, the lecturer could provide supportive feedback on the discussions and pose a question that leads the audience back to the main issue (Harden & Laidlaw, 2021; Knowles et al., 2015). According to these responses, the lecturers largely achieved the aim and goal of the pilot study.

7.3 Settings

The pilot lecture for group A was conducted in a room equipped with a computer and a television screen for PowerPoint presentations. For those who desired to take notes, pens and paper were available. As the authors were invited to an academic workshop, thirty minutes were allotted for their presentation. Since everyone in attendance used FAW on a daily basis, there was no need for a demonstration of the apparatus, and the lecturers could concentrate on presenting the theory and promoting discussion. The lecturers started with a case intended to stimulate discussion and reflective thinking. As the computer was used for the hospital's morning report, the lecturers were not permitted to test the connection beforehand. This caused a delay because the computer lacked a zoom link for the third lecturer. To reduce the delay, one lecturer began the introductions while the other prepared the technical equipment. The presentation of the theory proceeded without any technical difficulties. There was time allocated for discussion and ideation.

The lecture for Group B was held in a room suited for the group. Before the lecture began, the lecturer took a few moments to get everything ready, and the attendees had time to grab a cup of coffee and settle in. The combined duration of the lecture and Kahoot! was fifty minutes. Everyone in group B was acquainted with FAW equipment. The available 50 minutes were sufficient to complete the lecture, kahoot!, and discussions.

The pilot lecture helped determine what worked and what could be enhanced. Harden and Lilley (2018) believe that we learn more effectively when we are aware of our strengths. This insight can be applied constructively to further our development and improve ourselves. The allotted time for the lecture is important so that the process of reflection and subject engagement can be fully utilised. Preparing technical equipment before the lecture prevents delays. The most essential factor is creating an environment in which all participants are engaged and interested in the topic. Given that preventing hypothermia is an everyday occurrence in clinical practice, the process of reflection could continue after the lecture has concluded. The feedback for questions regarding the settings is presented in Table 9.

Table 9
Questions related to the settings surrounding the SEP Answers were rated from poor to excellent. In parentheses are the answers in percentages.

5. Was the time set for the specified educational programme appropriate?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		2 (13)	9 (56)	5 (31)
Group B			2 (20)	8 (80)
6. Was the time allotted for the theory section sufficient?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		7 (44)	8 (50)	1 (6)
Group B			2 (20)	8 (80)
7. Was the time allotted for discussion sufficient?				
	Poor (%)	Fitting (%)	Good (%)	Excellent (%)
Group A	1 (7)	5 (31)	9 (56)	1 (6)
Group B		1 (10)	1 (10)	8 (80)

Several members of group A requested additional time for the lecture but commented that they had grasped the lecture's central message and begun to reflect. Group B was content with the allocated time. This reflects the author's views on the amount of time that should have been allocated. The topic can be presented and discussed in 30 minutes, but there is a sense of hurriedness, and the reflective process was limited. Still, this is preferable to doing nothing. However, an hour should be adequate to encourage greater participation and give participants time to arrive at their own solutions with guidance.

In Group B, Kahoot! was administered following the PowerPoint presentation. The game was displayed on a projector screen. All participants connected using their own mobile devices. Due to technical difficulties, some participants were logged out of the quiz. This caused an unnecessary delay for the participants, which was regrettable. This may be due to a sluggish internet connection or participant unfamiliarity with Kahoot! This was also mentioned by Wang and Tahir (2020) as a typical barrier. Despite the delay, favourable feedback was received. The participants appeared to appreciate the fact that the lecture concluded with a quiz, which elicited laughter and even a few instances of competitive behaviour.

In addition, all members of group B provided verbal feedback that the quiz was entertaining. Some questions could have been given faster, while others were presented too fast, so time adjustments can be made within the game itself. The lecturer is also a factor to consider when evaluating the parameters (Hiim & Hippe, 2022). Therefore, the participants were asked to rate the lecturer(s), and the results are shown in Table 10 below.

Table 10

Questions related to the lecturer's performance during the SEP. Answers were rated from poor to excellent. In parentheses are the answers in percentages.

8. Did the lecturer(s) create a good learning atmosphere during the course?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			3 (19)	13 (81)
Group B			1 (10)	9 (90)
9. Did the lecturer(s) seem professionally confident on the subject of prewarming?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			1 (6)	15 (94)
Group B				10 (100)
10. Were relevant questions answered in a professional and in an evidence-based way? From this question only 13 participants in group A answered as these were on the back of the form which was missed by 3 participants. The percentage is therefore adjusted to 13 participants from this point.				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			2 (15)	11 (85)
Group B			1 (10)	9 (90)
11. Did the lecturer(s) lead discussions systematically, as was relevant for the topic?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			8 (62)	5 (38)
Group B			1 (10)	9 (90)

According to the answers regarding the lecturers, the lecturers created a positive atmosphere, were knowledgeable about prewarming, led discussions effectively, and answered queries appropriately. Group A had less time for inquiries, but participants provided verbal feedback that they felt they had gained new knowledge. Rather than focusing solely on the well-known complications of IPH, several individuals pondered prewarming and its effect on the patient's comfort and well-being.

7.4 Content

According to Harden and Lilley (2018), the lecturer should be familiar with the lecture's content, which implies that they should adapt it to their teaching style. It can be beneficial for the teacher to communicate in their preferred manner or language, as this can make the presentation more intuitive and therefore easier to engage the audience. A competent teacher encourages students to share and discuss their personal experiences, as adults learn best when emotions tied to life events are involved (Harden & Lilley, 2018; Knowles et al., 2015). The purpose and audience of the lecture will have a significant impact on the presentation's contents (Hiim & Hippe, 2022). Different teaching strategies improve lectures. Kahoot! and the use of cases aid the lecturers in assessing the level of comprehension among the audience. In addition, it indicates whether participants believed there was a need for development and whether they would be motivated enough to implement changes (Wang & Tahir, 2020).

During the planning phase, the authors created a PowerPoint that could be readily adapted to the different levels of the target group. The pilot lecture placed a greater emphasis on problem-solving and introspection, as the theory was typically well-known and only required a brief review. For a different group, there may be a greater need for a more in-depth discussion of physiology and the effects of prewarming or the absence thereof, on potential complications. To increase the effectiveness of the lecture, it is advantageous for attendees to establish connections between theory and practice (Harden & Laidlaw, 2021). Throughout the presentation, the lecturers provided several implementation strategies for prewarming. For instance, during lower-body surgeries where the FAW is utilised and the patient receives spinal anaesthesia, if the patient is seated during the induction of spinal anaesthesia, the FAW blanket can be placed over the patient's lap. The lecturers encouraged attendees to think creatively and solution-focused. This allows participants to consider their own actions and, presumably, apply the theory in clinical practice (Harden & Laidlaw, 2021). Participants were encouraged to ask questions throughout, but time was also reserved for questions at the conclusion. Table 11 presents questions and answers pertaining to the content of the pilot SEP.

Table 11

Questions related to the contents of the SEP. Answers were rated from poor to excellent. One question is a yes, don't know, maybe, or no question. In parentheses are the answers in percentages.

