



UPPSALA
UNIVERSITET

*Digital Comprehensive Summaries of Uppsala Dissertations
from the Faculty of Medicine 1042*

Pressure Ulcer Prevention

*Performance and Implementation in Hospital
Settings*

EVA SVING



ACTA
UNIVERSITATIS
UPSALIENSIS
UPPSALA
2014

ISSN 1651-6206
ISBN 978-91-554-9073-7
urn:nbn:se:uu:diva-234028

Dissertation presented at Uppsala University to be publicly examined in Brömssalen, Gävle sjukhus, ingång 11, Centrum för Forskning och Utveckling, Uppsala Universitet/Landstinget Gävleborg. Gävle, Friday, 28 November 2014 at 13:00 for the degree of Doctor of Philosophy. The examination will be conducted in Swedish. Faculty examiner: Docent Helle Wijk (Göteborgs universitet).

Abstract

Sving, E. 2014. Pressure Ulcer Prevention. Performance and Implementation in Hospital Settings. *Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine* 1042. 73 pp. Uppsala: Acta Universitatis Upsaliensis. ISBN 978-91-554-9073-7.

Background: Pressure ulcers are related to reduced quality of life for patients and high costs for health care. Guidelines for pressure ulcer prevention have been available for many years but the problem remains. **Aim:** The overall aim of this thesis was to investigate hospital setting factors that are important to the performance of pressure ulcer prevention and to evaluate an intervention focused on implementing evidence-based pressure ulcer prevention. **Methods:** Four studies with a qualitative and quantitative approach were conducted. Registered nurses' performance of pressure ulcer prevention for patients at risk was investigated. Factors related to pressure ulcer prevention at different levels in hospital organizations were examined (hospital and ward type, workload, and nurse staffing) in two hospitals. A quasi-experimental study evaluated the effects of an intervention focusing on pressure ulcer prevention and a descriptive study with interviews examined nurses and first-line managers' experiences of this intervention. **Results:** All of the studies show that quality improvement was needed for patients at risk of pressure ulcer. Registered nurses attention to pressure ulcer prevention was low and the caring culture of the wards ranged from organized work to unorganized work. Factors related to pressure ulcer prevention were patients' age (risk and skin assessment) and patients' risk (skin assessment, pressure reducing mattresses and planned repositioning), type of hospital (university and general), and ward (geriatric, medical, and surgical). Nurse staffing and workload played a minor role. Significantly more patients received pressure ulcer prevention after the intervention. Important factors for improvement were the support nurses and managers received by external and internal facilitators. Another important factor was interpersonal communication on the care provided by the nurses and first-line managers. **Conclusion:** Quality improvement regarding evidence-based pressure ulcer prevention was needed. Factors associated with pressure ulcer prevention were related to all levels in the hospital settings. A comprehensive intervention showed statistically significant improvement in the care. Interpersonal communication among the staff based on quality measurements was the key factor. Managers from the micro- to the macro-level have to know the conditions for pressure ulcer prevention and, given their position, ensure that the necessary prerequisites are in place.

Keywords: Pressure ulcer prevention, nursing care, implementation

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

© Eva Sving 2014

ISSN 1651-6206

ISBN 978-91-554-9073-7

urn:nbn:se:uu:diva-234028 (<http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-234028>)

***To my family,
Tommy, Amanda & Johan***

Amanda, you have on the cover in a beautiful way illustrated the meaning of the three silver rings on my nursing brooch - the head, the hand and the heart. It is fundamental to care and so important in pressure ulcer prevention.

List of Papers

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

- I Sving, E., Gunningberg, L., Högman, M., Mamhidir, A-G. (2012) Registered nurses' attention to and perceptions of pressure ulcer prevention in hospital settings. *Journal of Clinical Nursing*, 21(9-10):1293-1303.
- II Sving, E., Idvall, E., Högberg, H., Gunningberg, L. (2014) Factors contributing to evidence-based pressure ulcer prevention. A cross-sectional study in two hospitals. *International Journal of Nursing Studies*, 51 (717-725).
- III Sving, E., Högman, M., Mamhidir, A-G., Gunningberg, L. (2014) Getting evidence-based pressure ulcer prevention into practice: a multi-faceted unit-tailored intervention in a hospital setting. *International Wound Journal*. Doi: 10.1111/iwj. 12337
- IV Sving, E., Gunningberg, L. Fredriksson L., Mamhidir, A-G. Getting evidence-based pressure ulcer prevention into practice – looking into the 'black-box' of a multi-faceted intervention in a hospital setting (*Submitted*).

