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Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine 1186

Communication and Patient Safety

Transfer of information between healthcare personnel in anaesthetic clinics

MARIA RANDMAA

ACTA
UNIVERSITATIS
UPSALIENSIS
UPPSALA
2016

ISSN 1651-6206
ISBN 978-91-554-9489-6
urn:nbn:se:uu:diva-278726

Dissertation presented at Uppsala University to be publicly examined in Museum Gustavianum, Akademigatan 3, Uppsala, Wednesday, 20 April 2016 at 13:00 for the degree of Doctor of Philosophy (Faculty of Medicine). The examination will be conducted in Swedish. Faculty examiner: Professor Hans Rutberg (Department of Medical and Health Sciences, Division: Centre for Medical Technology Assessment, Linköping University).

Abstract
Randmaa, M. 2016. Communication and Patient Safety. Transfer of information between healthcare personnel in anaesthetic clinics. *Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine* 1186. 70 pp. Uppsala: Acta Universitatis Upsaliensis. ISBN 978-91-554-9489-6.

Communication errors are frequent during the perioperative period and cause clinical incidents and adverse events. The overall aim of the thesis was to study communication – the transfer of information, especially the postoperative handover – between healthcare personnel in an anaesthetic clinic and the effects of using the communication tool SBAR (Situation-Background-Assessment-Recommendation) from a patient safety perspective.

The thesis is based on studies using a correlational (Paper I), quasi-experimental (Paper II and III) and descriptive (Paper IV) design. Data were collected using digitally recorded and structured observations of handovers, anaesthetic records, questionnaires, incident reports and focus group interviews.

The results from baseline data showed that lack of structure and long duration of the verbal postoperative handover decreased how much the receiver of postoperative handover remembered; the item most likely not to be remembered by the receiver was anaesthetic drugs. The variation in remembered information showed that there were room for improvement (Paper I). Implementing the communication tool SBAR increased memorized information among receivers following postoperative handover. Interruptions were frequent during postoperative handover, which negatively affected memorized information (Paper III). Furthermore, after implementation of SBAR, the personnel's perception of communication between professionals and the safety climate improved, and the proportion of incident reports related to communication errors decreased in the intervention group (Paper II). The results of the focus group interviews revealed that the nurse anaesthetists, anaesthesiologists and post-anaesthesia care unit nurses had somewhat different focuses and views of the postoperative handover, but all professional groups were uncertain about having all information needed to secure the quality of postoperative care (Paper IV).

The findings indicate that using a predictable structure during postoperative handover may improve the information memorized by the receiver, perception of communication between professionals and perception of safety climate. Incidents related to communication errors may also decrease. Long duration of the handover and interruptions may negatively affect the information memorized by receiver. To ensure high quality and safe care, there is a need to achieve a shared understanding across professionals of their work in its entirety.

Keywords: anaesthesiologist, anaesthetic clinic, communication, handover, incident reports, information transfer, interruption, memory, nurse, operating theatre, patient safety, post-anaesthesia care unit, safety attitudes, SBAR

Maria Randmaa, Department of Public Health and Caring Sciences, Box 564, Uppsala University, SE-75122 Uppsala, Sweden.

ISSN 1651-6206
ISBN 978-91-554-9489-6
urn:nbn:se:uu:diva-278726 (http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-278726)

To Alexander
and Michaela

List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

I Randmaa M, Mårtensson G, Leo Swenne C, Engström M. An observational study of postoperative handover in anesthetic clinics; the content of verbal information and factors influencing receiver memory. Journal of PeriAnesthesia Nursing, 2015;30:105-115. Doi: 10.1016/j.jopan.2014.01.012.

II Randmaa M, Mårtensson G, Leo Swenne C, Engström M. SBAR improves communication and safety climate and decreases incident reports due to communication errors in an anaesthetic clinic: a prospective intervention study. BMJ Open 2014;4:e004268. Doi:10.1136/bmjopen-2013-004268.

III Randmaa M, Leo Swenne C, Mårtensson G, Högberg H, Engström M. Implementing situation-background-assessment-recommendation in an anaesthetic clinic and subsequent information retention among receivers: a prospective interventional study of postoperative handovers. European Journal of Anaesthesiology, 2016;33:172–178.
Doi: 10.1097/EJA.0000000000000335.

IV Randmaa M, Engström M, Leo Swenne C, Mårtensson G. Different professionals' descriptions of and reflections on postoperative handover: a focus group interview study with nurse anaesthetists, anaesthesiologists, and PACU nurses. (Manuscript)

Contents

Abbreviations

ICU	Intensive Care Unit
OT	Operating Theatre
PACU	Post-Anaesthesia Care Unit
RN	Registered Nurse
SALAR	Swedish Association of Local Authorities and Regions
SBAR	Situation, Background, Assessment, Recommendations
WHO	World Health Organization

Introduction

Hippocrates said "First do no harm",[1] and safe care is a core competence within healthcare,[2] but about one in ten patients receiving hospital care is harmed.[3] The prevalence of adverse events in industrialized countries in the world is between 3% to 16% of hospitalized patients, and most events cause substantial harm.[4] In Sweden, patients in 15% of hospital admissions were harmed in 2013. Half of the cases were temporary, but 5.3% resulted in permanent harm or contributed to the patient's death. Besides human suffering there are costs for society, and in Sweden the costs for these preventable adverse events were estimated to be from 6.9 to 8.1 billion SEK.[5] In a study using structured record review in a Swedish intensive care unit (ICU) during the years 2007 and 2008, almost one fifth of patients who died had been subjected to harmful events.[6]

The most common reason for incidents and accidents in high-stakes environments is human error. Human factors that are not related to technical expertise are called nontechnical skills and include error related to interpersonal skills (e.g., communication, teamwork) and cognitive skills (e.g., planning, decision-making).[7] In the present thesis, it is primarily interpersonal skills such as communication, especially during postoperative handover, which are studied. Communication and collaboration problems in healthcare have been shown to be strong predictors of surgical error,[8] and errors of communication can jeopardize patient safety.[9] Moreover, studies have shown that these communication errors are frequent during the preoperative, intraoperative and postoperative periods[9-11] and that communication error causes clinical incidents and adverse events.[10, 12-14] One way to improve communication is through use of the communication tool SBAR (Situation, Background, Assessment, Recommendation),[3, 15, 16] which is a method intended to make communication consistent and structured. In the present thesis, communication and patient safety were studied in the context of an anaesthetic clinic. The focus was to describe the postoperative handover and enhance the understanding of the involved professionals' view as well as to investigate the effects of implementation of SBAR.

Communication

The etymology of the word communication is from the Latin's "communicare", which means "make something common", and the word has a multiplicity of meanings and is used in different contexts.[17] In healthcare there are many types of communication depending on in which context communication is performed and on whether communication is performed between personnel and patients or between different personnel. In the present thesis, the focus was on studying the communication between healthcare personnel. Barriers to communication are described as both internal (individual) and external (environment). The internal barriers are described as language difference, culture, motivation, expectations, past experiences, prejudice, status, emotion/moods, deafness, and voice level. The external barriers are described as noise, interference and distraction, separation in location, time, and lack of visual cues (e.g., body language, gestures, and facial expressions).[18] An error of communication is defined as "missing or wrong information exchange or misinterpretation or misunderstanding".[19 (p. 114)]

One-way and two-way communication

During the Second World War, Shannon and Weaver developed a communication theory that serves as the basis of many other communication theories, and is described as linear process. They described the transfer of a message as follow: the *signal* is sent from the *source* by the *sender* through the *channel* to the *receiver* and further to the *destination*. The term *noise* was described as everything that is added to the signal between the sender and receiver, and that was not intended by the source but affects reception of the message. Shannon and Weaver identified three levels of problems: technical problems (How exactly can communication symbols be transferred?), semantic problems (How exactly can the transferred symbols be explained?), and effectiveness problems (How effectively does the received message affect the desired behaviour?). The theory also demonstrates how redundancy facilitates the accuracy of decoding. *Redundancy* is what is predictable or conventional in a message. A message that is high in predictability is redundant and contains less information. The opposite of redundancy is *entropy,* which means a message low in predictability and containing a great deal of information. *Convention* is a major source of redundancy, as we check the accuracy of a message we receive in relation to what is probable, depending on our experience of the code, the context, and the type of message. Structuring one's message according to conventions is one way to decrease the entropy and increase the redundancy.[20, 21]

Shannon and Weaver's theory is described as one-way communication, which has advantages because it is rapid, looks and sounds proper, and the sender feels in control. Disadvantages of one-way communication are that is

requires planning, the responsibility lies with the sender, there is no feedback, and the receiver may not be paying adequate attention.[18] Feedback, which is found in two-way communication, is described as closing the communication loop and may prevent misunderstanding[18, 22] in the receiver's interpretation of the original meaning of a message. Using feedback has advantages in that it is reliable and effective, permits checking and correction, requires less planning, the receiver has more confidence and makes more correct judgements about accuracy, both the sender and receiver have responsibility, and the sender and receiver work together to achieve shared understanding.[18] Flin et al.[18] described three types of feedback: "1) Informational – the receiver provides a non-evaluative response, e.g. provides an objective statement in response to the initial statement. 2) Corrective – the receiver challenges or corrects the sender's message, e.g. questions or queries the initial statement to gain clarification. 3) Reinforcing – the receiver acknowledges clear receipt of the message, e.g. checks understanding of the message."[18 (p.73)] There is also a term called closed-loop communication where the sender also verifies the message; it is described as follows: 1) the sender transmits the message, 2) the receiver acknowledges the message by check-back and 3) the sender verifies that the message has been interpreted correctly.[23]

Communication in healthcare

Communication error between healthcare personnel is the most common cause of low quality in care,[24] and studies[10, 11] have shown that lack of communication causes clinical incidents and adverse events in relation to surgery. Greenberg et al.[11] examined 60 malpractice claims due to communication errors in the preoperative, intraoperative and postoperative periods. They found that 92% of errors were verbal communications and 64% occurred between one sender and one receiver. In one study[25] using questionnaires in four hospitals in the Netherlands and measuring latent risk factors, 40-50% of personnel in the operating theatre (OT) and in the ICU rated communication as poor.[25] In an observational study[9] analysing 421 communication events in the OT, communication errors occurred in 30% of team exchanges and one third of these jeopardized patient safety.[9] Barriers to nurse-physician communication have also been reported as hierarchy, lack of consistent structure, differences in communication style between the two professions and language.[26-28] In an interview study[27] with nurses and physicians, they declared that the most important factor for effective communication was straightforward unambiguous communication and that what is being heard or said is accurate.

Handover

There are several terms used in the literature for the exchange of information about a patient between healthcare personnel, e.g., handover, handoff, signout, signoff, intershift report and shift report. In their extensive review of published literature on handovers in hospitals, Cohen and Hilligross[29] concluded that there is an ambiguity in the definition. In the present thesis, the term handover is used and refers to "the transfer of information and professional responsibility and accountability between individuals and teams, within the overall system of care".[30 (p. 272)] Jeffcott et al.[30] suggested that the handover involve the transfer of three key aspects: "1) information, 2) responsibility and/or accountability, in 3) the context of teams and their work environments".[30 (p. 272)] The focus here is on the transfer of information and responsibility, studied in the context of handover during patient transfer of care from the OT team to a post-anaesthesia care unit (PACU) team.

Handover in the anaesthetic clinic

In the anaesthetic clinic different teams work together. The general consensus in the research literature is that a team consists of two or more individuals, who have specific roles, are adaptable, perform independent tasks, and share a common goal. Furthermore, all these individuals have to coordinate their activities to deliver safe and efficient patient care.[31]

The OT team usually consists of the professions nurse anaesthetist, anaesthesiologist (who also has responsibilities for and takes part in other surgical teams in the OT), surgeon, physician in specialist training, theatre nurse, and licensed practical nurse. The PACU team consists mainly of specialist nurses in intensive care, but also of nurse anaesthetists, registered nurses and licensed practical nurses. In the ICU, the team consists mainly of anaesthesiologists, physicians in specialist training, specialist nurses in intensive care, and licensed practical nurses. The licenced practical nurse (LPN), also called enrolled nurse, is a vocational degree obtained after upper secondary education. Registered nurses have different competences depending on where they are trained and work. The professional title of nurse anaesthetists exist in countries such as Sweden, Norway, Denmark, the US, and Schweiz.[32] The nurse anaesthetists and specialist nurses in intensive care have a protected professional title, indicating that the person holding the title is a registered nurse with a graduate diploma in either specialist nursing-anaesthesia care or in specialist nursing-intensive care. A specialist nurse with specialization as a nurse anaesthetist has the authority to, when instructed, independently induce, maintain and conclude general anaesthesia, with some support from an anaesthesiologist.[33] A specialist nurse with specialization as an intensive care nurse has the authority to, when instructed, judge, address and evaluate, e.g., analgesia and sedation.[33] In many countries, postoperative handovers from an anaesthesiologist to a PACU nurse are common. Because of the above-

mentioned specialist nurses' authority in Sweden, postoperative handovers at the PACU between a nurse anaesthetist and an intensive care nurse are common.

At the anaesthetic clinic (including the OT, PACU and ICU), the patient is in a vulnerable position and the personnel often work under high stress,[34] under conditions that change frequently, and with a varying number of personnel, working together for a short period. Moreover, the team consists of several different professionals who need to be integrated.[35] Furthermore, the handover most often takes place in an environment that is event-driven, time-pressured[36] and marked by frequent distractions.[37, 38]

Surgical patients undergo several transfers through the continuum of care; from the ward to the OT, from the OT to the PACU or ICU and finally back to the ward. Emergency patients are also transferred from the emergency department to the ICU.[39] When Nagpal et al.[10] observed 20 patients to evaluate information transfer through the continuum of surgical care, they found that preoperative verbal handover from the ward to the OT was done for 9 of the patients. Of the essential information, 56% was transferred from the OT to the PACU and of that 44% reached the ward. Of the studied 20 patients, 15 experienced clinical incidents or adverse events due to information transfer and communication errors.[10] Studies have revealed that handovers in the anaesthetic clinic contain incomplete transfer of information,[40, 41] are informal, unstructured[42] with poor standardization[38, 42] and that the delivering and receiving personnel may have differing expectations about the content and timing of information transfer.[37] There is a need for standardization of handovers in anaesthetic clinics, and studies of such interventions have been conducted, although patient outcomes were not measured.[43-45] Because of the patients' vulnerable position, in a disturbing environment, the handover places great demands on both delivering and receiving personnel, in that they must retain in memory a great deal of sometimes complex information.