12. Were the contents of professional relevance?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			2 (15)	11 (85)
Group B			1 (10)	9 (90)
13. Did you gain new knowledge or refresh your knowledge through the lecture?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		1 (8)	5 (38)	7 (54)
Group B			3 (30)	7 (70)
14. Did the discussions allow for constructive reflection?				
	Poor	Fitting (%)	Good (%)	Excellent (%)
Group A		1 (8)	5 (38)	7 (54)
Group B			1 (10)	9 (90)
15. Would you consider changing your everyday practice after this specified educational programme?				
	No	Don’t know	Maybe	Yes, definitely (%)
Group A				13 (100)
Group B				10 (100)
16. How would you rate the overall quality of the specified educational programme?				
	Poor	Fitting	Good (%)	Excellent (%)
Group A			4 (31)	9 (69)
Group B				10 (100)
17. Was the progression of the educational intervention appropriate for learning?				
	Poor	Fitting	Good	Excellent
Group A			4 (31)	9 (69)
Group B				10 (100)

Both groups found the content to be professional and relevant. Theatre nurses in group B suggested the lecturer include anaesthetic nurses. This educates them about prewarming and facilitates implementation when employees collaborate. During the lecture, the theory was discussed. The participants discovered that IPH caused more severe complications than anticipated. However, they were aware that IPH could cause postoperative infections, but not

that the risk was tripled. Some mentioned that they were unaware that prewarming was a standard procedure for most surgical patients, and others were astonished to learn that other hospitals prewarm every patient. A few stated they were aware of the physical complications but had not considered the psychological effects. It was essential for the lecturers to promote awareness, introspection, and evaluation during their lectures.

Safe Surgery was a central topic of the presentation. The three components of Safe Surgery were examined. All participants agreed that the first step is frequently disregarded and that the patient's temperature is measured only after the initiation of general anaesthesia. The lecture emphasised the significance of critical evaluation. The participants agreed and discussed how they could enhance themselves, their self-practice, and their routines. Some mentioned that refreshing their knowledge of Safe Surgery was beneficial and reminded them of the significance of measuring the patient's temperature.

The questionnaire's content was deemed adequate in light of the vast differences in work experience and prior knowledge. Two participants deemed the content to be fitting rather than good or excellent. Future questionnaires should include a section for free-form comments, which would enable respondents to provide more specific feedback on what they felt was missing.

8.0 ETHICAL CONSIDERATIONS

The authors assert that this SEP was created solely out of a desire to prevent IPH and a desire to break down potential barriers. The objective of the authors is to implement change with a SEP based on the evidence of prewarming's benefits. Ethical considerations are closely tied to the nurses' attitudes toward prewarming and changing traditions in everyday practice. While working on this thesis, the authors reflected on theatre nurses' disposition towards change. Experience shows that there are several that adhere to tradition and avoid attempting to improve or fix something that they consider already adequate. As a result, prewarming continues to be an infrequent practice (Becerra et al., 2019; Weirich, 2008).

Nurses adhere to the ethical principles of beneficence and non-maleficence as outlined in the Nurses' Code of Ethics (NSF, 2019, 2022). Despite the demonstrated benefits of prewarming, it is noteworthy that this practice is often overlooked in clinical settings where adherence to ethical codes is expected. According to Hjelen and Sagbakken (2018) article, theatre nurses face barriers to implementing evidence-based practices due to insufficient time and expertise. The authors attribute these barriers to a lack of organisational infrastructure and culture that foster and sustain evidence-based practices. The results of their study indicate that these factors may be observed within the framework of inadequate support as well as insufficient dedication, both at the individual and institutional levels. Vråle et al. (2017) conducted a qualitative investigation on ethical reflection and awareness-raising in teaching, aiming to address ethical challenges that arise in the daily practice of nurses. Nursing professionals may encounter moral distress and feelings of shame when they encounter situations where there is a conflict between the patient's needs and the demands of the treatment system. The incorporation of ethical reflection within guidance has the potential to be beneficial. Nurses frequently experience time and efficiency constraints that exert pressure on their work. The expression "on behalf of the patient" can be interpreted as a manifestation of values that pertain to the personal and professional duties and responsibilities of nurses in their interactions with individual patients. The fundamental principles of nursing are closely associated with the existence and inherent worth of the individual human being. Participants described how individual adaptation of measures was frequently neglected in favour of more general ones, and when they were unable to fulfil their responsibilities, they felt despair and guilt (Vråle et al., 2017). Moreover, the absence of allocated time for professional development by management could potentially diminish employees' motivation and

commitment, leading to a regression towards previous customs and practices. According to Vråle et al. (2017) research, participants reported that guidance on ethics and cooperation prompted them to reflect and gain the confidence to effect change within their respective workplaces. During the planning phase of this thesis, the authors contemplated this moral conundrum. Change necessitates excitement and energy. The apparent choice for a quality improvement thesis was a SEP that increases competence while engaging participants through discussion, reflection, and problem-solving, presented during an academic workshop. The authors suggest that guidance or instruction that emphasises reflection on ethical challenges and collaboration can facilitate change. Thus, the theatre nurse can ensure all patients' autonomy, non-harm, beneficence, and equal treatment.

Knowles' six assumptions, developed by Malcom Knowles in the 1970s, govern the learning of all SEP participants, who are all adults: the need to know, the need to learn, self-concept, learning from prior experiences, preparedness to learn, life-centred learning to develop increased competence levels, and motivation for learning (Knowles et al., 2015).
During the planning phase of the SEP's learning process, it was essential to consider the material and the intended outcome. Adults value knowing why they must learn something new, and by helping them comprehend that it is to enhance their knowledge and competence as part of ensuring patient safety, the need for learning becomes clear. An adult's self-perception is predicated on a transition from dependence to self-management, which can be achieved through active participation in discussions that facilitate the learning process. Often, prior experience can be a learning resource because it enables the nurse to connect past experiences with theory (Knowles et al., 2015). Adults are typically receptive to learning something new if it will assist them in mastering a situation or task. Adults have a life-centred and problem-oriented approach to learning, which is a process leading to a higher level of competence. Using the various forms of instruction will foster this growth. Adults have an internal rather than an external motivation for learning, unlike infants. Often, this is sufficient to initiate a process of reflection, which significantly aids the learning process (Knowles et al., 2015).

9.0 FOLLOW UP

After the lecture, prewarming received increased attention. The placement of a heating cabinet close to each operating room was one of the novel suggestions made during the pilot lecture for group B. Following the lecture, this was implemented. In addition, participants from both groups discussed prewarming on subsequent days and shared with their coworkers how they would prewarm patients. However, they reported that prewarming the first patient was simple, but preheating the second patient was difficult due to staff turnover during the lunch break. In addition, they felt a great urgency to complete all surgeries before the evening shift began. The sensation of pressure may persist until prewarming becomes a natural part of the perioperative process or until the department discovers more suitable routines and recognises that prewarming, in fact, creates efficiency. According to research, the increased efficacy as a direct result of prewarming is due in part to the drugs' faster breakdown, which results in shorter anaesthesia wake-up intervals (Broback et al., 2018; Madrid et al., 2016). This may require time to be observed and recognised. Due to the nature of the questionnaire inquiries, it is impossible to determine how much knowledge the participants gained or how much the SEP influenced their clinical actions. Future questionnaires should allow for written feedback. However, the questionnaire allowed comparison, which helped identify SEP areas that required improvement.

In future academic workshops, the SEP will be presented to groups of other theatre nurses and nurse anaesthetists to ensure that everyone is working toward the same objective: prewarming as a standard procedure for all surgical patients. Upon reflection, it may be advantageous to include postoperative nurses to ensure a unified comprehension of how to ensure the patient receives prewarming throughout the perioperative process. On occasion, patients are called down to the postoperative ward to receive nerve blocks, epidurals, and other treatments prior to surgery. These patients frequently receive the mentioned medical procedure only partially clothed. In addition, they are washed with a disinfectant containing alcohol, which may cool the patient further. It is crucial that these patients be prewarmed prior to surgery. In this case, the postoperative nurses would initiate prewarming. On the other hand, it may be beneficial to keep lecture participants in smaller groups to encourage more discussion without the burden of public speaking in front of numerous people. Additionally, the theory would likely need to be modified to accommodate the knowledge gap between OR staff and postoperative personnel, who have differing patient care focus and

levels of education. A tailored SEP may therefore be preferable to combining the specialties. Furthermore, a pamphlet containing summarised information about IPH and the significance of prewarming could be provided to patients when they are summoned for surgery. In this manner, as mandated by law, patients are encouraged to participate in their own health care (Pasient og brukerrettighetsloven, 1999).