Reprints were made with permission from the respective publishers.

Front cover painting by Amanda Sving, 2014
Back cover photo by Lennart Fredriksson, 2013

Contents

Preface	11
Introduction.....	13
Pressure ulcers.....	13
Definition.....	13
Patients at risk.....	14
Patients' experiences.....	14
Prevalence and incidence of PU, nurse staffing and workload measurements	14
Patient safety and quality improvement	15
Evidence-based pressure ulcer prevention	16
Healthcare organization.....	18
Implementation in healthcare	19
Theoretical framework	19
Implementation of evidence-based nursing care	21
Rationale for the present research project.....	22
Aims.....	23
Study I.....	23
Study II	23
Study III.....	23
Study IV.....	23
Methods	24
Study 1	24
Settings	24
Participants	25
Data collection	25
Data analysis.....	26
Study II.....	26
Settings	26
Participants	26
Data collection	27
Data analysis.....	28
Study III and IV.....	28
Settings	28
Intervention focusing on implementation of PU prevention.....	29

Study III	30
Participants	30
Data collection	31
Data analysis	32
Study IV	32
Participants	32
Data collection	33
Data analysis	34
Ethical considerations	35
Summary of results	36
Study I	36
Study II	37
Study III	39
Study IV	40
Discussion	43
Pressure ulcer prevention	43
Risk assessment related to pressure ulcer prevention	43
Differences in nursing care in relation to pressure ulcer prevention ...	44
Nurse staffing in relation to pressure ulcer prevention	45
Knowledge in relation to pressure ulcer prevention	46
Prevalence in relation to pressure ulcer	47
Implementation of evidence-based pressure ulcer prevention in relation to PARIHS	47
Methodological considerations	49
Study I and IV	49
Study II and III	51
Conclusions	54
Clinical implications	55
Svensk sammanfattning (Swedish summary)	57
Acknowledgements	60
References	64

Abbreviations

Assistant nurse	AN
National Pressure Ulcer	NPUAP
Advisory Panel	
Collaborative Alliance for Nursing	CALNOC
Outcomes	
European Pressure Ulcer	EPUAP
Advisory Panel	
Odds ratio	OR
Promoting Action on Research	PARIHS
Implementation in Health Services	
Interquartile range	IQR
Pressure ulcer	PU
Swedish Association of Local	SALAR
Authorities and Regions	
Registered nurse	RN
Standard deviation	SD
United States	U.S.

Preface

Patient safety has been my interest and focus since 2002. At that time, I left my work as a registered nurse at an intensive care unit and started building up a Clinical Training Center at the hospital. After a while, it became clear to me that there was a great gap between what was recommended in guidelines and what was actually done in clinical practice. Education did not lead to better compliance with guidelines, something more was needed.

The hospital I work at was early to perform pressure ulcer prevalence surveys. The first was conducted in 2005. The results of the first pressure ulcer prevalence survey at the hospital, showed that quality improvement was necessary. The hospital introduced mandatory risk assessment, according to the Modified Norton Scale, for all patients admitted to the hospital. The Clinical Training Center started to educate nursing staff on the wards. A new pressure ulcer prevalence survey was conducted one year later, but there were no improvements. I started to wonder what more was needed besides knowledge. What factors determine whether evidence-based care is performed or not performed for patients in need of professional nursing care.

In 2009, I began my journey in the field, my aim being to examine factors that contribute to application of evidence-based pressure ulcer prevention.