Memory

Memory is described as a flow from the environment through *sensory memory* to *short-term memory* and then to *long-term memory.*[46] In short-term memory, one can keep small quantities of material in mind and in long-term memory material can be stored for a long period of time. In *working memory,* one can "keep things in mind" when complex tasks are performed.[46] Working memory actively processes information from sensory input and items from long-term memory. Working memory is extremely limited in its capabilities, duration and the number of items that can be held there. Furthermore, the items in working memory are easily disturbed by each other. The items that are most easily recalled are those that have resided longest in working memory and the items most recently added, hence those

in the middle of the "mental list", are less likely to be remembered. Negative effects on working memory are interference and diversion of attention, and people who work in interrupt-driven environments are likely to suffer failures of working memory.[47] There is also a definition of memory that includes retrospective memory and prospective memory. *Retrospective memory* is the memory we have of words, events and people that we experienced in the past, and it can contain a large amount of information. *Prospective memory* is the memory we have for tasks we should remember to do in the future without having to be reminded of them, and it usually contains a small amount of information.[48] Prospective memory seems to depend on both working memory and long-term memory.[49]

According to Reason,[50] errors may be related to memory and occur when actions deviate from the current intention and are associated with some form of attentional capture, depending on distractions or preoccupation with something in mind.[50] In aviation, which is classified as a high-stakes environment, a study investigated reports of incidents or accidents involving memory failures and 74 of 75 cases were due to failures of prospective memory. The authors claimed that the pilots were most likely to show failures of prospective memory when they were interrupted.[51] In their systematic review of the psychological literature on interruption and its patient safety implications, Li et al.[52] concluded that interruptions during a task execution seem to be more disruptive than those occurring between tasks. Interruptions that share the same cognitive mechanism are more likely to disrupt tasks than are dissimilar interruptions. Practice on a task can free up cognitive resources, which in turn results in better defence against interruptions. Finally, having control over when to deal with interruptions is less disruptive than having no control. The authors suggested that interruption interferes with prospective memory and that interruption should be minimized in workplaces with high working memory demands.[52] In a review[49] of interruptions in healthcare, Grundgeiger and Sanderson concluded that there is lack of evidence in healthcare concerning whether interruptions lead to adverse effects. They also suggested that prospective memory research can provide a theoretical background for understanding the impact of interruptions and so could provide guidance for empirical research on interruptions in healthcare.[49]

SBAR (Situation-Background-Assessment-Recommendation)

Because communication errors between healthcare personnel may threaten patient safety, many attempts have been made to improve communication. The communication tool SBAR is used in high-stakes organizations and was modelled on US naval military procedures. In 2000, Leonard, Bonacum, and Graham of Kaiser Permanente adapted the relevant skills from aviation to high-stakes medical environments. One tool was SBAR, which is thought to

make communication effective and consistent through use of a predictable structure. SBAR was also thought to bridge differences in communication styles (e.g., between nurses and physicians), thus reducing barriers that a hierarchy may lead to and increasing patient safety.[16] Using SBAR, important information can be transferred in a predictable structure and in a brief and concise manner.[16] In a systematic review[53] in which 24 handover mnemonics were identified, the communication tool SBAR was the most cited. In a systematic review[15] of communication failures and how to avoid them, the authors proposed that one way to improve communication is to structure the information based on SBAR.[15] SBAR is recommended by WHO[3] and in Sweden by the Swedish Association of Local Authorities and Regions (SALAR),[54] the Swedish Medical Association,[55] the Swedish Association of Health Professionals[56] and the Patient Insurance LÖF[57] for use in healthcare to increase patient safety. SBAR stands for: *Situation* - what is going on with the patient? *Background* - what is the clinical background, or context? *Assessment* - what do I think the problem is? *Recommendation* - what would I do to correct it?[16 (p. i86)] An example is shown below:

> Situation: "Dr. Preston, I'm calling about Mr. Lakewood, who's having trouble breathing."
>
> Background: "He's 54 year old man with chronic lung disease who has been sliding downhill, and now he's acutely worse."
>
> Assessment: I don't hear any breath sounds in his right chest. I think he has a pneumothorax".
>
> Recommendation: "I need you to see him right now. I think he needs a chest tube." [16 (p. i86)]

Studies dealing with SBAR have been conducted in the US,[58-60] Canada,[61, 62] Australia,[63, 64] the UK,[65] Belgium[66] and the Netherlands.[67] Studies evaluating SBAR have shown improved collaboration and nurse-physician communication in surgical and medical wards,[66] better team communication as well as an improved safety climate among rehabilitation staff.[61, 62] In studies using simulated telephone referrals by medical students and junior doctors, use of SBAR has shown improved call impact[63] and improved communication.[64] Studies measuring clinical outcomes after implementation of SBAR have found decreased order entry errors,[60] improvements in safety reporting[61] and reduced unexpected death.[66] Among the above-mentioned studies, only six had used a comparison group[60-64, 67] and of these, three were simulation studies.[63, 64, 67] Furthermore, studying interventions intended to facilitate teamwork and communication in healthcare, one review[68] found that only 3 of 14 studies measured actual clinical outcomes.[68]

Patient safety

There are different definitions of patient safety, and WHO defines it as "the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum".[19 (p.22)] To reduce risks to an acceptable level, there is need to enhance our understanding of safety culture. In the report on the Chernobyl accident, the International Nuclear Safety Advisory Group in 1988 coined the term "safety culture".[69] Safety culture is a component of organizational culture, which includes the attitudes, values, norms, shared beliefs and behavioural characteristics of personnel.[70] Although the term has been used for many years, there is a lack of consensus regarding the cause, content and consequences of safety culture. Based on an organizational culture framework suggested by Schein,[71] Guldenmund[72] proposed that safety culture could be seen as having three layers 1) *The core* (basic assumptions) consists of basic assumptions, is relatively unspecific and permeates the entire organization. It is obvious to members, but otherwise invisible and has to be deduced from espoused values and through observation. 2) *The middle layer* (espoused values/attitudes) is relatively explicit and conscious and can be exemplified by, e.g., attitudes, manuals, procedures as well as accident and incident reports. 3) *The outermost layer* (artefacts) consists of particular manifestations and is visible. It can be exemplified by personal protective equipment, dress code, accidents or incidents, near-misses or different types of behaviour. Guldenmund defined safety culture as "those aspects of the organisational culture which will impact on attitudes and behaviour related to increasing or decreasing risk",[72 (p. 251)] and safety climate is equated with attitudes and the manifestation of the culture within an organization. He also proposed that the safety climate has limited dimensionality, as surveyed through questionnaires, and that the organizational culture is more complex.[72] Sexton et al.[73] also claimed that surveys are not capable of measuring all aspects of culture, e.g. behaviour and values, and that safety climate is the most appropriate term when using questionnaires to study group-level perceptions of patient safety.[73] In healthcare there are several definitions of safety culture, and in the present thesis the culture of safety is defined as in The European Network for Patient Safety: "An integrated pattern of individual and organisational behaviour, based upon beliefs and values that continuously seeks to minimize patient harm, which may result from the processes of care delivery".[74 (p.4)] In Morello et al.'s[75] systematic review of strategies for improving safety culture in hospitals, they concluded that there is limited evidence to suggest that strategies to improve patient safety culture have impacts on patient safety climate outcomes. According to Morello et al.,[75] all of the 21 included studies had methodological limitations and only eight of them incorporated a comparison group. Three studies, conducted in the US,[76] Australia[77] and England,[78] respectively, used a mixed-methods evaluation, but only two of the studies[76, 78] incorporated a comparison group.

Incident report

WHO defines a patient safety incident as "an event or circumstance which could have resulted, or did result, in unnecessary harm to a patient" and an event as "something that happens to or involves a patient."[19 (p.22)] WHO[79] has recommended that healthcare personnel or an organization report incidents and adverse events in a system so as to identify hazards and risks. The incident report system can provide information on where the system is breaking down, thus enabling prevention of future incidents.[79] Healthcare organizations and individuals benefit from reporting incidents if, after analysing and through generalizing, useful information is fed back to them.[80, 81] According to Mahajan,[80] incident reporting should contain *data input* that is independent and non-punitive; the *data* should give personnel the opportunity to give their own version of the event, to reflect on the true nature of the incident; the *analysis* should turn the report into a lesson and should be performed by an expert using a standardized methodology; the *feedback* purpose is to learn from mistakes and to safeguard that the system is improved, the goal being to ensure better patient safety. It is also important that all personnel see something positive coming out of the incident reporting.[80] In the present thesis, an incident report is defined as "A process used to document occurrences that are not consistent with routine hospital operation or patient care".[19 (p. 120)]

According to Reason,[82] human error can be viewed in two ways: the person approach and the system approach. The person approach assumes that bad things happen to bad people and results in naming, blaming and shaming. The system approach assumes that humans are fallible, that errors are to be expected and errors are seen as consequences of systemic factors. A central idea is that of system defences. In Reason's Swiss Cheese Model, it is presumed that a system has multiple defensive layers that prevent the occurrence of adverse events. The defensive layers can be comprised of active failures (e.g., forgetting to administer or administering the wrong medicine) and latent conditions (e.g., time pressure, understaffing). When an adverse event occurs, the important issue is how and why the defences failed.[82] Reason et al.[81] also claimed that an organization that is more vulnerable to adverse events is a system characterized by blaming individuals, denying the existence of systemic error and the pursuit of productive and financial indicators.[81] In the 1940s, investigation of critical incidents was first used as a technique to improve safety among military pilots.[83] According to Reason,[82] effective risk management depends on establishing a reporting culture, because the same circumstances can provoke similar errors, regardless of the people involved.[82] Reason et al.[81] also proposed that double-loop learning could be used to recognize systematic causes.[81]

Rationale for the thesis

Errors of communication between personnel are frequent during preoperative, intraoperative and postoperative periods[9-11] and cause clinical incidents and adverse events.[10, 12-14] Surgical patients undergo several transfers through the continuum of care, resulting in a plurality of handovers between personnel[10, 39] and a risk for loss off information at each transfer.[10] Barriers to safe information transfer between healthcare personnel are incomplete transfer of information,[40, 41] distractions,[37, 38] unstructured information,[42] poor standardization,[38, 42] and the personnel involved may have differing expectations of information transfer.[37] Moreover, it is important to acknowledge the role of non-technical skills during postoperative handover with respect to patient safety.[84] Attempts have been made to standardize transfer of information as a handover, but there is limited evidence on the effectiveness of handover standardization and outcome measures.[29, 43-45] Furthermore, there is limited evidence to support the effectiveness of different patient safety strategies and safety climate outcomes. There is a need for research on information transfer,[75] as well as on the involved personnel's views on postoperative handover. It is recommended that different data collection methods be used to evaluate the effectiveness of interventions to improve safety climate[75] and that studies include a control group to increase their quality.[39] Therefore, it is important to study the transfer of information and determine whether a standardized structure such as SBAR can affect personnel's perception of communication and safety attitudes as well as patient outcome, using different data collection methods as well as a comparison group. Furthermore, there is a need to enhance our understanding of the multiple functions of postoperative handover by observation and by analysing the delivering and receiving personnel's descriptions of and reflections on postoperative handover.

Aims

Overall aim

The overall aim of the present thesis was to study communication, the transfer of information, and especially the postoperative handover, between healthcare personnel in an anaesthetic clinic as well as the effects of using the communication tool SBAR from a patient safety perspective.

Specific aims

The aim of Paper I was to: 1a) describe how postoperative handovers occur when patients are moved from the operating theatre to the post-anaesthesia care unit, b) describe what content in the patients' anaesthetic record is verbally handed over, c) describe how much the receiver remembers after the handover and 2) examine factors associated with memory.

The aim of Paper II was to 1a) examine staff members' perceptions of communication within and between different professions as well as safety attitudes and psychological empowerment (secondary outcome), prior to and after implementation of the communication tool SBAR. A further aim was to b) investigate whether there were any differences in change over time in these variables between an intervention group that was introduced to SBAR and a comparison group. Still another aim was to 2) study whether there was any change in the proportion of incident reports due to communication errors (secondary outcome).

The aim of Paper III was to investigate whether implementation of the communication tool SBAR affects retention of information by receivers of postoperative handovers.

The aim of Paper IV was to investigate different professionals' (nurse anaesthetists', anaesthesiologists', and PACU nurses') descriptions of and reflections on the postoperative handover.

Methods

Design

To study communication and transfer of information between healthcare personnel in anaesthetic clinics, qualitative and quantitative methods were used. Paper I-III are based on a quasi-experimental intervention study, where Paper I has a descriptive and correlational design and contains baseline data collected 2011. In Paper II and III, outcome measures from the quasi-experimental study are presented using different data collection methods, during the same period of 2011-2012. The results of Paper I-III inspired the study described in Paper IV, a focus group interview study, conducted in 2015 (Figure 1). An overview of the completed studies is presented in Table 1.