In the event that the SEP receives a favourable response, the surgical department's procedures may be modified. As part of their orientation programme, a brief introduction to prewarming should be provided to all new employees. The objective is to promote lasting changes in current practice and enhance the quality of patient care (Harden & Lilley, 2018). In addition to benefiting both the patient and the surgical department, the SEP should be perceived as a positive experience by participants (Helsedirektoratet, 2019, 2020). This must be accomplished by utilising evidence-based practice and arguing the benefits of prewarming for both the patient and the surgery or postoperative department. Figure 9 below presents a number of factors that must be addressed for enduring change.

Figure 9

Factors necessary for lasting change

Figure 9. Factors required to enable lasting change. Originally found at Kvalitetsforbedring, Helsebiblioteket, Modell for kvalitetsforbedring - English.

Establishing a method for assessing whether or not lasting change has happened and whether it delivers the anticipated benefits with respect to the necessary resources is crucial in addition to the SEP. Any feedback provided during the control period following the SEP will be evaluated and adjustments made as necessary. As part of quality improvement, it is the collective obligation of the theatre nurses to implement evidence-based changes that are sustainable (Helsedirektoratet, 2020). All personnel in the surgery department should be engaged through motivation, information, and, if necessary, professional development. However, change cannot be implemented if the OR staff lacks a desire for change. Equally essential is the management's attitude toward change; consequently, it is crucial that they are involved in the process and receive adequate information about the benefits of prewarming (Helse- og omsorgsdepartementet, 2017; Helsebiblioteket, 2021b; Orvik, 2022). Therefore, the quality enhancement is legitimised and has a greater chance of success (Helse- og omsorgsdepartementet, 2017; Helsedirektoratet, 2018a; Orvik, 2022), as the SEP relies heavily on their support and resources. Ideally, the SEP could be utilised by other institutions to improve the quality of standard treatment for all patients, thereby reducing society's expenses on a much larger scale. This could be accomplished through communication and experience sharing with counterparts at other hospitals, local or national networking, articles, posts, and lectures (Helsedirektoratet, 2017, 2018b).

10.0 CONCLUSION

The authors developed a specified educational programme and tested it systematically for evaluation purposes. The evaluation suggested that the SEP could enhance or update knowledge and skills, potentially fostering a shift in mindset regarding the adoption of prewarming measures. The verbal comments of the attendees demonstrated to the authors the significance of lectures on prewarming. It demonstrated that not all theatre nurses are aware of the physical and psychological benefits of prewarming the patient. After the pilot lecture, methods for incorporating prewarming into surgical procedures were developed while maintaining the integrity of the surgical schedule and ensuring the necessary sterility of the operating site. This bolsters the significance of this thesis and a SEP that can be implemented and modified at various institutions to help standardise the level of care provided to all patients.

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Appendix 1: Comprehensive Details of the Literature Search

Search history with findings

Search terms	**Database**	**Total number of hits**	**Relevant findings according to inclusion and exclusion criteria**
Pasientsikkerhet og kvalitet	Regjeringen.no	293	• Meld. St. 11 (2020-2021) – Kvalitet og pasientsikkerhet 2019 • Meld. St. 7 (2019-2020) – Nasjonal helse- og sykehusplan 2020-2023
(Education OR prevent OR hypothermia OR surgery)	McMaster Plus • Up To Date • PLUS Synthesis	 50 100	 • No findings • No findings
(Prevent AND hypothermia AND surgery)	• Best Practice	19	• Nr 2 Hypothermia: prevention and management in adults having surgery (NICE, 2016)
(Prewarm*)	• Up To Date • PLUS Synthesis	1 4	• No findings • Nr. 1 A systematic review on the effectiveness of prewarming to prevent perioperative hypothermia (Poveda et. al., 2012)
(Prevention of hypothermia)	• Up To Date • Best Practice • PLUS Synthesis	50 50 100	• No findings • No findings • Nr 30 Active body surface warming systems for preventing complications caused by inadvertent perioperative hypothermia in adults (Madrid et. al., 2016)
	DARE	4	• Nr 2 Effectiveness of strategies for the management and/or prevention of hypothermia within the adult perioperative environment (Moola & Lockwood, 2011)

(Interprofessional education)	McMaster Plus ● Up To Date ● DARE ● PLUS Synthesis ● EMB Guidelines	 50 3 13 1	 ● No findings ● Interprofessional collaboration to improve professional practice and healthcare outcomes (Review) (Reeves et. al., 2017) ● Interprofessional education: effects on professional practice and healthcare outcomes (Reeves et. al., 2013) ● The effectiveness of interprofessional education: key findings from a new systematic review (Reeves et. al., 2010) ● No newer findings ● Effects of interprofessional education on professional practice and health care outcomes (EMB, 2011)
Hypotermi	Helsebiblioteket.no – Ferdige fagprosedyrer	10	● Nr 4 Hypotermi perioperativt – forebygging og behandling
(Prevent hypothermia surgery) (Prewarm*)	● AORN Journal	341 80	● Nr 12 Prevention of unplanned perioperative hypothermia (Paulikas et. al., 2008) ● Nr. 43 Effects of comfort warming on pre-operative Patients (Cooper, 2006) ● Nr 18 Hypothermia/ Warming protocols: Why are they not widely used in the OR? (Weirich, 2008) ● Nr 24 Recommended practices for the prevention of unplanned perioperative hypothermia (AORN Journal, 2007) ● Nr 63 Effects of comfort warming on preoperative patients (Wagner et. al., 2006) ● No newer findings

Hypotermi	• NSFLOS	13	• Nr 1 Forebygging av hypotermi. Lecture (Sandersen, 2012) • Nr 10 Hypotermi- Prehospitalt-Perioperativt- Postoperativt. Forelesning. Seminar at Klækken (2014) • Nr 12 Operasjonssykepleierens ansvar- og funksjonsbeskrivelse (NSFLOS, 2016)
(Prewarming) (Hypothermia AND preoperative warming) (Preoperative warming)	• Medline Ovid	127 25 39	• Nr 27 Effects of 10-min prewarming on core body temperature during gynecologic laparoscopic surgery under general anesthesia: a randomized controlled trial (Lee et. al., 2020) • Nr 63 Resistive-heating or forced-air warming for the prevention of redistribution hypothermia (De Witte et. al., 2010) • Nr 54 Effects of pre-operative warming on the occurrence of surgical site infection: A systematic review and meta-analysis (Zheng et. al., 2020) • Nr 104 Preventing inadvertent perioperative hypothermia (Torossian et. al., 2015) • No newer findings • Nr 20 A review of the evidence for active preoperative warming of adults undergoing general anaesthesia (Roberson et. al., 2013)
(Interprofessional relations OR lecture)	• Medline Ovid	92	• No newer findings
(Prewarming hypothermia)	• Pubmed	134	• Nr 22 Prewarming. Yesterday's luxury, today's minimum requirements (Bräuer et. al., 2014) • Nr 111 The effect of short time periods of preoperative warming in the prevention of peri-operative hypothermia (Horn et. al., 2012)