Introduction

Pressure ulcers (PU)s are related to reduced quality of life for patients. A literature review, including 31 studies, describes how PUs can influence a person's life (Gorecki *et al.* 2009). Examples are constant pain, anxiety, depression and decreased social life. Research on PUs has been carried out for several decades, but the problem still remains. In European studies at hospital settings, the reported prevalence of PUs varies between 9 and 18% (Beeckman *et al.* 2011, Moore & Cowman 2012, Tannen *et al.* 2008, Vanderwee *et al.* 2007), and reveals a lack of preventive care. That is in line with studies performed in Sweden, which has a reported PU prevalence of 17% (Gunningberg *et al.* 2013a) and a lack of preventive care for about 50% of at risk patients (Baath *et al.* 2014). The healthcare organization is complex and needs to be organized in a way that supports patients' journey through the system (Nelson *et al.* 2008), optimizing the quality of care and preventing adverse events (SFS 2008), such as PUs. According to a Cochrane review, there is a lack of research on key mechanisms for successful implementation (Flodgren *et al.* 2013) and more research is needed, especially in the nursing practice (van Achterberg 2013). Studies have been performed regarding implementation of evidence-based pressure ulcer prevention in nursing homes (Beeckman *et al.* 2013) and hospital settings (van Gaal *et al.* 2011), but the effects were limited.

Pressure ulcers

Definition

A PU is defined by international guidelines as a “localized injury to the skin and/or underlying tissue usually over a bony prominence, resulting from sustained pressure (including pressure associated with shear)” (NPUAP/EPUAP 2014). The pressure/shear causes asphyxia to the skin. If the pressure on the skin is too high or of too long duration, an ulcer can be develop. PUs are classified in four categories (NPUAP/EPUAP 2014) (Table 1).

Table 1. *Classification of PUs*

Category	Description
Category 1	Intact skin with non-blanchable redness
Category 2	Partial thickness loss of dermis
Category 3	Full thickness tissue loss
Category 4	Full thickness tissue loss with exposed bone, tendon or muscles

Patients at risk

The most important risk factors related to the patients are activity or mobility limitations and skin status. After these, tissue perfusion, nutritional status and skin moisture are described as important to patients' risk (NPUAP/EPUAP 2014). There are several other risk factors described in reviews, and according to expert opinion, these also affect patients' risk; these include diabetes, infections, acute illness, high body temperature, age and general health status (Coleman *et al.* 2014). It means that a person with high risk to develop PUs often suffers from various physical problems.

Patients' experiences

Having a PU has a significant impact on the person's quality of life (Essex *et al.* 2009, Gorecki *et al.* 2009) and described affecting the patient's physical functioning, social functioning and mental health (Essex *et al.* 2009). Gorecki *et al.* (2009) describe examples like isolation frustration, depression and anxiety. Persons with a PU also describe experiencing constant pain related to the sore (Essex *et al.* 2009, Gorecki *et al.* 2011). Many patients with PUs report that it is important that they have knowledge of PU development and prevention and are involved in wound care decisions. Knowledge both leads to adherence to treatment and has a positive effect on mental health (Gorecki *et al.* 2012).

Prevalence and incidence of PU, nurse staffing and workload measurements

When working with quality improvement regarding PU prevention, it is of importance that comparisons between different studies and countries can be made. An international group of experts has provided international consensus regarding definitions for PU prevalence and incidence studies (Baharestani *et al.* 2009). Another measure of interest is whether or not the PU developed in the hospital. Definitions regarding prevalence, incidence and facility-acquired PU are presented in Table 2.

Table 2. *Definitions of prevalence, incidence and facility-acquired PU*

Point prevalence (Baharestani <i>et al.</i> 2009)	The number of patients with PU at a specific point in time
Period prevalence (Baharestani <i>et al.</i> 2009)	The number of patients who have a PU during a specified time period
Facility-acquired PU (NPUAP/EPUAP 2014)	The number of patients PUs at a specific point in time and that were acquired at the facility
Cumulative incidence (Baharestani <i>et al.</i> 2009)	The number of patients developing PUs during a specific time period

The European National Pressure Ulcer Advisory Panel (EPUAP), the National Pressure Ulcer Advisory Panel (NPUAP) and Pan Pacific Pressure Injury Alliance are three organizations working with research on and development of PU prevention guidelines. The organizations have together developed international guidelines, the latest 2014, based on rigorous research (NPUAP/EPUAP 2014). Other important work by EPUAP is a method developed to enable comparison of the prevalence of PUs in hospital settings (Vanderwee *et al.* 2007). Collaborative Alliance for Nursing Outcomes (CALNOC) is an organization in the United States (U.S.) that supports healthcare settings in improving PU prevention. CALNOC combines prevalence of PUs with nurse staffing (care hours and skill mix of registered nurses (RN)s and assistant nurses (AN)s) and workload. The organization carries out benchmarking between hospitals quarterly. So far, hundreds of hospitals are participating (CALNOC 2014). In the prevalence studies, hospital-acquired PUs are measured, defined as “patient with PU discovered/documentated over 24 hours after admission to the hospital” (CALNOC 2007).