Table 1. *Study design, data collection, study sample and data analysis for Paper I-IV*

Paper	Design	Data collection	Study sample	Analyses
I	Descriptive and correlational	Digitally recorded and structured observations of handovers, Anaesthetic records	73 handovers and reproduced reports, 72 personnel (and 7 accompanying senders) participated	Spearman's rho correlation, Multiple linear regression analysis, Generalized estimating equation (GEE), Content analysis
II	Quasi-experimental	Questionnaires, Incident reports	169 personnel (intervention group, n=100; comparison group, n=69), 380 incident reports (baseline, n=140; follow-up, n=240)	Wilcoxon Signed Rank Test, Mann-Whitney *U*-test, Chi-square, Fisher's Exact test

III	Quasi-experimental	Digitally recorded and structured observations of handovers	At baseline, 73 handovers (intervention group, n=40; comparison group, n=33), 72 personnel participated. At follow-up, 91 handovers (intervention group, n=44; comparison group, n=47). 57 personnel participated.	Independent t-test, Mann-Whitney *U*-test, Generalized estimating equation (GEE)
IV	Descriptive	Focus group interviews (n=6)	Nurse Anaesthetists (n=8), Anaesthesiologists (n=7), Specialist Nurses in Intensive Care (n=8)	Qualitative content analysis

Intervention

The management at the anaesthetic clinic decided to implement the communication tool SBAR. The implementation of SBAR at the clinic included 1) preparation of a modified SBAR pocket card, 2) an in-house training course, 3) information material and 4) 168 structured observations (Paper II and III).

1) In the present thesis, a SBAR template prepared by the SALARs[54] and, as recommended,[54, 85] a slightly modified version by a local interprofessional workgroup for the PACU were used to adapt the tool to the needs at the clinic. In the SALARs' version of SBAR, the *Situation* part contains information on the personnel's name, title and unit, the patient's name and age and the reason for contact. In the *Background* part, the sender reports about the patient's past and present diseases, current problems and treatments, and important information such as, e.g., allergies or infections. The *Assessment* part includes vital functions and status and an assessment by the sender. The *Recommendation* part contains what measures will be taken and also confirmation of communication by asking, "Are there any questions? Do you agree?" [54] To adapt the tool to needs at the PACU, the following modifications were performed: in the *Situation* part "diagnosis/performed surgery" was added, in the *Background* part "communication ability" was added, in the *Assessment* part "anaesthetic and surgery process", "respiration", circulation", "level of consciousness" "fluid/diuresis", "skin/bandage/drainage", "test results" and "catheters" were specified, and in the *Recommendation* part "ordinations" and "pain relief" were added.

2) The in-house training course was conducted in a unit called the Clinical Training Centre, which specialized in training of healthcare personnel. The in-house training course contained 2.5 hours of instruction and role-playing. In the intervention group, all personnel were encouraged to take part

in the training course and to use SBAR in their daily work. Eighty per cent (155 of 194) of the personnel were trained during the period May to September 2011 and the rest were offered continuous training.

3) Information material describing the SBAR structure and the SBAR pocket card to be used was distributed to all personnel. At the PACU, the SBAR card was attached to the patients' tables, where most handovers were conducted. In the room where the physicians' handovers were conducted, a SBAR poster was set up on the wall. At the ICU, a pre-printed SBAR template was used for the receivers' notes during handover.

4) To monitor the intervention process and as feedback to the intervention group, 168 structured observations were performed during 7 months of the implementation period to measure adherence to SBAR at handovers. The structured observations, using a specific protocol, were conducted in the OT, PACU and ICU by members of the local inter-professional group.

As careful control of the implementation is required for interpretation of the findings, process evaluation[86, 87] measures were made. The process evaluation was performed by the author (MR) during 7 months of the implementation period using structured telephone interviews with a random sample of 66 personnel in the intervention group. The process evaluation showed that the majority of personnel had taken the in-house training course and had used the SBAR tool during the past seven working days (Paper II and III).

The intervention was conducted during a period of 11 months. Questionnaires were delivered at baseline and follow-up, and the incident reports were collected during a one-year period prior to implementation and one-year period after implementation (Paper II). Digitally recorded, structured observations of handovers, reproduced reports and reviews of anaesthetic records were conducted at baseline (Paper I) and at follow-up to study change over time (Paper III) (Figure 1).

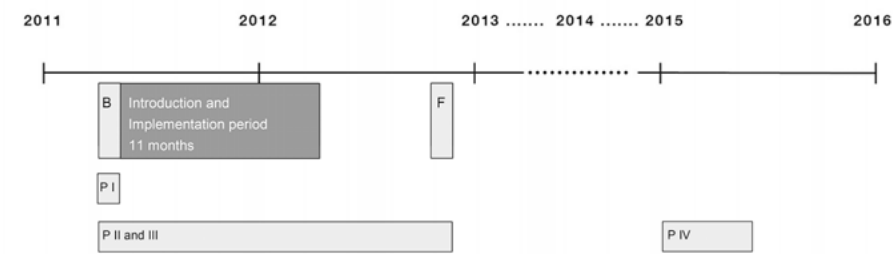

Figure 1. Timeline. The time when data were collected for Paper I-IV.
B=Baseline, F=Follow-up, P=Paper.

Setting

The setting was an anaesthetic clinic in two hospitals located in central Sweden in the same county council, with about 130 km distance between them, and sharing the same top management (Paper I-IV). During the quasi-experimental study (Paper II and III), the anaesthetic clinic at one of the hospitals served as the intervention group and the anaesthetic clinic at the other hospital served as the comparison group. At the anaesthetic clinic, the WHO Surgical Safety Checklist[88] was used. The checklist was developed to increase teamwork and communication in surgery, and has been shown to reduce the mortality rates and complications among patients.[89] The Surgical Safety Checklist was designed to ensure patient safety on three occasions during the surgical procedure: "Sign in" (before the induction of anaesthesia), "Time out" (before the skin incision), and "Sign out" (before the patient leaves the OT).[88]

At baseline, during 2011, there were 15,459 surgical procedures (9707 inpatients and 5752 outpatients) performed at the two hospitals (Paper I, II and III). At follow-up, during 2012, there were 15,465 surgical procedures (9586 inpatients and 5897 outpatients) performed at the two hospitals (Paper II and III).

After implementation of SBAR was completed in the intervention group and the follow-up measures were completed, the comparison group received in-house training and started using SBAR. This means that when the focus group interviews were performed, in 2015, SBAR[3] was implemented at both hospitals at the anaesthetic clinic. During the period June 2014 to June 2015, there were 16,004 operations (13,235 inpatients and 2769 outpatients) performed at the two hospitals (Paper IV).

Material and Participants

Paper I and III

In Paper I and III, consecutive recruitment of handover situations of planned surgery during weekdays was used. At baseline, 73 handovers at PACUs were observed (intervention group, n=40; comparison group, n=33) (Paper I and III). At follow-up, 91 handovers were observed (intervention group, n=44; comparison group, n=47) (Paper III). During the study period, all adult patients planed for surgery received written information about the study along with the letter of notice for the operation. If the patient had agreed that the handover could be included in the study, he/she was asked to bring a written consent form at admission to the hospital. If the written consent was attached to the patient's anaesthetic record upon arrival at the PACU and the sender and receiver of the handover had agreed to participate,

the handover was included in the study. At baseline, the included handovers concerned patients who had undergone, e.g., gastrointestinal, urologic, vascular, endocrinologic (n=35 [48%]), orthopaedic (n=28 [38%]) or gynaecological surgery (n=10 [14%]) (Paper I and III). At follow-up, the included handovers concerned patients who had undergone, e.g., gastrointestinal, urologic, vascular, endocrinologic (n=42 [46%]), orthopaedic (n=45 [50%]) or gynaecological surgery (n=4 [4%]) (Paper III).

All physicians and nurses who worked daytime shifts at the units and who took part in handovers between the OT and PACU were invited to participate. At baseline, 72 personnel participated (nurse anaesthetists [n=35], intensive care nurses [n=27], registered nurses [n=5] special trainee (ST) physicians [n=5]. There were accompanying senders at seven handovers (anaesthesiologists [n=3], theatre nurses [n=3] and nurse anaesthetist [n=1]) (Paper I and III). At follow-up, 57 personnel participated (nurse anaesthetists [n=31], intensive care nurses [n=19], registered nurses [n=5], special trainee (ST) physicians [n=1], anaesthesiologists [n=1]). There were accompanying senders at seven handovers (theatre nurses [n=2] and nurse anaesthetists [n=2]). In total, four declined to participate.

Paper II

In Paper II all LPNs, registered nurses (RNs) and physicians working in the OTs, ICUs and PACUs at anaesthetic clinics in two hospitals were invited to participate in the study (n=316 [the intervention group n=194 and the comparison group n=122]). They were invited to participate if they had been working at the anaesthetic clinic for the past six months and would be continuing their employment. Information about eligible personnel was collected via the clinic's human resources department.

There were no statistically significant differences between the intervention group and the comparison group regarding sex, age, the proportion of LPNs, RNs and physicians, years working at the clinic, years working in the profession and working time (Table 2).

Table 2. *Demographic data on personnel in the intervention group and comparison group who participated at baseline and follow-up. Mean (m), Standard deviation (SD), numbers (n) and per cent (%)*

	Intervention group (n=100)	Comparison group (n=69)	P-value
Age, years, m (SD)	48.2 (8.7)	48.6 (9.0)	0.780
Sex male/female, n (%)	15 (15%)/85 (85%)	11 (16%)/58 (84%)	1.000
Profession, n (%)			0.945
LPN	27 (27%)	18 (26%)	
RN	63 (63%)	43 (62%)	
Physician	10 (10%)	8 (12%)	
Years in the profession, m (SD)	17.5 (11.2)	19.5 (10.2)	0.257
Years at the clinic, m (SD)	15.2 (11.0)	15.4 (10.3)	0.883
Working full-time/part-time, n (%)	60 (60%)/40 (40%)	48 (70%)/21 (30%)	0.254

Independent samples t-test and Chi-square test. The significant level is 0.05
LPN=Licensed Practical Nurse; RN=Registered Nurse

Paper IV

During the period January to May 2015, a total of six focus group interviews were conducted. Using purposive sampling, nurse anaesthetists (n=8), anaesthesiologists (n=7) and PACU nurses (n=8) with at least one year's experience in the profession were invited to participate. The heads of department established contact with potential participants. The participants received written and oral information about the study. The composition of the groups was based on the participants' similar role, profession and experience of the same issues[90] so as to enable identification of patterns in the professional groups' description of and reflections on postoperative handover. The demographic characteristics are shown in Table 3.

Table 3. *Demographic characteristics of participants*

	Nurse Anaesthetists	Anaesthesiologists	PACU nurses[1]
Gender Male/Female	2/6	5/2	0/8
Median age (Q1-Q3)[2]	40 (34-44)	54 (47-61)	59 (55-63)
Median years of practice[3] (Q1-Q3)	3 (2-16)	24 (15-30)	34 (23-40)

[1]PACU (post-anaesthesia care unit) nurses were all Specialist Nurses in Intensive Care, which means registered nurses with one year of training and a degree in intensive care. [2]Quartiles.
[3]Years of practice in current profession

Data collection

To address the overall aim, different data collection methods[75] were used in the present thesis to study the postoperative handover between healthcare personnel in anaesthetic clinics (Paper I, III and IV) and the effects of using SBAR from a patient safety perspective (Paper II and III).

Paper I and III

In Paper I, data were collected during 2011, the aim being to describe the postoperative handover and to determine whether postoperative handover structure, interruptions, duration of postoperative handover, number of patients treated and irrelevant information (i.e., information not at all concerned with the patient handed over) during postoperative handover influenced retention of information by the receivers. In Paper III, data were collected during 2011 and 2012, the aim being to determine whether implementing SBAR affected retention of information by receivers of postoperative handover.

To describe the postoperative handover, data were collected using a digital recorder and by making observations during the postoperative handovers as well as by reviewing patients' anaesthetic record. Data collection was performed by the author (MR), who is an intensive care nurse/nurse anaesthetist. The author did not actually work at the PACUs, but was dressed like the personnel. Based on earlier research, a study-specific protocol was developed and used to collect the data. The digital recorder was used to collect the verbally given report, made by the sender, and the reproduced report, made by the receiver as well as to determine the duration of the postoperative handover.[43, 91] During observations, data on break-in-task (Paper I and III);[92] simultaneous activity (e.g., dealing with the monitoring equipment);[37] pointing in the anaesthetic record; position;[93] number of patients the receivers had responsibility for during postoperative handover; and whether the receiver made notes[94] (Paper I) were observed and noted in the study-specific protocol. Interruptions[49, 92, 95] were collected both by digital recorder and during the observation (Paper I and III). There are several definitions of interruption in the literature. In the present thesis, an interruption is defined as in Chisholm et al.[92] as "any event that briefly required the attention of the subject but did not result in switching to a new task"[92 (p. 1240)] and a break-in-task as an event that required attention for more than 10 seconds and subsequently resulted in changing tasks.[92] After completion of the postoperative handover, the receiver of the handover reported back as much as possible about what he/she remembered from the verbal handover and was asked to reproduce the information. The reproduced information was also digitally recorded (Paper I and III). The anaesthetic record of each patient was reviewed to

measure what content in patents' anaesthetic record was verbally handed over (Paper I).

Paper II

Data were collected to measure whether use of the communication tool SBAR improved personnel's perception of communication within and between different professions as well as their safety attitudes (primary outcome). Data were also collected to measure whether implementation of SBAR decreased the proportion of incident reports due to communication errors as well as improve personnel's perception of psychological empowerment (secondary outcome). Prior to implementation of SBAR in April 2011 and at follow-up 6 months after completion of the implementation period in October 2012, questionnaire data were collected. For the primary outcome measures two questionnaires were used.

The *ICU Nurse-Physician Questionnaire* (short version, section one)[96] was used to measure communication within and between different professions, and consists of five factors: Within-group communication openness (4 items); Between-group communication openness (4 items); Within-group communication accuracy (4 items); Between-group communication accuracy (3 items); Communication timeliness (3 items). The questionnaire was adapted for LPNs and translated forward by the research team and back-translated by a bilingual translator.[97] Responses to the items were made on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." The questionnaire has shown satisfactory psychometric properties. Cronbach's alpha values (α) for the five factors have been between 0.64 and 0.88,[98] and in Paper II Cronbach's alpha values (α) were between 0.68 and 0.88 at baseline and between 0.68 and 0.85 at follow-up.