(Prevent AND hypothermia AND surgery) (Unplanned AND hypothermia)		242 57	• No newer findings • No newer findings
(Interprofessional relations AND lecture*)	• Pubmed	288	• No newer findings
(Prevent AND hypothermia)	• Cochrane	22	• No newer findings
(Education for health care professionals)	• Cochrane	141	• Nr 2 Educational games for health professionals (Review) (Akl et. al., 2013)
(Prewarm*) (Prevent AND hypothermia AND surgery)	• Epistemonikos	60 74	• No newer findings • Nr 11 Preoperative warming with a forced-air warming blanket prevents hypothermia during surgery (Broback et. al., 2018) • Nr 24 Prevention and management of perioperative hypothermia in adult elective surgical patients: A systematic review (Simegn et. al., 2021) • Nr 71 Effect of Perioperative Active Body Surface Warming Systems on Analgesic and Clinical Outcomes: A Systematic Review and Meta-analysis of Randomized Controlled Trials (Balki et. al., 2020)

Appendix 2: Elaborated Source Criticism of the Main Articles

Article	Educational games for health professionals (review) (Akl et al., 2013).
Method	Review with systematic literature search.
Participants	Includes two RCTs.
Intervention	Jeopardy/family feud (quiz) verses Snakes and ladders board game as active learning methods.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● A modified version of the EPOC data checklist was used to extract data. ● The critical appraisal was conducted independently by two reviewers. ● Low risk of bias and declared no conflict of interest. ● Used GRADE to ensure the quality of the source. ● The utility of games as a teaching strategy for health professionals is unclear. The article neither confirms nor refutes whether the findings are recommended for further us. ● Due to the lack of transparency regarding method development, there is considerable room for individual data interpretation. ● Specific directives for the new search were appropriate, as was additional high-quality research to explore the impact of educational games on performance outcomes and patient.
Comment	The authors cannot conclude whether these types of games contribute to increased learning among participants, but they can indicate increased enthusiasm for the topic, which can contribute to increased learning. Older literature, however, this publication in the Cochrane Database of Systematic Reviews has been cited 97 times. 21% of its citations have been received in the past two years (Dimensions, 2023d).

Article	Effect of Perioperative Active Body Surface Warming Systems on Analgesic and Clinical Outcomes: A Systematic Review and Meta-analysis of Randomised Controlled Trials (Balki et. al., 2020).
Method	Systematic reviews and meta-analyses of randomised controlled trials (RCT).
Participants	3976 patients (54 articles). Adults over 18 years old. Included only noncardiac surgical procedures.
Intervention	To provide an updated review on temperature maintenance and clinical outcomes from the effect of active body surface warming systems (ABSW). Active body surface warming systems include circulating water garments, electric warming blankets, heated mattresses, and forced-air warmers (FAW).
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria and search strategy. ● Adequate sources and resources. ● The Mantel-Haenszel method for categorical data was used with a piloted data extraction form. ● The critical appraisal was conducted independently by two reviewers. ● Cochrane Collaboration's tool for assessing the risk of bias. Some studies scored unclear in the risk of bias, and less than 5% scored high in the risk. ● ABSW for upper-body, lower-body, and full-body were included. ● Well-documented search and method. ● Findings are critically discussed. ● Recommendations were supported by the reported data and were specific to new research.
Comment	No significant effect of prewarming on postoperative opioid use or pain was observed. One of the subgroups administered ABSW pre-operatively and continued to administer it throughout surgery, with excellent results.

Article	Pre-operative warming with a forced-air warming blanket prevents hypothermia during surgery (Broback et al., 2018).
Method	Systematic review with randomised controlled trials (RCT) included. The findings are presented in a narrative analysis.
Participants	Ten articles are included. Adults between 18 and 85 years old. Patients going through elective surgery under general anaesthesia.
Intervention	To find new knowledge about the effect of prewarming using FAW, in the prevention of IPH during surgery.
Source criticism	JBI Critical Appraisal Checklist for systematic reviews and research synthesis is used: ● A clear and explicit review question ● Appropriate inclusion criteria and search strategy ● Adequate sources and resources ● Data analysis was appropriately conducted and described. ● The article's various figures and tables are simple to read and easily understandable. ● A well-documented method that describes the research criteria and the process. ● The authors include and discuss studies that have contradictory results. ● A critical appraisal was conducted independently by two reviewers. ● Seven main points reflect different features of the study that could show a risk of systematic bias. ● Some of the studies scored high or were unclear on the validation tool RoB (the Cochrane Collaboration's tool for assessing risk of bias). ● Inaccurate measuring instruments were used in one of the studies, and another study used various measuring instruments. ● Factors such as diseases, age, and weight can influence the outcome; these factors should be kept in mind and equally distributed between the groups. ● Some of the patients had a high BMI. This may have influenced the results in a positive way, since they are less exposed to heat loss. However, once they are hypothermic, it often takes them longer to return to normothermia. ● The authors recommend further research regarding children, older people above 85 years old, patients with ASA III or above, and also prewarming during different kinds of surgeries. ● The article is recommended for health personnel in practice as it could be a good source of knowledge regarding prewarming of the surgical patient.
Comment	Prewarming with FAW has a substantial impact on the prevention of IPH. The recommended preheating temperature for FAW is above 40 °C, and the recommended preheating time is 10 to 30 minutes. During surgery, it may be beneficial to continue warming the patient.

Article	The effect of preoperative warming on patients' postoperative temperatures (Home Study Programme) (Cooper, 2006).
Method	Professional, non-scientific article.
Intervention	Prewarming.
Source criticism	● Addresses both the psychological and physical needs that prewarming covers. ● Cooper compares several different types of studies to give greater validity to their findings. ● Is a surgical services charge nurse, meaning they are on a similar educational level to the authors of this thesis and therefore have a similar understanding of prewarming, making it easier to draw parallels. ● One of the studies is about two interventions; thus, one of the studies had a control group and an experimental group. ● Older literature. However, a strength is that this article is still being widely used and has been cited in 83 articles, most recently in 2023 and 2022. ● The study has no methodological component. Not much is known about the authors' inclusion and exclusion criteria, and the study does not criticise the methods on which the primary sources are based. ● One study included a simulation, so it did not include "real" patients. It was tested on seven men, and due to the small sample, the findings cannot be generalised. However, the researchers' reasoning was sound, as it confirmed what the authors of this thesis already knew: that prewarming maintains the patient's normal temperature for hours after surgery.
Comment	The study identifies a problem, demonstrates its impact on nursing, conducts a literature review, and concludes with a summary. In conclusion, the author discusses calls for additional research on prewarming. This publication has been cited 99 times as per 13.05.23 according to google search.

Article	Resistive-heating or forced-air warming for prevention of redistribution hypothermia (De Witte et al., 2010).
Method	Primary research study.
Participants	27 adults, patients were not older than 80 years old. Elective patients going through laparoscopic colorectal surgery.
Intervention	Patients were randomised into three different groups, with nine patients in each group: No prewarming group; prewarming 30 minutes with a 42°C whole body-cover carbon fibre group and prewarming with FAW 30 minutes with 42 °C group
Source criticism	JBI Critical Appraisal Checklist for Randomised Controlled Trials. ● The authors in this article do not present or mention this study as an RCT. We understood this to be an RCT since randomization is used. ● True randomisation was made, randomisation consisted of drawing lots by a random individual. ● Allocation to the treatment group was concealed, the sealed envelope was destroyed after being drawn. ● Treatment groups were similar, all patients scheduled for the same surgery, normal weight defined by the body mass index and comparable ASA. ● Patients were blind to treatment until the moment treatment started, since they could see and feel if they got prewarmed or not. It could be that the patient that got prewarmed didn't know the difference between FAW and carbon fibre. ● There is no information if those delivering the treatment were blind to treatment assignment, which is seen as a weakness in this study. ● Treatment groups were treated identically other than the intervention of interest. ● Unclear if outcome assessors were blind to treatment assignment. ● Outcomes were measured in the same way for treatment groups and measured in a reliable way, low risk of bias. ● Used the same duration of prewarming which gives clear and comparable results. ● The equipment used in the study was donated from a healthcare company, so a conflict of interest may have occurred. ● Temperature pre- and postoperatively was measured in the ear, while it was measured via oesophageal probe intraoperatively, it can give a risk of temperature differences. ● Participants were analysed and appropriate statistical analysis used. ● Peer-reviewed.
Comment	Prewarming must be implemented in the perioperative phase, especially in elective patients with risk factors. This publication in Anesthesia & Analgesia has been cited 62 times. 20% of its citations have been received in the past two years (Dimensions, 2023h).