Patient safety and quality improvement

Patient safety in healthcare is a global issue (The Joint Commission 2014, WHO 2004) and is defined as the “absence of preventable harm to a patient during the process of the health care” (WHO 2004). PUs are addressed as one specific area of patient safety (The Joint Commission 2014). PU prevention is included in nursing care and considered as a nursing-specific quality indicator, both internationally (ANA 2003, Savitz *et al.* 2005) and nationally (Gunningberg 2013).

In Sweden, patient safety has been regulated since 2011 in a new law, stating that the healthcare organization is obligated to perform quality improvement in problematic areas (SFS 2011). In agreement with the Swedish Government, the Swedish Association of Local Authorities and Regions (SALAR) requests improvements regarding PU in Swedish hospital settings

(Socialdepartimentet 2014). National point prevalence surveys have been introduced twice a year since 2011, together with payment for performance, public reporting and benchmarking (SALAR 2014). In Table 3, results from the national prevalence surveys are presented (including between 14540-16466 patients each year).

Table 3. *National prevalence surveys performed annually during the spring (SALAR 2014)*

Year	Patients with a pressure ulcer Category 1-4	Patients with a pressure ulcer Category 2-4
2011, week 10	17 %	8 %
2012, week 10	16 %	7 %
2013, week 10	15 %	8 %
2014, week 10	14 %	7 %

In 2014, the Government and SALAR tightened the conditions for payment of performance and imposed demands on performance of prevention in patients at risk for developing PUs (Socialdepartimentet 2014).

In 2000, a quality register, ‘Senior Alert’ was developed in one Swedish County Council. The aim was to support healthcare professionals in the care of older persons. ‘Senior Alert’ is now a national quality register supporting healthcare professionals in preventing harm to and promoting health for elderly persons. All patients, 65 years or older, admitted to a community and hospital setting should be registered in the system. The focus is on the nursing care provided in five different areas: nutrition, falls, oral health, incontinence and PUs. Patients' risk should be assessed and registered together with a plan for prevention and evaluation of at-risk patients (Senior Alert 2014). Since 2010, it is mandatory for all Swedish County Councils to participate (Senior Alert 2014).

Evidence-based pressure ulcer prevention

Evidence-based practice is defined as “integrating individual clinical expertise with the best available external clinical evidence from systematic research” (Sackett *et al.* 1996). Guidelines based on research and expertise have been developed to support healthcare professionals. Guidelines for PU prevention have been available for many years. Over the years, these guidelines have been extended in an attempt to increase knowledge and include organizational factors for PU prevention and implementation (NPUAP/EPUAP 2014). Examples of international and national guidelines and their content are presented in Table 4.

Table 4. *Content of guidelines for pressure ulcer prevention, 1992-2014.*

Guideline	HCPH ¹ 1992	NPUAP/ EPUAP 2009 ²	SALAR 2011 ³	EPUAP/ NPUAP 2014 ⁴
Risk- and skin assessment	X	X	X	X
Use of risk assessment tool	X	X	X	X
Classification of PU	X	X	X	X
Nursing care plan	X	X	X	X
Pressure-reducing equipment	X	X	X	X
Planned repositioning in bed	X	X	X	X
Planned repositioning in chair	X	X	X	X
Positioning for reduce pressure	X	X	X	X
Repositioning techniques	X	X	X	X
Skin care	X	X	X	X
Nutrition	X	X	X	X
Documentation	X	X	X	X
Staff education	X	X	X	X
Patient education	X	X		X
Patient involvement			X	X
Special populations, 1 area		X		
Special populations, 7 areas				X
Medical device related PU				X
Evaluation of PU prevention			X	X
Implementation				X
Organization support				X

¹ Health Care Policy and Research (AHCPR 1992), ² National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel (2009) (NPUAP/EPUAP 2009) ³Swedish Association of Local Authorities and Regions (SALAR 2011), ⁴National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) (NPUAP/EPUAP 2014)