The *Safety Attitudes Questionnaire* (SAQ, short form)[73] was used to measure staff members' attitudes toward six patient-safety-related domains; it consists of six factors: Teamwork climate (6 items); Safety climate (7 items); Job satisfaction (5 items); Stress recognition (4 items); Perceptions of management (6 items); Working conditions (3 items). Responses to the items were made on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." The negatively worded items were reversed and the scale was converted to a 0-100% scale. To conform to Swedish conditions, the questionnaire was translated forward by the research team and back-translated by a bilingual translator.[97] The SAQ has shown satisfactory psychometric properties. Cronbach's alpha values (α) for the five factors have been between 0.70 and 0.85,[73] and in Paper II Cronbach's alpha values (α) were between 0.71 and 0.85 at baseline and between 0.71 and 0.86 at follow-up.

For secondary outcome measures, incident reports were collected from the hospitals' registration systems during a one-year period prior to (1 April 2010 to 31 March 2011) and after implementation of SBAR (1 April 2012 to 31 March 2013). Furthermore, *Spritzer's empowerment scale* [99] was used to measure psychological empowerment; it consists of four factors: Meaning (3 items); Competence (3 items); Self-determination (3 items); Impact (3 items). Responses to the items were made on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." Factor sores and the total score are averaged. The Swedish version of the scale has shown satisfactory psychometric properties and Cronbach's alpha values (α) for the factors have been between 0.77 and 0.90.[99] In Paper II, Cronbach's alpha values (α) were between 0.85 and 0.88 at baseline and between 0.80 and 0.87 at follow-up.

Paper IV

Data were collected by purposive sampling of profession-homogenous groups[100] to investigate nurse anaesthetists', anaesthesiologists', and PACU nurses' descriptions of and reflections on the postoperative handover. An interview guide with semi-structured questions was used.[90] The interview guide was pilot-tested on a focus group of PACU nurses, and minor changes were made. The interviews started with opening questions to get everyone to talk. Thereafter, introductory questions were posed to introduce the topic, and transition questions were posed to move the conversation closer to the key questions. The key questions concerned the transfer of 1) information, 2) responsibility/accountability, and 3) teams and work environment during postoperative handover.[30] The participants were presented with a transcribed handover to stimulate the discussion and questions about the ideal handover were posed. All focus group interviews were conducted by one moderator (MR), who is a specialist nurse in intensive care and a nurse anaesthetist with 22 years' experience in the professions. During the interviews, the assistant moderator (GM) observed the interaction between the participants as well as provided a summary and concluding question to enable the participants to reflect on previous comments. The interviews were digitally recorded and held in an undisturbed room at the participants' workplace; they lasted 1 to 1.5 hours.

Data analysis

Paper I

Descriptive data from the digital recordings and the study-specific protocol were analysed using frequencies, percentages, means and standard deviations (SDs) when the data were normally distributed and medians and ranges

when they were not. Concerning what content in the patients' anaesthetic record was verbally handed over, a content analysis was conducted.[101] The digital recordings of the verbal reports made by the senders during handover and the reproduced reports made by the receivers were transcribed verbatim and information sequences were identified. For example "bleeding 500 ml" was assessed as one information sequence. The content of the verbal handover, i.e. the identified information sequences, was deductively categorized using the structure of SBAR and compared with recorded data in the patients' anaesthetic record.

To measure how much the receiver remembered after the handover, the reported and reproduced information sequences were identified and counted for each handover. The reproduced information was compared with the reported information concerning information sequences and content. The quota of reproduced information sequences and reported information sequences was calculated and presented as percentage of remembered information sequences. The reproduced reports made by receivers were compared with reported information, and lost information was deductively categorized using the structure of SBAR. To test reliability, the two authors (MR and ME) independently identified reported and reproduced information sequences in 40 handovers. An intraclass correlation coefficient (ICC) was calculated, which was 0.98 for the reported information sequences.

To examine factors associated with memory, bivariate correlations (Spearman's rank correlations coefficient, r_s) between the dependent variable "percentage (%) remembered information sequences" and the hypothetical independent variables (structure of information during handover, interruptions during handover, duration of handover, number of patients the receiver had responsibility for during handover as well as number of irrelevant pieces of information during handover) were calculated. The independent variable "structure" originated from the content and structure of information sequences deductively categorized using the structure of SBAR. Information sequences that were reported in an irregular part of the handover were counted (e.g., reporting recommendation information while reporting background information). The independent variable "interruptions" was captured by the digital recordings and observations and then counted. The independent variable "duration" was captured by the digital recordings and measured in seconds. Multivariate regression analyses were calculated using linear regression analysis, and the generalized estimating equation (GEE)[102] approach was used. As some participants were involved in more than one handover, GEE was used to account for unknown correlation within a subject. Residuals in both the multivariate regression analysis and GEE were normally distributed.

Paper II

The data were analysed using descriptive statistics such as means, standard deviations [SD], absolute numbers and percentages. Using the Shapiro-Wilk test, the data were tested for normality. The Wilcoxon Signed Rank Test was used to measure within-group comparison over time, and the Mann-Whitney U-test was used to measure between-group comparisons. To detect differences in the frequency data, the Chi-square test and Fisher's Exact test were used. Factor scores were calculated if at least 66.7% of the questions for each factor were answered. Internal consistency was calculated using Cronbach's alpha. Because the majority of factors were not normally distributed, non-parametric tests were used.

Paper III

Descriptive statistics, frequencies, and percentages, means and standard deviations (SDs) were used when the data were approximately normally distributed, and means and ranges when data were not. Using the Shapiro-Wilk test, the data were tested for normality. Because the combinations of receiver, sender and the situation/patient handed over only occurred once, they were regarded as independent observations; the data were analysed using independent samples t-test when the data were normally distributed and the Mann-Whitney *U*-test when the data were not. However, as some receivers participated in several handovers, which could have resulted in unknown correlations among measurements, a linear generalized estimating equation (GEE) model was also used.

The digital recordings of the verbal reports made by the senders during handover and the reproduced reports made by receivers were analysed in the same way as described in Paper I concerning identifying information sequences, percentage of remembered information sequences and structure. Data on interruptions, breaks-in-task and duration were also collected as described in Paper I. The level for statistical significance was set at $p<0.05$ (two-tailed). The statistical analyses were performed using IBM SPSS 20.0[103] (Paper I-III).

Paper IV

The focus group interviews were transcribed verbatim and analysed using qualitative content analysis.[90] The digitally recorded interviews were listened to and transcripts were read and re-read to become familiar with the text and to obtain an overall impression. In line with the study aim, the three professional groups were first analysed separately to form preliminary subcategories.[90] Meaning units were identified and condensed, abstracted, and marked with a code and thereafter sorted into three topics: 1) information, 2) respon-

sibility and/or accountability, as well as 3) teams and work environment. Based on their similarities and differences, the codes within each topic were then grouped into preliminary subcategories. Thereafter, the preliminary subcategories for the three professional groups were scrutinized for similarities and grouped together when they had the same content. Then, the final subcategories were grouped into five categories based on similarities (Table 9).[90] The analyses were primarily carried out by the moderator and assistant moderator. The subcategories and categories were discussed with all co-authors until consensus was reached.

Ethical considerations

The studies were approved by the Regional Ethical Review Board (reg. no. 2011/061) and were conducted according to the medical research ethical standards of the Declaration of Helsinki[104] and the ethical guidelines for nursing research.[105]

Ethical considerations concerning the principles of autonomy, beneficence, non-maleficence and justice[105] were made.

The principle of autonomy "with respect for the participant's dignity, integrity and vulnerability"[105 (p.3)] was complied with through voluntariness, informed consent, the right to withdraw from research project and confidentiality. The author verbally informed the personnel about the study at workplace meetings (Paper I, II and Paper III). Written information was delivered to all personnel (Paper I, II and Paper III) and to all adult patients planned for surgery during the observation period (Paper I and Paper III). Before the focus group interviews, the heads of the department provided written information about the study as well as the moderator's e-mail address and telephone numbers to the participants (Paper IV). The information dealt with what the study entails; the study aim; the method and that the personnel and patients could withdraw from the study at any time without explanation; that the data would be coded and handled strictly confidentially and that the results would be presented on a group level (Paper I-III) so that no person could be identified (Paper I-IV). The personnel (Paper I-IV) and patients (Paper I and III) were also informed that they could contact the researchers if they had any questions about the study. In Paper I and III, the handover was included if a written consent form from the patient was attached to the anaesthetic record upon arrival at the PACU and the sender and receiver during handover had agreed to participate. In Paper II, written information was attached to the questionnaires and the participants gave their consent by completing the questionnaires. In Paper IV, verbal information was used to inform the informants about the study and their written consent was received.

The principle of beneficence was followed in the sense that "the research can be justified and brings new knowledge to promote and restore health, to prevent illness and to alleviate suffering".[105 (p. 4)] As lack of communication between personnel is the most common cause of low quality in care, results of research on factors that affect communication and technics that improve communication may enhance quality, patient safety and alleviate suffering.

Regarding *the principle of non-maleficence* or not causing harm to participants, the measures using a digital recorder, observations, anaesthetic record (Paper I and Paper III) questionnaires and incident reports (Paper II) as well as focus group interviews (Paper IV) were considered not to harm participants, even though some of them may have felt uncomfortable.

The principle of justice was followed by inviting all personnel at the anaesthetic clinic to take part in the study.

Results

Paper I

Description of handovers at the PACU

During handover at the PACU, most often the sender was a nurse anaesthetist (n=59 [81%]) and the receiver an intensive care nurse (n=59 [81%]). There were accompanying senders at seven handovers (anaesthesiologists [n=3], theatre nurses [n=3] and nurse anaesthetist [n=1]). The mean duration of handover was 2 minutes and 22 seconds (range; 20 seconds to 8 minutes and 44 seconds), and interruptions occurred during 56 (77%) of the handovers. The most common interruption was signals from the monitoring equipment, and in 13 (18%) handovers an interruption resulted in a break-in-task of at least 10 seconds. The sender and receiver made assessments during 28 (38%) handovers and were engaged in simultaneous activity during 22 (30%) handovers. During handover, the sender produced repetitions (n=34 [47%]), reported irrelevant information (n=15 [20%]), expressed unclear information (n=51 [70%]) and pointed out information in the anaesthetic record (n=71 [97%]). The receiver confirmed the sender's statements during the verbal handover by saying, e.g., "hm", "yes" or "okay" (median=10 [range 0 to 47]) during 70 handovers (96%) and asked questions during the verbal handover (n=43 [59%]). During the studied handovers, the receiver had responsibility for another 1 to 6 patients (median=2). The receivers never made any notes during the handover. The most common position during handover was nearby the patient (66 [90%]), and at 7 (10%) handovers the handover was carried out in a place at a distance from the patient.

Reported information sequences during the verbal handover

The total number of information sequences during the studied handovers was 1764, and the range was between 8 and 50 sequences (median=23) per handover. The content was categorized according to the SBAR structure and compared with the anaesthetic record. The patient's name and age, diagnosis, performed surgery, past and present diseases, current problems and treatments, anaesthetic and surgical process, respiration, circulation and fluid/diuresis were mentioned in ≥50% of the handovers. Information such as allergy/infection, skin/bandage/drainage, test results, catheters, ordinations,

postoperative pain relief and controls/monitoring were mentioned in <50% of handovers (Table 4).

Table 4. *Information in the anaesthetic record mentioned by the sender during handover, per cent, n=73*

SBAR-structure		Mentioned %
Situation	Sender's name and title	0
	Patient's name and age	**93.2**
	Diagnosis	**57.5**
	Performed surgery	**93.2**
Background	Past and present diseases	**94.5**
	Current problems and treatments	**69.9**
	Important information, Allergy/infection	39.7
	Communication ability*	15.1
Assessment	Anaesthetic and surgery process	**95.9**
	Respiration	**50.7**
	Circulation	**65.8**
	Level of consciousness*	37.0
	Fluid/diuresis	**83.6**
	Skin/Bandage/Drainage	30.1
	Test results	30.1
	Catheters	20.5
Recommendation	Ordinations	49.3
	Postoperative pain relief	24.7
	Controls/monitoring	20.5
	Do you have any questions?*	19.2

Mentioned: Information in the anaesthetic record was also verbally handed over. * Communication ability, level of consciousness and do you have any questions were not in the anaesthetic record. Results of fifty per cent or more are marked with boldface text.

Remembered information sequences after handover

The total number of information sequences in the reproduced report was 774, and the range was between 2 and 20 sequences (median=10) per handover. The mean percentage of information sequences remembered by the receiver during verbal handover was 47% (SD 16%), and the items most likely not to be remembered were drugs used during the anaesthetic and surgical process (Table 5).

Table 5. *Number and per cent of information sequences not reproduced by the receiver after handover, n=73*

SBAR - structure		Number of missed information sequences	Per cent of missed information sequences, %
Situation	Patient's name and age	10	1.0
	Diagnosis	7	0.7
	Performed surgery	16	1.6
Background	Past and present diseases	52	5.3
	Current problems and treatments	66	6.7
	Important information and Allergy/infection	27	2.7
	Communication ability	1	0.1
Assessment	Anaesthetic and surgery process	381	38.5
	Surgery process	*(38)*	*(3.8)*
	Anaesthetic process	*(71)*	*(7.2)*
	Drugs	*(272)*	*(27.5)*
	Respiration	33	3.3
	Circulation	42	4.2
	Level of consciousness	5	0.5
	Fluid/diuresis	127	12.8
	Skin/Bandage/Drainage	14	1.4
	Test results	46	4.6
	Catheters	44	4.4
	Others	58	5.9
Recommendation	Ordinations	47	4.7
	Postoperative pain relief	8	0.8
	Controls/Monitoring	2	0.2
	Unclear category	4	0.4
	Total	990	

Ordinations: Treatment to be performed during the patients continuing care; SBAR: Situation-Background-Assessment-Recommendation.
Main groups are marked with plain text. Subgroups are marked in italics. The table can be read in the following manner: The total number of information sequences in the main group "Anaesthetic and surgery process" was divided into the subgroups *Surgery process, Anaesthetic process* and *Drugs*.