Article	The effect of short time periods of pre-operative warming in the prevention of peri-operative hypothermia (Horn et. al., 2012).
Method	Primary study, RCT.
Participants	200 randomised patients, both genders. Adults over 18 years old. Elective surgery lasting 30 to 90 minutes under general anaesthesia.
Intervention	Passive heating is alternated with active preoperative FAW heating for 10, 20, or 30 minutes. All fluids were warmed to 39 °C.
Source criticism	JBI Critical Appraisal Checklist for Randomised Controlled trials. ● RCT with a large number of participants. ● True randomisation for the assignment of participants. A modified dice was rolled to assign the patient to one of the four treatment groups. ● Allocation to treatment groups was concealed, and the participants were blinded until the treatment started. The patient would perceive if they got prewarmed or not. ● Those delivering the treatment were blinded until the modified dice were rolled and one of the four treatments was assigned. ● An investigator, blinded to the patient's core temperature, was present, observing and grading shivering and thermal comfort. ● Treatment groups were similar: adults, classified not higher than ASA II, and elective surgery under general anaesthesia. ● All treatment groups were treated identically. ● Identical temperature measurements for all participants. ● Outcomes are measured in a reliable way. ● Participants were analysed and appropriate statistical analysis used. ● No funding or competing interests were declared. ● Well documented and presented methodology, results, and discussion. ● Appropriate trial design.
Comment	The results showed a significantly greater proportion of patients whose core temperature dropped in the passive group than in all the prewarmed groups. There was no significant difference between the three preheated groups. Warming for as little as 10–20 minutes proved to be sufficient to prevent hypothermia in the vast majority of patients. Older literature, however, this publication in Anaesthesia has been cited 108 times. 22% of its citations have been received in the past two years (Dimensions, 2023j).

Article	Resistive polymer versus forced-air warming: comparable heat transfer and core rewarming rates in volunteers (Kimberger et al., 2008).
Method	Primary research article, quasi-experimental study.
Participants	Eight healthy participants. 19 to 25 years old.
Intervention	The participants were chilled without anaesthesia and rewarmed on two separate days using two distinct rewarming methods on the respective days.
Source criticism	JBI Critical Appraisal Checklist for Quasi-Experimental Studies (Non-Randomised Experimental studies). ● Clear and explicit "cause" and "effect," active warming with forced-air warming, and polymer fibre resistive warming. ● All participants were healthy, did not routinely take any medications, and had a body mass index of less than 30. ● The participants received no other treatment or care other than exposure for the study. ● The same patient group on both days, which contributes to increased reliability in measurements. ● Measures of pre- and post-exposure were made. Several measurements, including heart rate, blood pressure, and thermal comfort, were collected continuously at ten-minute intervals. Temperatures of the skin were taken from 15 various locations, and the tympanic membrane was used to measure the core temperature. ● The follow-up was completed. ● In both groups, participants' outcomes were measured with the same method. ● Results were measured and presented in a transparent and reliable manner, and results were presented appropriately in statistical analysis. ● Low risk of bias. ● Peer reviewed. ● Small trial group, which may affect the validity of the results. ● The participants were healthy, so the transfer value must be critically assessed.
Comment	Equal effect of both forms of active heating. This publication in Anesthesia & Analgesia has been cited 44 times. 6% of its citations have been received in the past two years (Dimensions, 2023i).

Article	Effects of 10-min prewarming on core body temperature during gynecologic laparoscopic surgery under general anaesthesia: a randomised controlled trial (Lee et al., 2020).
Method	Randomised controlled trials (RCT).
Participants	54 gynaecology patients (19 to 75 years).
Intervention	The prewarming group prewarmed for 10 minutes before initiation of general anaesthesia combined with intraoperative warming. Non-prewarm group warmed intraoperatively. Both groups warmed with FAW.
Source criticism	JBI Critical Appraisal Checklist for Randomised Controlled Trials. ● True randomisation for the assignment of participants using a computerised random number generator. ● Allocation to treatment groups was concealed, and the participants were blinded until the treatment started. The patient's allocation was put into a sealed envelope by an assistant, and opened after the patient entered the operating theatre. Double blinding was impossible for this study. The patients would feel if they got prewarmed or not. Researchers were blinded. ● An investigator blinded to the patient's allocation did an observation, grading the patient's shivering. ● Treatment groups were similar in age, BMI, type of surgery, duration of anaesthesia, blood loss, surgery duration, amount of administered. fluid, and classified not higher than ASA II. ● All treatment groups were treated identically. ● Identical temperature measurements for all participants. ● Outcomes measured: infrared tympanic thermometer used before the patients were intubated. Controversy exists concerning the accuracy. of the tympanic thermometer, which can be considered a weakness. ● Participants were analysed and appropriate statistical analysis used. ● Appropriate trial design. ● The prewarming group was prewarmed on the operating table, which may have had a favourable influence on the results.
Comment	Prewarming for 10 minutes was an effective way to prevent IPH. Prewarming also showed a lower incidence of postoperative shivering.

Article	Active body surface warming systems for preventing complications caused by inadvertent perioperative hypothermia in adults (Review) (Madrid et al., 2016).
Method	Systematic literature review.
Participants	5438 patients in 67 trials (RCTs).
Intervention	Active warming aimed at maintaining normothermia, using FAW pre- and/or intraoperatively, as a preventive measure against postoperative complications caused by IPH.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● Criteria for appraisal of the included RCTs were appropriate. ● The critical appraisal was conducted by several authors and collaborators in pairs, independent of each other. Disagreements were resolved through discussion and consensus among the authors, but with the collaboration of a third author. ● Several authors, in pairs, extracted data independently using a standardised data extraction form that is attached. ● The methods used to combine the trials were appropriate and gave 79 comparison points. ● Bias was assessed by two pairs of authors independently of each other for each study, using criteria outlined in the Cochrane Handbook for systematic reviews of interventions. Disagreements were resolved by discussion of the involvement of a third party. Well documented ● Recommendations for practice were supported by the reported data. ● Specific directives for the new search were appropriate; there was a need for larger studies of high quality and focused on clinically relevant outcomes.
Comment	The study concluded that there is a lower incidence of postoperative complications where FAW has been used and that the studies showed that there is no significant risk during patient treatment. This publication in the Cochrane Database of Systematic Reviews has been cited 184 times. 43% of its citations have been received in the past two years (Dimensions, 2023c).