According to the international guideline, early and repeated risk assessment is crucial (NPUAP/EPUAP 2014). The risk assessment should be structured. Validated risk assessment instruments including the key risk factors have been developed to support healthcare professionals (Braden & Maklebust 2005, Ek 1987, Lindgren *et al.* 2002, Waterlow 1985). A validated risk assessment tool should be supplemented by advanced and specialized clinical judgment (NPUAP/EPUAP 2014, SALAR 2011). If a PU is identified, it should be classified as belonging to one of the categories, 1-4. Category 1 is intact skin with non-blanching redness of a localized area and Category 4 is full thickness tissue loss (NPUAP/EPUAP 2014) (Table 1). When a patient is at risk for developing PUs, goals and a prevention plan should be established together with the patient, and these should be evaluated regularly (NPUAP/EPUAP 2014, SALAR 2011).

It is important to prevent the causes of PU, that is, the pressure and shear on the skin (NPUAP/EPUAP 2014, SALAR 2011). This can be achieved in two ways, one by increasing the contact area and the other by performing pressure relief on the skin. Higher specification foam mattresses are recommended for all risk patients, according to a Cochrane review (McInnes *et al.* 2011). Planned repositioning in bed or a chair is needed even if the patient has the support of a pressure-reducing device (NPUAP/EPUAP 2014). According to a Cochrane review, there is still a lack of research on how often repositioning needs to be performed (Gillespie *et al.* 2014). In the latest guideline (NPUAP/EPUAP 2014), moisture is described as an important factor for development of PUs. It is important to prevent the skin from becoming too moist. Another risk factor is malnutrition. Patients' nutritional status should be assessed and supported (NPUAP/EPUAP 2014) but so far, no clear evidence of a benefit associated with nutritional interventions are found (Langer & Fink 2014). All patients ought to be informed about the risk and how they can act to prevent PUs (NPUAP/EPUAP 2014, SALAR 2011). Relevant information should be documented in the patients' health records (SFS 2008). The guideline also states that education and training in the correct methods of repositioning should be offered to all persons involved in the care (NPUAP/EPUAP 2014). When compliance with guidelines is higher, the prevalence of PUs has decreased (Lahmann *et al.* 2010, Moore *et al.* 2011).

Healthcare organization

One way of viewing the healthcare organization is as being composed of micro-, meso- and macro-systems (Nelson *et al.* 2008). The micro-system refers to the context where bedside care takes place. There is seldom only a single patient involved, but instead a population of patients, families and a team of different healthcare professionals who work together to promote or restore the patient's health in the micro-system. The patient visits different micro-systems during the care, for example, the emergency ward, operation ward, surgical ward and geriatric ward. These different small micro-systems combine to form a meso-system, and thus they need to fit smoothly together, as if they were a single system, designed just for the specific patient (Nelson *et al.* 2008), for example preventing him/her from developing PUs. The patient safety work performed by leaders on the meso-level is important, for example strategic planning and establishing a culture of patient safety and leaderships routines. The macro-system refers to the hospital/county level (Nelson *et al.* 2008), where public reporting and benchmarking are important. Each of the systems should be characterized by professionalism and built on evidence-based care.

Implementation in healthcare

Knowledge translation, research utilization, diffusion of innovation, dissemination and implementation science are different names that generally encompass a process “aimed at converting scientific knowledge to socially beneficial actions, often through behavior change of various stakeholders and actions of decision and policy makers” (McKibbin *et al.* 2013, WHO 2014). In the present thesis, the word “implementation sciences” will be used. The focus is on the potential to bridge the gap between what is known and what gets done in practice, also called the “know-do” gap (Pablos-Mendez & Shademani 2006). The “know-do” gap is often a problem in healthcare. As a consequence, evidence-based care is lacking. A study performed in the U.S. (n=6700 patients), on 439 different indicators of quality of care, showed that 60% of the patients received recommended care (McGlynn *et al.* 2003). Cochrane reviews have been performed to learn more about the effects of different intervention strategies, example lectures, educational outreach visits, opinion leaders and tailored interventions. The results showed that such strategies may have an impact on implementation (Baker *et al.* 2010, Flodgren *et al.* 2011, Forsetlund *et al.* 2009, Giguere *et al.* 2012, Ivers *et al.* 2012, O'Brien *et al.* 2007). A recent review by Boaz *et al.* (2011) showed that multi-faceted interventions were more likely to improve practice than a single strategy was. Tailoring the intervention to hinders is another aspect described as important (Bartholomew *et al.* 2011, Grol *et al.* 2013).