Factors associated with receivers' retention of information

Bivariate correlation analysis showed that the per cent remembered information sequences was statistically significantly associated with lack of structure (r_s=−0.27; p=0.019), interruptions (r_s=−0.26; p=0.027) and duration of verbal handover (r_s=−0.32; p=0.005). Multiple regression analysis showed that structure, interruptions and duration as independent variables explained 14.1% (R^2=0.141, $R^2_{adjusted}$=0.104) of the variance in per cent remembered information sequences (F=3.785, p=0.014). The variable that contributed to statisti-

cally significant portions of the variance in remembered information sequences was lack of structure (B=−0.012, p=0.030). A linear generalized estimating equation (GEE) was conducted because some receivers participated in several handovers, which could have resulted in unknown correlations among measurements. The results showed that the model fitted well; the significant variables were lack of structure (B=−0.012, Wald Chi-square=16.92, p<0.001) and duration (B=−0.000348, Wald Chi-square=6.008, p=0.014).

Paper II

Sample characteristics

At baseline, the response rate was 72% (n=139 of 194) in the intervention group and 75% (n=91 of 122) in the comparison group. At follow-up, the response rate was 72% (n=100 of 139) in the intervention group and 76% (n=69 of 91) in the comparison group (Table 6). The dropouts had fewer years working at the clinic (p<0.001) and fewer years working in the profession (p=0.005). The dropouts had lower scores on the factor Competence on the scale Psychological empowerment (p=0.048) and higher scores on the factor Teamwork climate on the scale measuring personnel's safety attitudes (p=0.017) than the participants did. At baseline, the comparison group had statistically significantly higher scores on five factors: Safety climate (p=0.002), Working condition (p=0.002), Job satisfaction (p=0.004) and Teamwork climate (p=0.045) on the scale measuring personnel's safety attitudes and Within-group communication accuracy (p=0.001) on the scale measuring communication within and between different professions.

Table 6. *Reasons why non-participants dropped out at baseline and follow-up (Paper II)*

	Intervention group	Comparison group
Baseline	*194*	*122*
Declined	3	24
No reason	52	7
Completed questionnaires	**139**	**91**
Follow-up	*139*	*91*
Parental leave	3	2
Quit work	7	8
Long-term illness	-	1
Leave of absence	5	1
Education	2	1
Total unavailable staff	17	13
Eligible staff	**122**	**78**
Declined	6	6
No reason	16	3
Completed questionnaires	**100**	**69**

Primary outcome

On the ICU Nurse-Physician Questionnaire, the factor Between-group communication accuracy improved significantly ($p=0.001$) over time in the intervention group. For the factor Within-group communication accuracy, there was a tendency for improvement ($p=0.076$) over time in the intervention group. When analysing each item for the factor, there was a significant ($p=0.025$) improvement for the item "It is often necessary for me to go back and check the accuracy of information I have received from [physicians, nurses or licensed practical nurses] in this unit". In the comparison group, the factor Between-group openness showed a significant ($p=0.039$) improvement over time.

On the Safety Attitudes Questionnaire, the factor Safety climate improved significantly ($p=0.011$) over time in the intervention group. In the comparison group, the factor Perception of management at the unit ($p<0.001$) showed a significant improvement over time, as did the factor Working condition ($p=0.029$).

When changes over time were compared between the intervention group and the comparison group, the results showed a significant ($p<0.001$) effect for the factor Perception of management at the unit. For the other variables, there were no statistically significant differences when the groups were compared for changes over time (Table 7).

Secondary outcome

The number of incident reports during a 1-year period prior to implementation was 116, whereof 36 (31%) were due to communication errors, in the intervention group. During a 1-year period after implementation, the number of incident reports had increased but the proportion of incident reports due to communication errors had decreased to 11% (23 of 208) in the intervention group. The decrease in the proportions of incident reports due to communication errors in the intervention group was statistically significant ($p<0.0001$).

In the comparison group, the number of incident reports during a 1-year period prior to implementation was 24, whereof 6 (25%) were due to communication errors. During a 1-year period after implementation, the incident reports due to communication errors were 6 of 32 (19%) in the comparison group. The decrease in the proportions of incident reports due to communication errors in the comparison group was not statistically significant ($p=0.744$). On the Spreitzer's Empowerment scale, there were no statistically significant changes over time in either the intervention group or the comparison group (Table 7).

Table 7. *Personnel's assessment of communication within and between groups, safety attitudes and empowerment in the intervention and comparison group at baseline and follow-up as change over time between groups. Mean (SD), n=169*

	Intervention group – within group, n=100		Comparison group – within group, n=69		Change over time between groups
Factors	Mean value (SD)	p value[1]	Mean value (SD)	p value[1]	p value[2]
PRIMARY OUTCOME					
ICU Nurse-Physician Questionnaire					
Within-group communication openness					
Baseline	4.3 (0.6)		4.4 (0.6)		
Follow-up	4.3 (0.5)	0.998	4.4 (0.5)	0.529	0.390
Between-group communication openness					
Baseline	4.3 (0.5)		4.2 (0.6)		
Follow-up	4.3 (0.5)	0.686	4.3 (0.6)	**0.039**	0.263
Within-group communication accuracy					
Baseline	3.3 (0.8)		3.7 (0.8)		
Follow-up	3.4 (0.8)	0.076	3.7 (0.9)	0.966	0.371
Between-group communication accuracy					
Baseline	3.3 (0.8)		3.5 (0.8)		
Follow-up	3.5 (0.8)	**0.001**	3.6 (0.8)	0.185	0.172
Communication timeliness					
Baseline	4.2 (0.7)		4.2 (0.7)		
Follow-up	4.3 (0.6)	0.612	4.3 (0.7)	0.650	0.958
Safety Attitudes Questionnaire					
Teamwork climate					
Baseline	72.2 (15.1)		76.9 (15.1)		
Follow-up	73.8 (14.4)	0.350	76.7 (15.8)	0.914	0.584
Safety climate					
Baseline	63.1 (15.8)		70.3 (14.3)		
Follow-up	66.4 (16.2)	**0.011**	70.2 (16.0)	0.949	0.087
Job satisfaction					
Baseline	75.3 (15.5)		81.5 (16.4)		
Follow-up	74.2 (15.4)	0.604	81.7 (15.0)	0.865	0.771
Stress recognition					
Baseline	68.0 (21.9)		65.8 (25.2)		
Follow-up	67.8 (20.8)	0.483	63.5 (24.9)	0.382	0.388
Perception of management at the unit					
Baseline	60.2 (17.9)		59.2 (16.7)		
Follow-up	60.2 (18.6)	0.667	68.6 (16.7)	**<0.001**	**<0.001**
Working condition					
Baseline	63.9 (19.2)		73.3 (15.6)		
Follow-up	63.5 (18.8)	0.956	77.8 (16.2)	**0.029**	0.131

SECONDARY OUTCOME					
Spreitzer's Empowerment scale					
Meaning					
Baseline	6.2 (0.8)		6.3 (0.9)		
Follow-up	6.3 (0.7)	0.270	6.3 (0.8)	0.935	0.602
Competence					
Baseline	6.4 (0.7)		6.5 (0.6)		
Follow-up	6.4 (0.6)	0.985	6.5 (0.7)	0.877	0.818
Self-determination					
Baseline	4.3 (1.2)		4.4 (1.5)		
Follow-up	4.3 (1.3)	0.992	4.6 (1.3)	0.342	0.465
Impact					
Baseline	4.2 (1.3)		4.5 (1.4)		
Follow-up	4.2 (1.4)	0.639	4.5 (1.3)	0.867	0.857
Empowerment total factors					
Baseline	5.3 (0.7)		5.4 (0.8)		
Follow-up	5.3 (0.8)	0.474	5.5 (0.7)	0.444	0.916

[1]Wilcoxon signed rank test, [2]Mann-Whitney U test. The significance level is 0.05 and statistically significant results are marked with boldface text.

Paper III

In the intervention group, the per cent remembered information sequences by receivers increased from 43.4% (SD 13.9%) during baseline to 52.6% (SD 14.6%) at follow-up (p=0.004). The corresponding figures for the comparison group were 51.3% (SD 17.8%) and 52.6% (SD 14.5%) (p=0.725). The median for structure of information during verbal reports improved in the intervention group: baseline 3 (range 0 to 17), follow-up 2 (range 0 to 12) (p=0.028). In the comparison group, no significant change was seen: baseline 3 (range 0 to 26), and follow-up 3 (range 0 to 10) (p=0.889). There was no significant change over time for interruptions in the intervention group: baseline 4 (range 0 to 66), follow-up 7.5 (range 0 to 25) (p=0.115), but in the comparison group the interruptions increased at follow-up: baseline 2 (range 0 to 64), follow-up 4 (0 to 28) (p=0.024). The duration for handover was non-significant over time for the intervention group and comparison group, and ranged between 20 and 524 seconds. To test whether the intervention and time had an effect on the information sequences remembered and whether this change over time differed between the two groups, controlling for variations in interruptions, we proceeded by using GEE. In the GEE models, we used the recalled information sequences as the dependent variable and the independent variables were the two groups (intervention and comparison) and time (baseline and follow-up), as well as an interaction effect (time*group) with interruptions as a covariate. In the first model performed, a non-significant interaction term was shown (p=0.219), indicating that change over time was not significantly different in the two groups. We

continued with a model to test the main effect only. The results were significant for the variables time (p=0.041) and interruptions (p=0.002). Thereafter, we used a model that explicitly tested the differences between groups at baseline and between baseline and follow-up. The results of the model showed a statistically significant effect for the intervention group when baseline was compared with follow-up (p=0.025) and the covariate interruptions were significant (β=−0.29, p=0.004). Furthermore, there was no significant difference between the intervention group and comparison group at baseline (p=0.130) or the comparison group over time. In Table 8, the sizes of estimated mean differences with 95% confidence intervals for pairwise comparisons are shown. To summarize, the results showed an improvement in recalled information between baseline and follow-up in the intervention group after controlling for interruptions, but no significant time*group interaction was found. We therefore cannot claim that this improvement over time is different from the change over time in the comparison group.

Table 8. *Differences in estimated mean values of the percentage of information sequences remembered and 95% confidence intervals at baseline and at follow-up, controlling for number of interruptions from generalized estimating equation analyses*

	Mean difference in percentage	Standard error of the difference	95% Wald confidence interval for difference
Intervention group at baseline-Comparison group at baseline	−6.16	4.06	−14.12 to 1.81
Intervention group at baseline-Intervention group at follow-up	−8.59	3.83	**−16.10 to −1.1**
Comparison group at baseline-Comparison group at follow-up	−2.22	3.45	−8.99 to 4.54

Statistically significant results are those with p≤0.05, and the results are in boldface text.

Paper IV

Five categories emerged concerning the nurse anaesthetists', anaesthesiologists', and PACU nurses' descriptions and reflections on the postoperative handover: "Having different temporal focus during handover", "Insecurity when information is transferred from one team to another", "Striving to ensure the quality of the handover", "Weighing the advantages and disadvantages of the bedside handover", and "Having different perspectives on the transfer of responsibility". Patterns in each of the categories and subcategories are described and shown in Table 9.

Table 9. *Categories and sub-categories that emerged for each profession, marked by an* X

Category	Subcategory	Nurse Anaesthetists	Anaesthesiologists	PACU nurses[1]
Having different temporal focus during handover	*Focusing mainly on the past*	X		
	Focusing mainly on the present			X
	Focusing on the continuum of care		X	
Insecurity when information is transferred from one team to another	*Insecure about having all information needed*	X	X	X
	Insecure about receiver's knowledge	X	X	
Striving to ensure the quality of the handover	*Focus the information on deviating events*	X	X	X
	Aid memory by structure and written information	X	X	X
	Cooperate within and between teams	X	X	X
Weighing the advantages and disadvantages of the bedside handover	*Provide control and save time*	X		X
	Threats to integrity	X		X
	The disturbing bedside environment		X	X
Having different perspectives on the transfer of responsibility	*Hand over the responsibility*	X		
	Not hand over the responsibility or accountability		X	
	Require control before taking over responsibility			X

[1]PACU (post-anaesthesia care unit) nurses were all Specialist Nurses in Intensive Care, which means registered nurses with one year of training and a degree in intensive care

Having different temporal focus during handover

The nurse anaesthetists, anaesthesiologists and PACU nurses described their temporal focus during the post-operative handover. There were differences found in this focus. The nurse anaesthetists described that their main focus concerned information on what they themselves had done, i.e. the anaesthe-

sia process. The anaesthesiologists described focusing on the continuum of care from the OT to discharge. Both the nurse anaesthetists and anaesthesiologists reflected on the insecurity concerning the receiver's focus during handover. While the PACU nurses' main focus was on essential information of importance for the present, e.g., the patient to be taken care of, vital parameters and recommendations; they reflected on their observation that nurse anaesthetists mostly reported information about the anaesthesia process.

Insecurity when information is transferred from one team to another

All three of the professional groups described and reflected on the insecurity surrounding the question of whether all required information was actually being transferred from the OT team to the PACU team. The nurse anaesthetists expressed that they were obliged to transfer all important information, but like the anaesthesiologists and PACU nurses, they had doubts about whether all of the essential information from the surgeon or theatre nurse was transferred before the patient left the OT. The anaesthesiologists described insufficient "sign out", and they also expressed that it would be beneficial if the main surgeon always communicated important information before the patient left the OT. Furthermore, they indicated that several information transfers and lack of knowledge constituted potential risks for the patient's continued care.

The nurse anaesthetists described insecurity as to whether the information was understood, and the anaesthesiologists described insecurity concerning the receiver's knowledge. To be sure that the information was understood, the nurse anaesthetists and anaesthesiologists saw a need for confirmation from the receiver.