Article	Effectiveness of strategies for the management and/or prevention of hypothermia within the adult perioperative environment (Moola & Lockwood, 2011).
Method	Systematic literature review that includes randomised controlled trials (RCT) and/or a control group.
Participants	1451 patients. Adults over 18 years old. All types of surgery.
Intervention	All types of warming, for instance, active warming, heated blankets, or fluid heaters.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● JBI Critical Appraisal Tools (JBI-SUMARI) were used to appraise the included RCTs. ● Two reviewers independently appraised the studies, and disagreements were resolved through discussion. ● It is not clear if methods were used to minimise errors in data extraction, as a meta-analysis was not possible due to the heterogeneity of the included studies. ● The method used to combine the studies was a narrative comparison, which was appropriate here since a direct comparison was not possible. ● Bias was assessed and not found in this article. ● Recommendations were supported by the reported data. ● Specific directives for new research were appropriate, calling for larger RCT trials looking at several factors.
Comment	The authors believe that the implementation of individual measures such as active heating preoperatively with subsequent temperature monitoring is more effective than passive measures. This study is old and therefore not necessarily up-to-date. However, this publication in the International Journal of Evidence-Based Healthcare has been cited 145 times. 26% of its citations have been received in the past two years (Dimensions, 2023e). This supports the validity of the study's conclusions as still relevant today.

Article	Barriers and enablers to the implementation of perioperative hypothermia prevention practices from the perspectives of the multidisciplinary team: a qualitative study using the Theoretical Domains Framework (Munday et. al., 2019).
Method	A qualitative study with semi-structured interviews.
Participants	12 participants, including nurses, surgeons, and anaesthetists.
Intervention	Identify and examine barriers to IPH prevention.
Source criticism	JBI Critical Appraisal Checklist for Qualitative Research. ● There is congruity between the stated philosophical perspective and the research methodology. ● It is the congruity between research methodology and questions. ● Data was collected through individual semi-structured interviews using the Theoretical Domains Framework. ● Two independent authors analysed the data. ● The result was presented in 11 theoretical domains, and some examples of the participants' answers were presented in tables. ● During data collection, discrepancies between authors were resolved with discussion. The belief statements were generated using thematic analysis. A precise statement locating the researchers culturally or theoretically was not mentioned. ● The authors' influence and vice versa are unclear, although it is mentioned that one of the authors has a prior professional relationship with one of the participants. ● The participants and their views are adequately represented. ● Ethical approval was obtained prior to commencement. Administrative approval was also obtained from the university HREC. ● An appropriate conclusion.
Comment	Using the Theoretical Domains Framework, 11 theoretical domains were identified that influence the prevention of hypothermia during surgery. Education on the prevention of IPH was mentioned as something that should be implemented more in the future. Feedback, reminders, and prompts about the subject were mentioned as being important. These strategies should target the entire surgical team and all health personnel involved in all perioperative phases.

Article	A systematic review on the effectiveness of prewarming to prevent perioperative hypothermia (Poveda et al., 2012).
Method	Systematic review article that includes RCTs.
Participants	Adults over 18 years old. Elective surgery.
Intervention	Prewarming
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● Two reviewers independently extracted data from included studies with a validated instrument. This instrument is unfortunately not named, but the authors write that it was submitted for face validity and used with permission. ● The Jadad score was used to assess the methodological quality of the RCTs. ● It is not clear if methods were used to minimise errors in data extraction, as a meta-analysis was not possible due to the heterogeneity in the included studies in terms of methods and populations. Rather, a synthesis of each study was included in a descriptive analysis. ● The method used to combine the studies was a narrative comparison, which was appropriate since a direct comparison was not possible. ● Bias was assessed and not found in this article. ● Recommendations were supported by the reported data. ● Specific directives for new research were appropriate, calling for further RCT trials concerning prewarming and the different methods.
Comment	The authors identify nurses as the potential beneficiaries of their research. They propose that nurses can use their review to inform decisions regarding perioperative prewarming programmes. According to the authors, nurses can also conduct research on strategies to implement prewarming in surgical settings. This is an older study; however, this publication in the Journal of Clinical Nursing has been cited 58 times. 18% of its citations have been received in the past two years (Dimensions, 2023b).

Article	The effectiveness of interprofessional education: key findings from a new systematic review (Reeves et al., 2010).
Method	Secondary review article.
Mentions/ examines	Includes RCTs (4) and CBA (2).
Intervention	Comparison of different teaching intervals.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● A method proposed by Melnyk and Fineout-Overholt was used for the appraisal of the studies; however, the methodology is not further described. ● It is not clear if one or all authors were involved in the critical appraisal. ● It is not clear if methods were used to minimise errors in data extraction, as a meta-analysis was not possible due to the heterogeneity of the included studies. There is no clear description of any efforts to minimise errors. ● The method used to combine the studies was a narrative comparison, which was appropriate since a direct comparison was not possible. ● Bias was not reflected by the authors themselves. They do not declare an absence of conflicts of interest. However, their findings were based on the literature, and no bias was immediately apparent. ● Recommendations were supported by the reported data. ● Specific directives for new research were appropriate, calling for further trials with shorter warming times, lower warming unit settings, appropriate sample sizes, and the consistent use of calibrated biometric instruments by trained staff.
Comment	The findings from this review point to the continuing need to strengthen the quality of studies that use both quantitative and qualitative methods to ensure that they can provide comprehensive insight into the effects of interdisciplinary teaching. Older literature, however, this publication in the Journal of Interprofessional Care has been cited 263 times. 12% of its citations have been received in the past two years (Dimensions, 2023k).

Article	Interprofessional education: effects on professional practice and healthcare outcomes (update) (Reeves et al., 2013).
Method	Second review or update on the previous article from 2010.
Mentions/ examine	Includes 8 RCTs, 5 controlled before and after (CBA) studies, and 2 interrupted time series (ITS).
Intervention	Interdisciplinary teaching versus no teaching.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● Data analysis was appropriately conducted and described. ● Three reviewers independently appraised the studies, and a fourth did a final quality review. ● Methods were used to minimise errors in data extraction. ● The method used to combine the studies was a narrative comparison, which was appropriate since a direct comparison was not possible. The 15 included studies were presented in three sections according to the type of research design employed. ● Bias was assessed using a form with the standard criteria described in EPOC and clearly documented. ● Recommendations were supported by the reported data, but lacking a convincing level of generalisable evidence. ● Specific directives for new research were appropriate, calling for three specific gaps to be filled.
Comment	The RCT and CBA compared interventions with no teaching at all. This limited their ability to provide a convincing level of generalisability for the effects of interdisciplinary teaching. This publication in the Cochrane Database of Systematic Reviews has been cited 1034 times. 22% of its citations have been received in the past two years (Dimensions, 2023g).

Article	Interprofessional collaboration to improve professional practice and healthcare outcomes (Reeves et al., 2017).
Method	Intervention review article.
Mentions/ examine	Includes nine randomised trials of practice-based interprofessional collaboration interventions involving health and social care professionals.
Intervention	Compared interdisciplinary interventions versus usual care or an alternative intervention.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● Data analysis was appropriately conducted and described. ● Two reviewers independently appraised the studies. Disagreements were resolved by consultation with another review author, who also reviewed all included articles as a further quality check. ● Methods were used to minimise errors in data extraction as two authors extracted data independently of each other. ● The method used to combine the studies was a narrative comparison, which was appropriate since a direct comparison was not possible. The 15 included studies were presented in three sections according to the type of research design employed. ● Bias was assessed using a form with criteria described by Cochrane Effective Practice and Organisation of Care (EPOC) and documented clearly. ● Recommendations were supported by the reported data, but the certainty of evidence was judged to be low to very low, so that clear conclusions on the effects of IPC interventions were not possible. ● Specific directives for new research were appropriate, calling for further rigorous, mixed-method studies.
Comment	There is an indication that IPC improves practice changes to improve clinical process and efficiency as well as patient health outcomes, but this does not yet have enough research to lend strong credibility to this conclusion. This publication in the Cochrane Database of Systematic Reviews has been cited 574 times. 51% of its citations have been received in the past two years (Dimensions, 2023f).