Theoretical framework

In the present thesis, the framework Promoting Action on Research Implementation in Health Services (PARIHS) has been used in the planning and evaluation of an intervention. The framework was first presented in 1998 (Kitson *et al.* 1998), and in 2008 the authors published a revised version summarizing the team’s conceptual and theoretical thinking (Kitson *et al.* 2008). The purpose of the framework is to provide a map of elements of importance for successful implementation. According to the developers, it could work like a checklist for the staff, to assess what they need to do to successfully implement evidence-based care (Kitson *et al.* 1998).

The framework argues that there are three interacting elements that positively or negatively influence the success of implementation: evidence, context and facilitation. In Table 5, the core elements, sub-elements and conditions for successful implementation are described.

Table 5. *Description of PARIHS: core elements, sub-elements and examples of conditions for successful implementation (Rycroft-Malone et al. 2002b).*

Core elements	Sub-elements	Conditions for successful implementation
Evidence	Research	Well-conceived, designed and executed research,
	Clinical experience	Consensus within similar groups
	Patient experiences	Judge as relevant Patient as a partner
Context	Context	Boundaries are defined Information and feedback systems in place Decision-making appropriate/transparent Context is receptive to changes
	Culture	Able to define culture in terms of prevailing values/beliefs Individuals and staff are valued A learning organization
	Leadership	Transformational leadership Effective organizational structures Effective teamwork Democratic inclusive decision making
	Evaluation	Feedback on performance Multiple sources of information
Facilitation	Purpose	Holistic
	Role	Enabling others
	Skill and attributes	Holistic/enabling

According to the framework, it is important to identify signs of support or barriers in everyday clinical practice. Examples are: a shared understanding about the benefits, disbenefits, risk and advantages of the new over the old approach among the staff (evidence), transformational leaders, a learning organization, appropriate monitoring, evaluation, and feedback mechanisms (context) together with appropriate facilitation (Kitson *et al.* 1998).

PARIHS has been widely used (Helfrich *et al.* 2010, Ullrich *et al.* 2014), but in empirical studies mostly as an organizing framework in analyses of the intervention process following, but not prior to the intervention (Helfrich *et al.* 2010). The framework has also been the subject of evaluation, which has provided reasonable evidence for the validity of its content and constructs (Harvey *et al.* 2002, McCormack *et al.* 2002, Rycroft-Malone *et al.* 2002a, Wallin *et al.* 2006). The strengths are described to be: planning facilitation strategies, flexibility and applicability to a range of settings. The primary issues regarding the weakness are described to be a need for greater conceptual clarity concerning the definition of sub-elements and the nature of the dynamic relationships among elements and sub-elements (Helfrich *et al.* 2010). Rycroft-Malone *et al.* (2013) suggested that the framework should be

enhanced to ensure that the theoretical development keeps up to pace with the current evidence-based research on implementation.

Implementation of evidence-based nursing care

Implementation of evidence-based nursing care in healthcare settings is considered complex. One reason for the complexity is the many factors/elements that need to be considered. Examples are: culture, leadership, evidence, evaluation, feedback and organizational readiness (Greenhalgh *et al.* 2004, Grol *et al.* 2013, Kitson *et al.* 1998, Kitson *et al.* 2008, Wallin 2009). Not only the organization, but also the individual RN own beliefs can affect the use of research findings in clinical practice (Wallin *et al.* 2012). Two studies using a multi-faceted approach have been performed in Europe. van Gaal *et al.* (2010) did not show any improvements regarding adequate preventive care in hospital settings. Beeckman *et al.* (2013) examined implementation in nursing homes and found improvements regarding repositioning while seated in a chair.

Rationale for the present research project

Patients admitted to hospital settings still suffer from preventable PUs. Even if evidence-based guidelines are available for healthcare professionals, prevention measures are not used for a large proportion of patients at risk for developing PUs (Baath *et al.* 2014). This leads to reduced quality of life for patients who do develop a PU (Gorecki *et al.* 2009) and high costs for the healthcare system (Dealey *et al.* 2012).

Research describes the problems associated with implementation, and there is a lack of research on how to best implement evidence-based nursing care (Flodgren *et al.* 2013, van Achterberg 2013). Studies have been designed to implement evidence-based PU prevention, but with limited effects (Beeckman *et al.* 2013, van Gaal *et al.* 2010).