Striving to ensure the quality of the handover

The three professional groups described how they strived to ensure the quality of the handover. All of the groups described the importance of emphasizing information on issues that deviate from the normal course of events. They expressed that information concerning the anaesthetic and surgical process that had proceeded as expected was less important to mention. The nurse anaesthetists and anaesthesiologists also saw the importance of limiting the amount of information during postoperative handover.

The nurse anaesthetists described using a structure such as SBAR when reporting essential information, and they wanted information to be communicated with a structure, to aid memory. The PACU nurses expected to receive the information with a structure and reflected on the importance of asking questions, in a structured manner, during the handover. The nurse anaesthetists and the PACU nurses reflected on the importance of having

written information during handover to aid memory and they felt that the electronic patient records complicated information retrieval.

The three professional groups saw the benefits of cooperation. The nurse anaesthetists reflected on the need for improved cooperation within the OT team and the need for developing further collaboration between the OT team and the PACU team. They wanted to reach consensus on how the handover should be conducted, who should carry out the handover and what information is needed during handover. The PACU nurses described the advantages and disadvantages of the theatre nurses and the nurse anaesthetists collaborating during handover. They reported that more information about the surgery process was transferred if the theatre nurse participated during handover; on the other hand, this also made the handover more unstructured. The anaesthesiologists and the PACU nurses described the benefits of cooperation within the PACU team, as it facilitated and safeguarded the handover situation by allowing the receiving PACU nurse to focus on the handover.

Weighing the advantages and disadvantages of the bedside handover

All three professional groups saw both the advantages and disadvantages of the bedside handover. Nurse anaesthetists and PACU nurses saw the benefits of performing handovers close to the patient, as this provided control over the patient's condition; on the other hand, it could threaten the patient's integrity. The nurse anaesthetists described considering whether the handover should be performed bedside depending on whether the information transferred was or was not meant to be heard by the patient. The PACU nurses reflected on the time-saving benefits of the bedside handover, compared with a handover in another room. The anaesthesiologists and the PACU nurses reflected on the bedside environment and the fact that it sometimes entailed frequent interruptions, which they felt could cause stress and distraction.

Having different perspectives on the transfer of responsibility

The three professional groups described different perspectives on the transfer of responsibility. The nurse anaesthetists handed over their responsibility when all the information was transferred to the receiver, and when they left the PACU. The anaesthesiologists described handing over responsibility to other physicians, but that their overall responsibility (accountability) remained even after handover to a PACU nurse. The PACU nurses described that they assumed the responsibility when they had control over the patient's condition. Uncertainty about responsibility arose when the nurse anaesthetist provided incomplete information about the patient or when the nurse anaesthetist failed to complete tasks that he/she should have completed prior to the handover.

Discussion

The findings of the present thesis provide additional insight into communication within and between healthcare teams in anaesthetic clinics, especially communication taking place during the postoperative handover. Findings on implementation of the communication tool SBAR indicated that the structure increased the amount of information remembered by the receivers (Paper III) as well as increasing the participants' ratings of between-group communication accuracy and safety climate within the intervention group. Furthermore, the proportion of incident reports due to communication errors decreased at follow-up (Paper II). The focus group interviews revealed that strategies intended to secure the quality of care during handovers were described by the nurse anaesthetists, anaesthesiologists and PACU nurses; these strategies were: to focus information on events deviating from the normal, to aid memory by using a structure and having written information, as well as to cooperate within and between teams. Moreover, they saw the advantages and disadvantages of the bedside handover (Paper IV).

The present thesis also showed that communication within and between healthcare teams at anaesthetic clinics needs to be improved to secure patient safety. The receivers of information, during postoperative handover, remembered only about half of the information reported; thus there is room for improvement (Paper I and III). There were frequent interruptions (Paper I and III), which, in turn, negatively affected information sequences memorized by the receiver (Paper III), as did the duration of handover (Paper I). The nurse anaesthetists, anaesthesiologists and PACU nurses described having a different temporal focus during postoperative handover as well as different perspectives on the transfer of responsibility. Last but not least, the three professional groups were uncertain about whether they had all of the information needed, during postoperative handover, to secure the quality of care (Paper IV).

Communication and patient safety

The structure of communication between teams

SBAR has the advantage of organizing the information to be transferred into a predictable structure,[16] and in the present thesis implementation of SBAR was associated with a significant improvement in the participants' performance of using the structure during postoperative handover. The results of using the SBAR structure also showed a significantly increased percentage of memorized information sequences in the intervention group, from 43.4% at baseline to 52.6% at follow-up (Paper III). During the focus group interviews, the nurse anaesthetists, anaesthesiologists and PACU nurses also reported that using a structure during postoperative handover aided memory (Paper IV). In earlier studies of postoperative handovers, the most common outcome measures were information omission (information not transferred to the receiver), quality of teamwork, technical errors and handover duration.[84] Checklists focusing on the content of the information that has to be reported during handover[106] may also serve as an aid to memory. However, when checklists are used, the omission is the focus. Previous studies of using checklists and handover protocols reduced error,[41, 45] and only five previous studies were found in which retention of information was measured after handover. The data were mostly collected using observational protocols, and none of the studies used digitally recorded transcribed records. In the five studies, retention of information varied between 27 and 90%.[107-111] The results of the study, described in Paper III, on using a predictable structure of information are in line with Shannon and Weaver's theory, according to which structuring a message to conform with conventions leads to increased redundancy.[20, 21]

When using SBAR, the receiver of information is not supposed to interrupt the sender of information during handover.[3] On the other hand, the PACU nurses expressed that they needed to ask questions (in a structured manner) during the handover, and the nurse anaesthetists and anaesthesiologists, as senders, were unsure about the PACU nurses' focus and attention and wanted confirmation from them (Paper IV). These results indicate that the communication during handover is primarily one-way. One weakness of Shannon and Weaver's theory is that they did not use the concept of feedback, which allows the sender of information to adapt the information to the receiver. Feedback also allows the receiver of information to feel involved and makes the transmission of the information effective.[21] In other high-stakes environments, such as aviation, Bowers et al.[112] found that high-performing teams used feedback and repeated commands more frequently than did low-performing teams. Regarding healthcare, in a study of simulated obstetric emergency situations, the use of closed-loop communication was associated with better team efficiency.[113] As both quantitative and qualitative data support the notion that using a structure, and as feedback and

closed-loop communication, is an easy way to prevent misunderstanding, structured two-way communication is preferable during handovers within and between healthcare teams, where the aim is to achieve increased team efficiency. Furthermore, both kinds of communication tools, those promoting a predictable structure and checklists focused on the exact content, are valuable in improving handovers.

The content of information transferred within and between teams

In the focus group interviews, the nurse anaesthetists, the anaesthesiologists, and the PACU nurses described how they strived to focus the information on events that deviated from the normal to ensure the quality of handover. They also described and reflected on being uncertain as to whether all of the information needed was being transferred from the OT team to the PACU team (Paper IV). An important reason for the latter opinion was described as lack of communication on the part of the OT surgeon or theatre nurse. The anaesthesiologists described the main surgeons' insufficient communication during "sign out" (Study IV). A previous study,[114] in paediatric cardiac surgery, found that communication between the main surgeons and the anaesthesiologists was not more than 5% of all communication in the OT.[114] In a qualitative study[115] of Swedish anaesthesiologists, one theme was that other physicians, especially surgeons, sometimes do not respect anaesthesiologists.[115] Furthermore, a study by Nagpal et al.[10] showed that of the essential information to be handed over, only 56% was transferred from the OT to the PACU.[10]

In the present thesis, a long duration handover, and the resultant large amount of reported information, was associated with decreased amount of information memorized by the receiver (Paper I). Moreover, the nurse anaesthetists and anaesthesiologists reflected on the importance of limiting the amount of information during postoperative handover (Paper IV). This is in line with recommendations made by Flin et al.[18] for improving communication in teams. They argued that the message should be as brief as possible and include only the most relevant information due to the costs of attention and cognitive resources for both the sender and the receiver.[18] Similar results were also shown in an earlier interview study[116] where surgeons, anaesthesiologists and nurses reported that incomplete and too much information can lead to information transfer and communication failures.[116] In a systematic review[106] of the literature on postoperative handovers, an overview of recommendations for information content was completed. Across the 31 included studies, a total of 74 different information items were proposed to be important to transfer.[106] Concerning memory limitations, it would not seem to be feasible for the sender to transfer all of the items or for the receiver to remember them. Thus, a selection of items would seem to be necessary, and according to the interviewed professional groups, essential information from

the surgeon and theatre nurse should be shared with other members of the OT team. Moreover, information on events that deviated from the normal seemed to be the most important.

Having a different focus depending on one's professional group and roles was also seen in the focus group interviews (Paper IV). The nurse anaesthetists focused on the past (i.e., the anaesthetic process), the anaesthesiologists on the continuum of care and the PACU nurses on the here and now (Paper IV). These results could explain why, during postoperative handover, the most common items reported by the senders and not remembered by the PACU nurses were anaesthetic drugs (Paper I). This is in line with a study[10] which revealed that the anaesthesiologists, as senders, reported information relevant to them and that there was a lack of surgical information.[10] In one prospective observational study[41] at the PACU, it was concluded that physicians as senders and PACU nurses as receivers had different views on what items should be included in the verbal handover.[41] Furthermore, listening is an active process, and if the listener is interested only about one-third of what is said is actually heard, and even less if the listener is not interested.[18] Another weakness of Shannon and Weaver's theory, mentioned by I. A. Richards, is that they did not mention the selection of information. Richards claimed that the sender of information cannot send complete information and that there is always a selection and distortion of the information; moreover, who is doing the selection and his/her view are paramount.[21] In the present thesis, Paper I and IV indicated that the senders of information made a selection of the content of the handover, and that the receivers of information made a selection and remembered information about what they considered to be important information for postoperative care. Perhaps these hypothetical selections, made by both senders and receivers, are not the result of conscious choice, but made on the basis of the handover participants' different views.

After implementation of the communication tool SBAR, the perception of between-group communication accuracy significantly increased and there was a tendency towards improvement for the factor within-group communication accuracy. Furthermore, the proportion of incident reports due to communication errors decreased significantly in the intervention group after implementation of SBAR (Paper II). These findings are in line with two previous studies.[66, 117] Manojlovich and DeCicco[117] found that a significant predictor of perceived medical error was between-group communication.[117] De Meester et al.[66] showed that, after implementing SBAR, nurse-physician communication improved and the rate of unexpected death decreased.[66] The results of the study described in Paper II indicate that the structure of SBAR seemed to bridge differences in communication style, which may have provided the conditions for safer care.

The interruptive environment and memory

It is well known that, at the PACU, the handover is marked by interruptions,[84] and in the present thesis interruptions during postoperative handover were frequent and occurred during 77% of handovers (Paper I), negatively interfering with the information memorized by the receiver (Paper III). In healthcare, two studies have shown causality between interruptions and errors.[118, 119] Shannon and Weaver described the term "noise" as everything that is added to the signal between the sender and receiver, but that was not intended by the source and that affects reception of the message.[20] In the context of handovers, interruptions can be interpreted as "noise". Concerning clinical communication from a cognitive psychological perspective, Parker and Coiera[47] argued that working in a busy and interruption-driven environment can over-extend the capabilities of the human cognitive system.[47] Moreover, in a review of the psychological literature on interruptions and their implications for patient safety, Li et al.[52] suggested that interruptions should be minimized at workplaces with high working memory demands.[52] In the present thesis, the nurse anaesthetists and PACU nurses were aware that interruptions could disturb the bedside postoperative handover and that they could threaten patients' integrity. Nevertheless, they also reflected on the benefits, mentioning that the bedside position increased control of the patient (Paper IV). According to Frankel et al.,[120] a "joint focus of attention" has advantages, as it coordinates the sender's and receiver's verbal and visual attention. Redundancy in the visual field gives a "joint focus of attention" owing to the simultaneous inputs and therefore has the greatest potential for achieving a high-quality and reliable handover.[120] Thus, the bedside handover has both advantages, because it increases control and gives a joint focus of attention, as well as disadvantages, because it is exposed to frequent interruptions that can negatively affect the receiver's memory and may threaten the patient's integrity.

Teams, responsibility and patient safety

Safety culture

After implementation of the communication tool SBAR, the perception of safety climate significantly increased in the intervention group and there was a tendency towards an interaction effect ($p=0.087$) between the intervention group and the comparison group. Furthermore, the proportion of incident reports due to communication errors decreased significantly, and the number of incident reports increased in the intervention group (Paper II). In line with this, improved perception of safety climate has been found in previous studies[61, 62] of rehabilitation settings in which SBAR was implemented. One previous study[121] of 91 hospitals found that a when the personnel rated safety

climate on a higher level, these higher ratings were associated with higher safety performance at the hospital level.[121] Another study of 30 ICUs in the US using the Safety Attitudes Questionnaire (SAQ) found that lower safety climate was associated with patient outcomes such as increased hospital length of stay.[122] According to Reason, effective risk management depends on the presence of a reporting culture,[81] as the incident reports can identify hazards and risks.[79] The increased amount of incident reports (Paper II) may be the result of increased awareness of safety, influenced by the intervention, and a movement towards a reporting culture among the personnel. Earlier studies have suggested that patient safety cultures may differ across specialties, professional groups and departments.[123-127] It is highly likely that the anaesthetic clinic has an organizational culture, but there may also be subcultures within the organization, e.g., different subcultures at the two hospitals (intervention group and comparison group) within the anaesthetic clinic, the OTs, the PACUs, and the ICUs as well as the professions and roles. The observations (Paper I and III) and focus group interviews (Paper IV) indicate that the team members at the OT and PACU had different focuses and views, which may indicate different subcultures in the OT team and PACU team. However, after implementing SBAR, the increased perception of safety climate and, as discussed earlier, the increased perception of between-group communication accuracy within the intervention group might have been the result of the SBAR communication bridging the differences between these hypothesized subcultures, thus causing handovers to be perceived as safer.