Article	A review of the evidence for active preoperative warming of adults undergoing general anaesthesia (Roberson et al., 2013).
Method	A review article with a systematic literature search including RCTs and cohort studies with historical controls.
Participants	665 patients. Adults over 18 years old. All type of surgery.
Intervention	Active prewarming.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria. ● Transparent search strategy. ● Adequate sources and resources. ● A method proposed by Melnyk and Fineout-Overholt was used for the appraisal of the studies; however, the process or methodology is not further described. ● It is not clear if one or all authors were involved in the critical appraisal. ● It is not clear if methods were used to minimise errors in data extraction, as a meta-analysis was not possible due to the heterogeneity of the included studies. There is no clear description of any efforts to minimise errors; however, they present their findings clearly in tables. ● The method used to combine the studies was a narrative comparison, which was appropriate here since a direct comparison was not possible. ● Bias was not reflected by the authors themselves. They do not declare an absence of conflicts of interest. However, their findings were based on the literature, and no bias was immediately apparent. ● Recommendations were supported by the reported data. ● Specific directives for new research were appropriate, calling for further trials with shorter warming times, lower warming unit settings, appropriate sample sizes, and the consistent use of calibrated biometric instruments by trained staff.
Comment	Older literature; however, this publication in the AANA Journal has been cited 27 times, last in 2022 (Dimensions, 2023a).

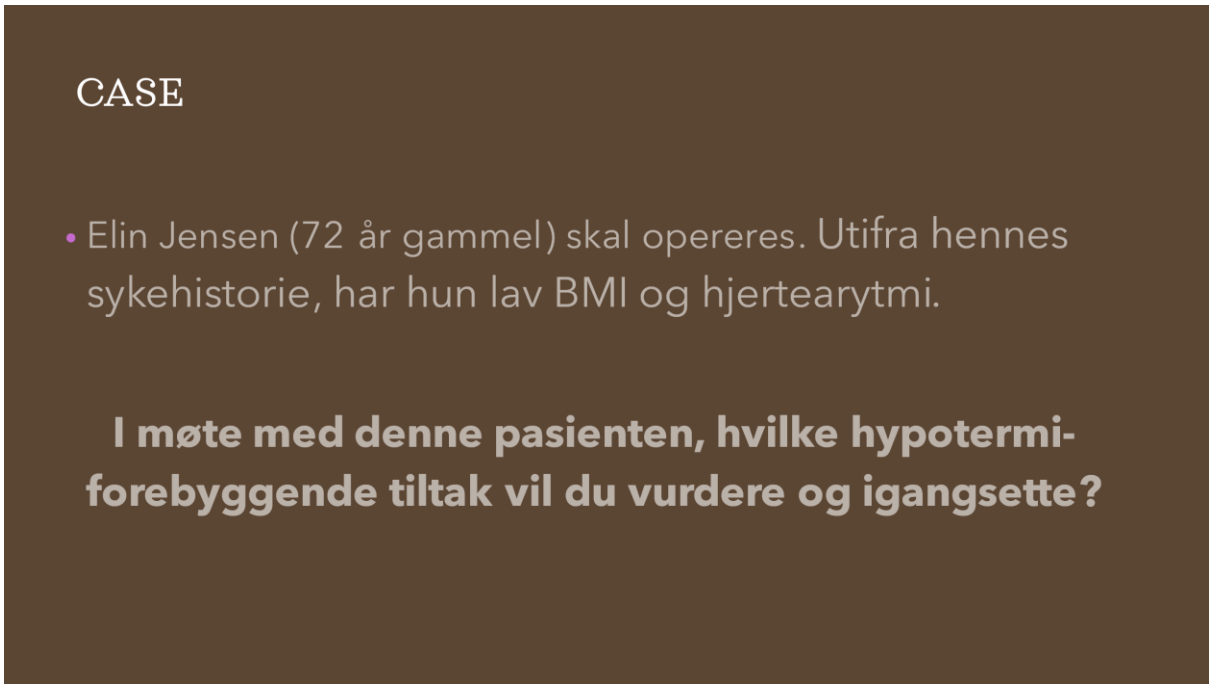
Article	Prevention and management of perioperative hypothermia in adult elective surgical patients: A systematic review (Simegn et al., 2021).
Method	A systematic review included meta-analysis, randomised controlled trials (RCT), comparative studies, original articles, and systematic reviews.
Participants	24 studies are included. Elective surgical patients.
Intervention	To develop a clinical practice protocol for the management and prevention of hypothermia during surgery.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question ● Appropriate inclusion criteria and search strategy ● Adequate sources and resources ● The data analysis was appropriately conducted and described. The quality of the data was evaluated based on WHO's 2011 level of evidence and degree of recommendation. ● All reviewers appraised the studies independently and presented them to peers for discussion. ● Heterogeneity among the studies is not discussed. ● Bias is not statically assessed; this is a significant weakness. The authors do not discuss or mention this. ● The number of participants is not mentioned. ● In the article, several tables (“management and prevention of perioperative hypothermia” and “perioperative management of hypothermia”) are included; they are systematic and easy to read. They are guidelines that can be useful on a daily basis for the theatre nurses and other health personnel. ● In addition, a table with “tips” is included. It could be useful for theatre nurses or other health personnel because it is systematic and emphasised in a positive manner. ● Mentions the importance of measuring the temperature every 5 or 15 minutes or continuously, depending on the patient's temperature. ● There are no specific directives for new research.
Comment	Shows that hypothermia is the least monitored complication during surgery and anaesthesia. For the prevention of hypothermia, both passive and active warming are highly recommended. The authors recommend active warming for 20 to 30 minutes before surgery.

Article	Effects of comfort warming on preoperative patients (Wagner et al., 2006).
Method	Experimental pretest/posttest study design.
Participants	126 patients between 18 and 80 years. Patients were asked to participate in the study and were then randomised into one of two groups on the day of surgery using data.
Intervention	Wearing warm clothes for over 30 to 60 minutes in the intervention group and warm blankets in the control group, which was standard routine for the hospital.
Source criticism	JBI Critical Appraisal Checklist for Quasi-Experimental Studies (Non-Randomised Experimental Studies). ● Clear and explicit "cause" and "effect," comfort warming by either heated cotton blankets or patient-controlled warming gowns. ● Participants included in the comparisons had similar abilities: reading and writing abilities, hearing abilities, mental competency, being over 18 years old, being scheduled for surgery on a day that a researcher was available, and identical temperature measuring instruments, times, and techniques were used. ● The participants were receiving elective surgery of all types relevant to the hospital in the study. ● The control group was the group receiving standard hospital treatment with warmed cotton blankets. ● There was a set of measurements and questions preoperatively, and then another set postoperatively. ● The follow-up was complete for all patients except those who were sent to the OR ahead of schedule; therefore, preoperative measurements were not recorded, resulting in missing data. All group distinctions have been exhaustively described and analysed. ● The outcomes were not directly compared to other measures. The authors present a detailed theory section and draw parallels without direct comparison. ● Both narrative and tabular results were measured and presented in a reliable and transparent manner. A computer-based spreadsheet. analysis programme was utilised to conduct the data analysis. ● A computer-based statistical and data analysis system was used.
Comment	Prewarming helps to both maintain normothermia and reduce the incidence of anxiety in surgical patients. Older literature; however, this publication has been cited 185 times (Pubmed, 2023).