RNs are important persons in PU prevention work and are responsible for the care provided to patients and the use of guidelines on evidence-based PU prevention in daily care. A previous study in Sweden has shown that RNs perceive PU prevention to be a low status area of nursing care (Athlin *et al.* 2010). Performance of evidence-based care does not only depend on the individual RN, but also on how managers at different levels in the hospital organization support evidence-based PU prevention (Grimshaw *et al.* 2004). Therefore, it is important to learn more about what contributes to or hinders evidence-based PU prevention, at the macro- as well as micro-level. It is also important to learn more about how to best implement evidence-based PU prevention.

Aims

The overall aim of the present thesis was to investigate hospital setting factors that are important to the performance of PU prevention. A further aim was to evaluate an intervention focused on implementing evidence-based PU prevention.

Study I

To describe how RN perform, document and reflect on PU prevention in a specific nurse-patient care situation as well as generally on hospital wards.

Study II

To investigate the associations between variables on different levels in the healthcare setting (patient, ward, hospital) and the documentation of (1) risk assessment and (2) skin assessment within 24 hours of admission, use of (3) pressure-reducing mattresses and (4) planned repositioning in bed.

Study III

To evaluate whether a multi-faceted, ward-tailored intervention using evidenced-based PU prevention affects 1) the performance of PU prevention, 2) the prevalence of PUs and 3) knowledge and attitudes concerning PU prevention among RNs and ANs.

Study IV

To describe RNs', ANs' and first-line managers' experiences and perceptions of a multi-faceted intervention focusing on implementing evidence-based PU prevention.

Methods

Study I and IV had a qualitative approach and Study II-III had a quantitative approach. Study III was an intervention study with a quasi-experimental design. An overview of the studies is presented in Table 6.

Table 6. *An overview of the four studies in the present thesis.*

Study	Design	Sample	Data collection	Data analysis
I	Descriptive, multiple methods	RNs (n=9)	Observations Interviews Review of patients records	Qualitative content analysis
II	Cross-sectional	Patients (n=825) Register data	Physical examination of patients Review of patients' health records Staff administration system	Multiple logistic regression
III	Quasi-experimental, pre- and post-test	Patients (n=506) RNs and ANs (n=145)	Physical examination of patients Review of patients' health records	Logistic regression Student's t-test
IV	Descriptive	RNs and ANs (n=31) First-line managers (n=5)	Focus groups interviews Individual interviews	Qualitative content analysis

Study 1

Settings

The settings were one geriatric, one surgical and one medical ward at three different hospitals. Each ward had in total 20-22 admitted patients. During the day shifts, one RN and two ANs were responsible for 6-9 patients. During the evening shifts, one RN and one or two ANs were responsible for 8-14 patients.

Participants

The nine RNs who participated in the study were all female, median age of 29 (range 26 to 54 years). The RNs had worked 3 years (median) in the profession (range 2 to 18 years) and 2 years (median) on the ward (range 2.5 months to 9 years).

Data collection

The data were collected by the author (ES) and included a) observations, b) interviews and c) review of patients' records. The procedure was as follows:

a) Non-participant observations of PU prevention were conducted by following the RNs during their work shift. PU risk among patients was assessed using the Modified Norton scale (Ek 1987) as well as clinical judgment. Of the 83 patients the RNs were responsible for, 32 were assessed as being at risk and the focus of the observations was these specific nurse/at-risk-patient situations. PU prevention activities were noted in a field observation protocol, developed by ES. The protocol was based on the SALAR guidelines 2008 (SALAR 2008) and included activities such as risk assessment, skin assessment, pressure reducing activities, nutrition, skin care and information on PU provided by the nurses and given to the patients. The field notes included the communication between the RNs and other professional staff. The observations were carried out over a period of 3-5 consecutive days on each ward, amounting a total of 74 hours of observations.

b) Subsequent RN interviews were performed after the observations. The interviews were based on the international guideline (NPUAP/EPUAP 2009). The interviews began with a discussion of the specific nurse-patient care situation to bring to mind the observed work shift. The questions asked with regard to the specific nurse-patient situation were: *'How did you judge the patients' need for care and risk of developing PUs to be?'*, *'What PU measures were used during the shift?'*. The more general questions asked were: *'What do you believe constitutes optimal PU prevention?'*, *'How do you and your staff work with PU prevention on the ward?'* and *'In what way do RNs and ANs collaborate around PU prevention?'* The interviews lasted between 37-70 minutes, were audio-recorded and performed 4-18 days after the observations.

c) Retrospective reviews of the patients' records were made from the day the patients were admitted onto the ward until the end of the observation period. The nursing documentation regarding risk and skin assessment and care plans was examined.