Teamwork

The results of the focus group interviews showed that the three professional groups strived to ensure the quality of handover by cooperating within teams. The nurse anaesthetists also wanted to achieve a shared understanding of handovers between the OT team and PACU team (Paper IV). Teamwork is an essential component of achieving high reliability in healthcare organisations,[31, 128] as a shared understanding and working atmosphere are factors of importance for the quality of handover.[129] SBAR has been suggested to reduce the barriers that a hierarchical structure may lead to.[16] However, implementation of the communication tool SBAR did not impact the teamwork climate (Paper II). To achieve increased cooperation and teamwork in an organization, it has been suggested that the personnel must have a shared understanding of the collective's work in its entirety as well as an understanding of their specific roles and competence in the performance of a task.[130] One cannot expect a structured method of communication to increase a shared understanding of the collective's work and the various professionals' roles and competences. Consequently, other interventions are needed to bridge the differences between different teams, between professional groups or subcultures, and thus to further improve patient safety.

Responsibility

The nurse anaesthetists, anaesthesiologists and PACU nurses expressed different perspectives on the transfer of responsibility (Paper IV). There is a lack of research on the transfer of responsibility and/or accountability during handover.[30, 131] However, some studies have been conducted. Using focus group interviews with midwives, nurses and physicians, Chin et al.[132] found that the participants did not spontaneously connect the transfer of responsibility and accountability as a function of clinical handover. They concluded that there is a lack of consensus on the transition of responsibility and accountability.[132] In another study[133] with surgeons and nurses using observations, focus groups, and a web-based survey, the authors argued that blurred boundaries of responsibility can result in no one assuming responsibility.[133] Another study by Smith et al.[37] showed that, during postoperative handover, the time of responsibility transfer varied depending on the professional relationship between the nurse and physician as well as the patient's condition.[37] Furthermore, Greenberg et al.[11] investigated malpractice claims due to error of communication during the perioperative period and found that 43% occurred during handover and that ambiguity concerning responsibilities was a commonly associated factor.[11] A view from psychology expressed by Parker and Coiera[47] was that if a healthcare personnel member hands over responsibility, in cases where the consequences of errors can be serious, without an explicit acknowledgement from the receiver, the responsibility may not truly have been handed over. This means that the task cannot be removed from working memory.[47] Despite the limited amount of research in the area, it indicates that the transfer of responsibility and/or accountability during handovers is quite unspoken and unsafe.

Methodological considerations

The strength of the present thesis is that different data collection methods were used. Quantitative and qualitative data were collected using observations, digitally recorded handovers, anaesthetic records (Paper I and III), questionnaires and incident reports (Paper II) as well as focus group interviews (Paper IV).

Paper I-III

One strength of the quasi-experimental study (Paper II and III) was the rigour of the implementation, which consisted of different methods to inform and train the personnel. A further strength was that the intervention process was monitored using 168 structured observations during 7 months of the implementation period to measure adherence to SBAR, and the results of

monitoring also served as feedback to the intervention group. As recommended by Moore et al.,[87] we conducted a process evaluation (the 66 randomized structured telephone interviews) to measure the impact of the implementation in the context; we also conducted the process evaluation alongside the implementation. Both the observations and telephone interviews showed that SBAR was in use at the clinic (Paper II and III). After the implementation of SBAR, the results showed that the structure significantly improved, indicating that the SBAR tool was being used as intended, which can be seen as a further strength (Paper III). The very nature of quasi-experimental studies may entail selection biases, in that the participants are not randomly assigned (as in Paper II and III). However, the comparison group was part of the same clinic with the same policies and top management, but had not used or been exposed to implementation of any communication tool. The total number of surgeries differed between the two hospitals annually, but not the proportion of planned surgery. At baseline, the intervention and the comparison group did not show any statistically significant differences concerning type of surgery or anaesthetic duration. Regarding these parameters, there were no statistically significant differences over time within groups (Paper II and III).

One strength of the observational studies (Paper I and III) was that the handovers were studied from different point of views by using a study-specific protocol based on earlier research, a digital recorder and the patients' anaesthetic records. The main results of the study were based on digitally recorded and fully transcribed handovers. The recorded data concerned verbally handed over and reproduced information sequences, structure, interruptions, duration of handover (Paper I and III), irrelevant information and oral confirmation (Paper I). A further strength was the high inter-rater reliability achieved when evaluating reported and reproduced information sequences. As some senders and receivers participated in several handovers, this could have resulted to an unknown correlation among measurements. We therefore used GEE to take nesting into account (Paper I and III) and corrected for differences in the covariate interruptions (Paper III).

The strengths of the quasi-experimental study, using questionnaires and incident reports (Paper II), were that it also measured safety climate and clinical outcome, as previously recommended.[68] The questionnaires used had shown satisfactory psychometric properties, and Cronbach's Alpha values for all instruments, total scale and factors were over 0.68. The response rate exceeded 70% at baseline and follow-up in both the intervention group and comparison group, and the number of drop-outs was moderate. Furthermore, there were no significant differences in demographic data between the two groups (Paper II).

The studies described in Paper I, II and III also have limitations. During the observations, the participants were aware that the handovers were being

digitally recorded and the observer was nearby, which could have affected them. The fact that the patients had to give their written consent before the observation may have caused a selected sample of handovers, i.e., no patient who had undergone acute surgery was included. Another limitation was that no non-verbal communication was possible to measure, as the observer had to stand side by side with and close to the sender and receiver, in front of the patient or by a counter (Paper I and III).

Another limitation, during the observational study, was that neither the data collector nor the outcome assessors were blind to which group the senders/receivers belonged to. The selection was based on consecutive sampling of handovers, following planned surgery, which may limit the generalizability of the findings. Thus, the results can be generalized to handovers from OT to PACU in relation to planned surgery that is conducted in small to medium-sized hospitals in which different kinds of surgery are performed (Paper I and III).

When interpreting the results of the questionnaires and incident reports (Paper II), possible threats to internal validity have to be considered. The very nature of quasi-experimental studies may entail selection biases, as the participants were not randomly assigned (Paper II and III). There were statistically significant differences between the intervention group and the comparison group at baseline. The comparison group rated their "teamwork climate", "safety climate", "job satisfaction", "working condition" and "within-group communication accuracy" on a higher level than the intervention group did at baseline, but there was still room for improvements. In the comparison group, the factors "between-group communication openness", "perception of management at the unit" and "working condition" improved significantly over time. Because the distribution was not normal, one limitation was that it was not possible to conduct multivariate analysis to correct for differences at baseline. During the period between baseline and follow-up, there were changes in the comparison group that could have affected the results. There had been discussions about the importance of collaboration at the ICU, and in the OT the number of personnel had increased. The incident reporting also differed between the two groups. The intervention group had an overall higher frequency of registered incident reports. The reason for this is unclear, but could depend on, e.g., the fact that there was a difference in the tendency to report incidents or that the frequency of incidents was actually different. An additional threat to internal validity was that there could have been some diffusion of the intervention to the comparison group, which could have affected the results. Another threat to internal validity was that the drop-outs had higher scores on the factor "teamwork climate" ($p=0.017$) and lower scores on the factor "competence" ($p=0.048$) than the participants did. On the other hand, the number of dropouts was moderate (Paper II). Furthermore, the results of the quasi-experimental study did not show any significant interaction effect between the intervention group and the compar-

ison group, which might have been seen with a larger sample size (Paper II and III).

Paper IV

The results of Paper I, II and III, and other previous studies gave rise to the notion that different professions involved in postoperative handover might have different perspectives on the handover. To collect data relevant to this issue, we chose focus group interviews with profession-based groups consisting of participants with a great deal of experience of postoperative handover. In qualitative research, the nomenclature for *trustworthiness* contains four aspects: *credibility*, *dependability, confirmability,* and *transferability.*[100] *Credibility* refers to "confidence in the truth of the data and interpretation of them"[100 (p.585)] and was achieved in Paper IV because the interview guide was discussed and developed with all co-authors as well as pilot-tested with a focus group interview with PACU nurses prior to the interviews. The interviews were digitally recorded and transcribed verbatim. Furthermore, the text was analysed and discussed by two authors and the subcategories and categories were discussed with all co-authors until consensus was reached.[101] A further strength was that during the interviews the interaction between the participants was observed by the assistant moderator. A friendly atmosphere was observed, the participants seemed to be familiar with each other and no participant seemed to be hesitant to speak. The topic engaged them in a lively discussion and did not seem to be sensitive. Within the groups, no single participant dominated the discussion, and each participant had roughly the same amount of time to talk. During the focus group interviews, the participants often confirmed each other using both non-verbal, e.g. nodding or smiling, and verbal communication. Furthermore, all participants had opportunities to voice their opinion about the key topics and all agreed upon the summary, which was given by the assistant moderator. *Dependability* refers to "the stability (reliability) of data over time and condition"[100 (p.585)] and was achieved because the data collection was carried out during a limited timeframe, in similar settings for all participating groups, and following the same interview guide. *Confirmability* refers to "objectivity, that is, the potential for congruence between two or more independent people about the data's accuracy, relevance, or meaning".[100 (p.585)] During the focus group interviews, the moderator was familiar with the context investigated, which could have threatened the confirmability. As the data collection and data analyses were performed by both the moderator and assistant moderator, who had different clinical backgrounds, this risk may have been decreased. *Transferability* refers to "potential for extrapolation, that is, the extent to which findings can be transferred to or have applicability in other settings or groups."[100 (p.585)] To increase trustworthiness, we explained the context and the data analysis as thoroughly as possible to allow the reader to determine the transferability of the present results.[134] One weakness could have been that the number of participants in

each focus group was quite small. On the other hand, Kreuger and Casey[135] suggested that a group with fewer participants is preferable when the purpose is to understand an issue or behaviour, when the topic is complex, and when the participants' level of experience is high.[135]

Conclusions

Long duration and lack of structure of the verbal postoperative handover decreased how much the receiver remembered. The variation in remembered information shows that there is room for improvement (Paper I). Implementing the communication tool SBAR in an anaesthetic clinic indicated improvement in personnel's perception of communication between professionals as well as their perception of the safety climate. It decreased the proportion of incident reports related to communication errors (Paper II) and revealed improvement in memorized information among receivers following postoperative handover. Compared to the comparison group over time, no significant difference in the information recalled was found (Paper III). There were differences and similarities between the nurse anaesthetists', anaesthesiologists' and PACU nurses' descriptions of and reflections on the postoperative handover, which may affect patient care (Paper IV). Further studies are needed to achieve a shared understanding across professional groups and consensus concerning the information needed – between the operating theatre team and the post-anaesthesia care unit team as well as within the operating theatre team – as well as to ensure safe postoperative care (Paper I-IV).

Clinical implications

- The postoperative handovers should be conducted in a predictable structure that is known to the sender and receiver of information.

- The information reported during postoperative handover should be limited to the essential information, e.g. events that deviate from the normal. Furthermore, different professionals involved in the postoperative handover need to reach consensus about what content is judged as essential to securing the patients continued care.

- The receiver of information should have the opportunity to ask question during handover as well as confirm the information in a structured manner and through two-way communication.

- In the OT, the “sign out” should always be conducted by the main surgeon so that the sender of information during postoperative handover has all the information needed. If applicable, the theatre nurse and/or the surgeon should participate during the handover, to secure the patient’s continued care.

- The environment should be designed so that the postoperative handover can be performed with a “joint focus of attention”, including control of the patient’s vital parameters, without threatening the patient’s integrity and with a minimum of interruptions.

- In an anaesthetic clinic, there is a need to achieve a shared understanding of the collective’s work in its entirety, as well as an understanding of their specific roles and competences. Furthermore, there is need to clearly define each professional’s responsibility so as to ensure high quality and safe care.

- Interventions are needed to bridge the differences between and within teams, the aim being to further improve patient safety.

Svensk sammanfattning (Swedish summary)

Bristfällig kommunikation mellan sjukvårdspersonal är vanligt förkommande under den pre-, intra- och postoperativa perioden, vilket också är en vanlig orsak till att avvikelser och oönskade händelser sker. Patienter som genomgår kirurgi överflyttas ett flertal tillfällen genom vårdkedjan, vilket resulterar i många överrapporteringar mellan sjukvårdspersonal och en risk för förlust av information vid varje rapporteringstillfälle. Hinder för säker informationsöverföring mellan sjukvårdpersonal är ofullständig muntlig rapportering, störningar, ostrukturerad information och bristfällig standardisering samt att sjukvårdspersonalen kan ha olika förväntningar på informationsöverföringen. Försök har gjorts att standardisera den muntliga rapporteringen av information, men det finns begränsad evidens om vilken effekt en sådan standardisering ger. Inom andra högriskverksamheter har kommunikationsverktyget SBAR utvecklats. SBAR står för Situation, Bakgrund, Aktuellt och Rekommendationer och används nu också inom hälso- och sjukvården för att strukturera och presentera informationen på ett effektivt sätt. SBAR anses också kunna överbrygga skillnader mellan personer som använder olika kommunikationssätt.

När en patient förflyttas från en operationsavdelning till en uppvakningsavdelning eller intensivvårdsavdelning är patienten i en sårbar situation eftersom många fysiologiska förändringar kan vara allvarliga och ske snabbt. Personalen som arbetar vid en operationsavdelning, uppvakningsavdelning eller en intensivvårdsavdelning består av personal med flera olika professioner som ska samarbeta i en högteknologisk miljö, med tidvis hög stress. De arbetar under förhållanden som snabbt kan förändras och där störningar är vanligt förekommande. Det finns ett behov av forskning om överrapportering av patienter mellan sjukvårdspersonal samt personalens syn på den postoperativa överrapporteringen. Det rekommenderas att olika datainsamlingsmetoder används, för att utvärdera effekten av interventioner för att förbättra patientsäkerheten, samt att sådana studier inkluderar en jämförelsegrupp för att öka studiernas kvalitet. Det övergripande syftet med avhandlingen var därför att studera kommunikation; överföring av information, och framför allt den postoperativa överrapporteringen mellan sjukvårdspersonal, vid en anestesiklinik och effekterna av användningen av kommunikationsverktyget SBAR ur ett patientsäkerhetsperspektiv.