Article	Hypothermia/ Warming protocols: why are they not widely used in the OR? (Weirich, 2008).
Method	Professional, non-scientific article.
Participants	The focus is on the theatre staff.
Intervention	To determine why active preheating is not implemented in practice.
Source criticism	● Weirich has compiled a number of high-quality prior studies to shed light on the issue and asserts that awareness, education, and comprehension of the dangers of hypothermia are necessary components for improving the quality and cost-effectiveness of patient care. ● The article is written by a nurse in further education for nurse anesthesia, which may be considered a limitation. ● No method is described and therefore the article is deemed a non-scientific article. However, it was discovered through scientific searches in the databases and is therefore included as relevant literature for this thesis.
Comment	Weirich mentions that hypothermia is a common problem for surgical patients and that it affects several organ systems. According to the author's research, sustaining a normal body temperature can reduce postoperative infection, operative blood loss, and hospital admission days. Although clinical guidelines are well established in several hospitals, prewarming is frequently not considered a priority by the surgical team, according to Weirich. Employees do not prioritise this due to concerns that there is a risk of contaminating the surgical field and that it generates an uncomfortable working environment. This is something the authors of this thesis also experience in practice. This publication has been cited 125 times as per 13.05.23 according to google search.

Article	Effects of preoperative warming on the occurrence of surgical site infection: A systematic review and meta-analysis (Zheng et al., 2020).
Method	Systematic review and meta-analysis with randomised controlled trials (RCT) included.
Participants	1086 patients, seven randomised controlled trials included.
Intervention	Pre-operative warming reduces the incidence rate of surgical site infections (SSI). The effect of the different warming methods on the occurrence of SSI.
Source criticism	JBI Critical Appraisal Checklist for Systematic Reviews and Research Synthesis. ● A clear and explicit review question. ● Appropriate inclusion criteria and search strategy. ● Adequate sources and resources. ● Three authors independently extracted data. ● Data extraction was done by going through 12 different questions presented in the article. ● Most of the studies scored low on the quality measure for bias. ● There is no restriction regarding type of surgery, sex, or age. All types of perioperative warming methods and lengths of warming time were included. ● The authors discuss and reflect thoroughly on the use of prewarming devices, including reflections from studies with divergent conclusions. ● They include different temperatures used on the forced-air warming devices during prewarming. ● Diabetes, smoking, arterial blood pressure, and blood loss are important risk factors for SSI; none of these factors was mentioned. regarding the patients. It is possible that some patients had these risk factors, which influenced the results. ● The authors concluded that prewarming is economical since it reduces postoperative mortality, morbidity, and hospital stays. In the study, they have not included any studies about the cost of using forced-air warming devices. ● No specific directives for new research or specific recommendations for policy or practise mentioned.
Comment	Preoperative warming can efficiently reduce postoperative mortality and morbidity, which corresponds to the author's conclusions in this thesis. In addition, it supports the recommendation of 15–30 minutes of prewarming.

Appendix 3 - Norwegian PowerPoint



Notater fra diskusjon

Forebygging av hypotermi

Prewarming of the surgical patient implemented by theatre nurses

- A specified educational programme

- Oversatt til norsk:

Prevarming av den kirurgiske pasienten igangsatt av operasjonssykepleiere

- Et undervisningsopplegg

Operasjonssykepleierens funksjon og ansvarsområder

- **Forebyggende** funksjon
  - Fremme pasientens helse
  - Forebygge komplikasjoner
  - Pasientens fysiske og psykiske behov for helhetlig omsorg
- **Pasienten** er i fokus!

Anestesisykepleierens funksjon og ansvarsområder

- Anestesisykepleieren skal ved hjelp av relevant kunnskap og klinisk kompetanse ivareta pasientens behov for sykepleie og anestesi i den perioperative perioden.
- Anestesisykepleieren er ansvarlig for å forebygge, observere og bedømme komplikasjoner, samt prioritere og iverksette sykepleietiltak og medisinske oppgaver i den perioperative forløpet.
- Pasienten er i fokus!

Fakta om hypotermi

- Hypotermi: kjernetemperatur under 36 ° C
- Temperaturfall på 0,2 ° C kan gi en significant forskjell
  - Øker faren for postoperative komplikasjoner

Fakta om utilsiktet perioperativ hypotermi (UPH)

UPH kan oppstå som en direkte følge av anestesi

Tre faser:

Fase 1: Omfordelingsfasen (1. timen)	Fase 2: Avtagende fasen (2 – 4 timer)	Fase 3: Platåfasen (etter 3 – 4 timer)

Risikogrupper

- Eldre
- Barn
- Pasienter med lav BMI
- Traumatiserte pasienter
- Brannskadede
- Store såroverflater
- Store og langvarige operasjoner
- Redusert allmenntilstand
- Tilleggssykdommer

Komplikasjoner:

- Hvilke komplikasjoner forbinder dere med hypotermi?

(Intern diskusjon)

Komplikasjoner

Postoperative sårinfeksjoner tredobles	Forsinket sårtilheling	Økt blødningstendens
Kardiovaskulære tilstander: myokardiale komplikasjoner tredobles	Postoperativ skjelving: kan øke oksygenbehovet med 400-500%	Økt fare for trykksår
Forlenget oppvåkningstid(pga nedsatt metabolisme)	Forlenget halveringstid av relakserende anestesimidler	Økt behov for væskeinfusjoner

Er det noen **andre komplikasjoner** som ble diskutert hos dere?

Prevarming med KFL

- Det viktigste tiltaket for å forhindre UPH
- Målet er å opprettholde pasientens kroppsvarme under anestesi og kirurgi
  - Minimalisere nedkjøling, fordampning og varmetap
- Bair Hugger

Funn ved prevarming

- **Uten prevarming:**
  - Aktiv varming intraoperativt vil ofte ikke ha effekt før etter 1,5 til 2 timer
  - Aktiv varming intraoperativt vil ofte ikke klare å forebygge fall i kjernetemperatur den første timen etter anestesistart
- **10 til 15 minutter** med aktiv varming er ofte tilstrekkelig
  - Det optimale er 20 til 30 minutter med prevarming

Funn ved prevarming

- Viktig for kortvarige og langvarige operasjoner
  - Kortvarige utvikler ofte UPH
- Kortvarige operasjoner (< 1 time): 30 minutter med prevarming vil ofte redusere behovet for ytterligere varme-tiltak

Funn ved prevarming

- Økt pasientkomfort
- Forsinker ikke operasjonsforløpet;
- Bidrar til mer effektivitet

Prevarming: Pasientens erfaring

Gir større komfort, og en følelse av omsorg og trygghet

80 % av pasientene har uro eller opplever angst preoperativt

- Kan bli redusert gjennom prevarming

Er ikke dette god nok grunn?

Kvalitetsforbedringsarbeid

Sjekkliste: Trygg Kirurgi

...men hva med første del av trygg kirurgi "**temperatur målt**?"

Hvilke hindringer, om noen, forbinder du med å implementere forvarming?

- Diskuter med personen ved siden av deg i ca. 3 minutter.

Hindringer

- Travel dag på jobb?
- Forurensing i operasjonsfeltet?
- For varmt arbeidsmiljø?
- Støy?
- Variasjoner i interne og eksterne prosedyrer ved bruk av aktiv oppvarming?
- Utskiftning av ansatte/ vikarer?
- Inkonsekvent temperaturovervåking?
- Feil temperaturmålinger som ikke reflekterer pasientens kjernetemperatur; slik at forvarming ikke blir prioritert?
- Fant dere noen **andre hindringer**?

Hvordan kan vi implementere forvarming i arbeidsdagene våre?

Notater fra diskusjon

-
-
-
-
-
-
-

HUSK!

- Pasienten i fokus
- **10 – 15 minutter** prevarming er ofte nok
- Prevarming hjelper til å dekke både fysiske og psykiske grunnleggende behov
- **Sammen** kan vi klare det!