För att besvara det övergripande syftet utfördes en kvasiexperimentell interventionsstudie (delstudie I-III) där data från förmätningarna presenteras i delstudie I och utfall av interventionen presenteras i delstudie II och III. Resultaten av delstudie I-III inspirerade till delstudie IV, vilken är en kvalitativ studie med fokuserade gruppintervjuer.

Syftet med delstudie I var att 1a) beskriva hur den postoperativa överrapporteringen sker när en patient överförs från en operationsavdelning till en uppvakningsavdelning, 1b) beskriva vilket innehåll i narkosjournalen som muntligen överrapporterades, 1c) beskriva hur mycket mottagaren av rapport memorerade efter rapporten och 2) undersöka vilka faktorer som hade samband med minnet. Delstudien hade en beskrivande och korrelerande design och data samlades in 2011 med hjälp av observationer av 73 överrapporteringar från en operationsavdelning till en uppvakningsavdelning. Rapporterna inspelades digitalt och vid observationerna användes ett studiespecifikt protokoll baserat på tidigare forskning. Data samlades också in genom granskning av anestesijournaler. Delstudien visade att medeltiden för en rapport var 2 minuter och 22 sekunder, störningar förekom vid 77 % av överrapporteringarna, samtidig aktivitet förekom vid 30 % av rapporterna, oklara uppgifter gavs vid 70 % av rapporterna och överrapporteringarna genomfördes, vid 90 % av fallen, nära patienten. Den information som rapporterades mindre frekvent var allergi/infektioner, hud/bandage/dränage, prover, katetrar, ordinationer, postoperativ smärtlindring och kontroller trots att det var noterat i anestesijournalen. I genomsnitt kom mottagaren av rapport ihåg 47 %, och de informationssekvenser som oftast inte memorerades var läkemedel som användes under operation. Multivariata analyser visade att bristfällig struktur och tidsåtgång vid rapport samvarierade med memorerad information.

Delstudie II och III utfördes efter att SBAR implementerats vid en anestesiklinik. Ledningen vid kliniken tog beslutet att införa SBAR. Implementeringen innebar 1) framställning av ett modifierat SBAR-kort i fickformat, 2) personalen deltog i en internutbildning via Kliniskt Tränings Centrum vilken bestod av 2.5 timmes instruktion och rollspel, 3) informationsmaterial om SBAR anslogs på strategiska ställen där de flesta överrapporteringarna skedde t ex på patientbord och i läkarnas rapportrum. På intensivvårdsavdelningen användes ett förtryckt rapportblad för personalens egna anteckningar vid rapport. På anestesikliniken utfördes strukturerade observationer (n=168) av medlemmar i en lokal arbetsgrupp för att kontrollera implementeringsprocessen och som återkoppling till undersökningsgruppen. För att utvärdera implementeringsprocessen utfördes även strukturerade och randomiserade telefonintervjuer (n=66). Introduktion och utvärdering av implementeringen pågick i 11 månader. Sex månader efter implementeringen skedde mätningarna som presenteras i delstudie II och III.

Syftet med delstudie II var att undersöka personalens skattning av kommunikationen inom och mellan olika yrkesgrupper, säkerhetsattityd och psykologisk empowerment, före och efter implementering av kommunikationsverktyget SBAR. Vidare studerades andelen av avvikelserapporter beroende av bristande kommunikation före och efter implementeringen. Studien hade en kvasiexperimentell design och data samlades in 2011 och 2012 med hjälp av enkäter och avvikelserapporter. Undersökningsgruppen bestod av 100 personer och jämförelsegruppen av 69 personer. Resultatet visade att i undersökningsgruppen förbättrades signifikant personalens uppfattning om kommunikationens riktighet mellan olika yrkesgrupper och personalens uppfattning om säkerhetsklimatet. Andelen avvikelserapporter på grund av bristande kommunikation minskade också signifikant i undersökningsgruppen från 31% till 11%. Ingen signifikant interaktionseffekt mellan undersökningsgrupp och jämförelsegrupp kunde dock ses.

Syftet med delstudie III var att undersöka om implementering av kommunikationsverktyget SBAR påverkar hur mycket information som mottagaren av rapport memorerar efter den postoperativa överrapporteringen. Sjuttiotre observationer av överrapporteringar från operationsavdelning till uppvakningsavdelning genomfördes före interventionen (undersökningsgrupp=40, jämförelsegrupp=33) år 2011 och 91 observationer (undersökningsgrupp=44, jämförelsegrupp=47) efter interventionen, år 2012. Rapporterna spelades in digitalt och vid observationerna användes ett studiespecifikt protokoll baserat på tidigare forskning. Resultatet visade att implementering av SBAR gav en signifikant förbättring av strukturen av information och en signifikant ökning (förmätning=43.4%, eftermätning=52.6%) av mottagarens memorerade informationssekvenser. Ingen signifikant interaktionseffekt mellan undersökningsgrupp och jämförelsegrupp kunde dock ses.

Syftet med delstudie IV var att undersöka olika yrkesgruppers (anestesisjuksköterskor, anestesiologer och sjuksköterskor vid en uppvakningsavdelning) beskrivning av och reflektioner om den postoperativa överrapporteringen. Sex fokuserade gruppintervjuer med totalt 23 personer gjordes år 2015. Resultatet visade att anestesisjuksköterskorna fokuserade framför allt på att ge information, vid överrapporteringen, om vad de själva hade utfört, dvs. anestesiprocessen, medan anestesiologerna fokuserad på hela vårdförloppet. Uppvakningssjuksköterskorna fokuserade framför allt på ”här och nu”, t ex vitala parametrar och rekommendationer. Alla tre yrkesgrupper beskrev en osäkerhet när information överförs från ett arbetslag till ett annat gällande huruvida de hade all nödvändig information. Alla tre yrkesgrupper strävade efter att säkra kvalitén vid överrapporteringen genom att; fokusera informationen på händelser som hade avvikit från det normala, att använda en given struktur som stöd för minnet samt att samarbeta inom och mellan arbetslag. De vägde för och nackdelar med att utföra överrapporteringen nära patienten. Anestesisjuksköterskor och uppvakningssjuksköterskor beskrev att de

patientnära överrapporteringarna förbättrade deras kontroll över patienten och sparade tid, men att det å andra sidan kunde hota patientens integritet. Anestesiologer och uppvakningssjuksköterskor ansåg att den patientnära miljön kunde vara störande och orsaka distraktion. De tre yrkesgrupperna hade olika syn på överlämnandet av ansvar i samband med överrapportering av en postoperativ patient. Anestesisjuksköterskorna överlämnade ansvaret när informationen var överrapporterad och när de lämnade uppvakningsavdelningen. Anestesiologerna överlämnade ansvaret till andra läkare men det övergripande ansvaret kvarstod när överlämnandet gjorts till en uppvakningssjuksköterska. Uppvakningssjuksköterskorna övertog ansvaret när de hade kontroll över patienten men var osäkra om ansvaret övertogs om anestesisjuksköterskorna inte hade slutfört uppgifter, som skulle ha varit utförda, innan överrapporteringen.

Sammanfattningsvis indikerar denna avhandling att bristande struktur och lång postoperativ överrapporteringstid minskar hur mycket mottagare av den muntliga rapporten memorerar samt att det finns utrymme för förbättringar (delstudie I). Implementering av SBAR vid en anestesiklinik kan förbättra personalens uppfattning om kommunikation mellan yrkesgrupper och säkerhetsklimat samt minska andelen avvikelser orsakade av bristande kommunikation (delstudie II). Implementering av SBAR kan förbättra strukturen av information och därmed öka mottagarens memorerade information, medan störningar under överrapporteringar har negativ inverkan på memorerad information efter postoperativ överrapportering. Svagheten med kvasiexperimentella studier är att undersökningsgrupp och jämförelsegrupp redan från början kan vara olika vilket försvårar jämförelser mellan grupperna och därmed gör det svårare att dra slutsatser. I delstudie II och III kunde inte heller någon skillnad över tid ses vid jämförelse mellan grupperna. Det finns likheter och skillnader i anestesisjuksköterskors, anestesiologers och uppvakningssjuksköterskors beskrivning av och reflektioner om den postoperativa överrapporteringen som kan ha inverkan på vården av patienter (delstudie IV). Fler studier behövs för att nå en gemensam förståelse mellan olika yrkesgrupper och arbetslag gällande vilken information som behövs – mellan operationslaget och arbetslaget på uppvakningsavdelningen samt inom operationslaget – för att säkra den postoperativa vården (delstudie I-IV).

Acknowledgements

This thesis was made possible by the engagement and efforts of many people. I want to thank all of you, especially:

All the participating personnel at the departments at the anaesthetic clinic, especially the PACU nurses, the nurse anaesthetists, physicians in specialist training to be anaesthesiologists, and anaesthesiologists for their generosity and cooperation during the eight months of observation of their daily work as well as for participating in the focus group interviews. Without you, this research could not have been done. I also want to thank the head of the clinic, and the management at the involved departments who created the conditions for conducting the research.

My former boss *Nader Ahmadi* at the University of Gävle and my former boss *John Mälstam* at Region Gävleborg for their support and for creating the conditions for my research.

Associate Professor, *Maria Engström*, my main supervisor. With your dedication to science and great scientific knowledge, patience and never-ending interest, you have encouraged me throughout my doctoral studies through your excellent supervision. I am truly grateful for all your tireless engagement and support whenever I needed it.

Associate Professor, *Gunilla Mårtensson*, my co-supervisor, for your supervision and guidance throughout the research process. I am thankful for all our discussions and your fast response when reviewing and commenting on the manuscripts. I am also thankful for your cooperation and guidance when collecting the data during the focus group interviews and during the analysis.

Associate Professor, *Christine Leo Swenne*, my co-supervisor, for your supervision, guidance throughout the research process and all the encouraging comments you made when I needed it most. I am thankful for our discussions and your great knowledge about the work in the operating theatre.

Statistician, PhD, *Hans Högberg*, my co-author and advisor in statistical matters. I appreciate your knowledge and all your support, engagement and patience when explaining statistics.

I am also thankful for the great engagement, collaboration and patience of all members in our group: *Ulla-Carin Blom Ivarsson, Elisabeth Roxström Djusberg, Susanne Lundin, Sanna Blomberg, Torsten Winkert, Susanne Ledin Eriksson, Marie-Louise Östlund, Anette Johansson, Annika Eklund*, and *Birgitta Molinder*. To my former colleague and friend, *Ingrid Halvarsson*, for assisting me. When we worked together, despite the high workload, you have always been so friendly and in your current position you have giving me great support in the same way.

All researchers, colleagues, lecturers, former and present doctoral students at the Department of Health and Caring Sciences at the University of Gävle for your support, inspiring meetings and sharing your knowledge with me. I especially want to thank the doctoral students *Ove Björklund, Maria Hedman, Ylva Pålsson* and *Lena Thunander Sundbom* for proofreading my thesis. I am also grateful to the researchers and doctoral students at the Department of Public Health and Caring Sciences, Uppsala University for inspiring meetings. I also want to thank all researchers, former and present doctorial students at Centre for Research and Development, Uppsala University/Region Gävleborg for inspiring meetings and sharing your knowledge with me.

My former colleagues and friends, *Ulla-Carin Blom Ivarsson* and *Gunilla Siltberg Lindqvist*. You were my office-mates for several years at an anaesthetic clinic. Many years have passed since then, and we have all changed our jobs and workplaces, but the great friendship that arose still remains. Ulla-Carin, you had a great influence when I was applying to doctorial studies and we discussed ideas about study topics. You have also been a knowledgeable person I could discuss different questions that have emerged during my study period with. We are all very busy, but we never give up searching for dates in our agendas to see each other. When we meet, the both of you have given me the best support and encouragement a person could ask for.

My friends *Eva Hübinette von Holst, Lena Löthman, Ullacarin Höök*, and *Siv Berg* for all of your encouragement during our eventful meetings. Sadly, I have been forced to cancel our meetings of late, but all that is going to change now.

The Faculty of Health and Occupational Studies, University of Gävle and Region Gävleborg for supporting me financially during my doctorial study period. This thesis was also supported by funding from the Patient Insurance LÖF and the Swedish Society of Nursing.

To my immediate family:

To my children *Alexander* and *Michaela* you are my everything, the most important people in my life. Thank you for all your love and for giving the very best support and encouragement a mother could get. You have always understood when I've been too busy with my studies. I love you. To Alexander's wife *Emelie* and their son *Ludvig* and to Michaela's partner *Per* and their children *Anton* and *Love* – thank you for all the joy, support and understanding. To my delight, soon a new grandchild is going to be born. Being a mother and grandmother is a precious gift; it is what is important in life. I have longed to not be as busy as I have been, and soon I can see you much more often.

To my beloved, *Peter Björebo*, for always supporting me and for your thoughtfulness and understanding. I also want to thank for helping me shovel snow, mow the lawn, and cook. It has really facilitated my doctorial studies. You have also helped me relax by taking me out on the sea. I also want to thank Peter's children, *Linnea* and *Alfred*, for the honour of getting to know you and for the kind way you have always welcomed me.

My brother *Tomas Puusepp*, for our discussions and always seeing the bright side of life. Thank you for all your support and cooperation during joy and sorrow, and last but not least for all our laughs and jokes.

I want to send a thought to my late father, *Lembit Puusepp*. At an early age you introduced me to science, some of it medicine and some aviation safety. You taught me that you can make your way if you are willing to work. I also want to send a thought to my late mother, *Greta Puusepp*. You were with me during almost my entire doctorial study period. You taught me the importance of having fun. At the same time, you were most encouraging and made me feel proud of what I had achieved. Most of all, both of you were the kindest, dearest and best of parents. Finally, I want to send a thought to my late sister, *Evi Puusepp*, the kindest person. What if you could have been here with me? I miss you.

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