All data were collected during the period January 2009-April 2009.

Data analysis

Observational data were analyzed using qualitative content analysis (Graneheim & Lundman 2004).

Based on the interview texts, general PU prevention was analyzed using latent qualitative content analysis (Graneheim & Lundman 2004). Meaning units were identified based on the study aim, condensed and labeled with a code. The various codes were compared for similarities and differences and grouped into subcategories and categories. A method of continuous movement between the whole and the parts was employed. Each ward was analyzed separately, and when formulating the theme, the subcategories and categories were considered as a whole. During the analysis, the codes, subcategories and categories were discussed between the authors before the theme was formulated. The patient records were reviewed and checked to determine whether risk assessment, skin assessment and care plans had been documented.

Study II

Settings

The university hospital included 1100 beds and the general hospital had 350. The university hospital had developed a hospital-wide quality improvement plan related to PU consisting of education, development of clinical guidelines, documentation and PUs as a quality indicator (Gunningberg & Stotts 2008). The general hospital had not worked systematically at the hospital level (macro-level) with quality improvements related to PU and conducted its first PU prevalence survey. On the other hand, the general hospital had a higher percentage of RNs in direct patient care (63%) compared to the university hospital (53%) (Gunningberg *et al.* 2011). The general hospital also had RNs with longer work experience (>5 years), 15% vs. 11% (Gunningberg *et al.* 2010).

Participants

The study included participants from 44 wards in the two hospitals: geriatric (n=8), medical (n=24) and surgical (n=19). All adult patients (> 17 years), in total 825, admitted to those wards before midnight the day of the study gave their consent to participate. Demographic data on patients are presented in Table 7.

Table 7. *Demographic data on patients.*

Patient	n	825
Age	Mean (SD)	68 (16.8)
Gender, male	n (%)	385 (47)
Days of hospitalization	Median (IQR)	6.0 (2.0, 16.0)
Braden score < 17	n (%)	143 (18)

Data collection

Clinical data were gathered by physical examinations for each patient and auditing of the electronic health record. The procedure followed the methodology outlined by the EPUAP (Vanderwee *et al.* 2007) and CALNOC (CALNOC 2007). On the day of data collection, a team consisting of two RNs, (one staff nurse and one nurse from a different ward) visited each patient. Afterwards, a retrospective audit of the electronic health records was conducted (Table 8 and 9). Nursing staff and workload variables were collected at ward level and were extracted from the computerized patient and staff administration system for September 2009 (Table 9).

Table 8. *Dependent variables and definitions*

Dependent variables	Definition
<i>Electronic health record</i>	
Risk assessment	Documented risk assessment performed by a validated risk assessment scale or clinical judgments within 24 hours of admission to the hospital
Skin assessment	Documented skin assessment within 24 hours of admission to the hospital
<i>Clinical observations</i>	
Pressure-reducing mattress	Non-powered devices, e.g., visco-elastic foam or powered devices, e.g., alternating pressure mattress
Planned repositioning in bed	As turning schedule in place at the bedside with planned manual repositioning every second, third and fourth hour

Table 9. *Independent variables and definitions*

Independent variables	Definitions
<i>Healthcare record</i>	
Days of hospitalization	Days of hospitalization prior to the study day
Risk assessment	The Braden scale. Risk score <17 was defined as at risk for developing pressure ulcers
University hospital	The type of hospital the patient was admitted to
General hospital	
Geriatric wards	
Medical wards	
Surgical wards	The type of ward the patient was admitted to
<i>Staff and patient administration system</i>	
Total hours of care per patient-day	The sum of productive hours for one month divided by the total number of patient days on the ward. Included were all RNs' and ANs' hours spent on direct patient care responsibilities
RNs' percent of the total hours of care for one month	The RNs' total hours of care divided by the total hours of care multiplied by one hundred
Patient turnover per patient-day	The total number of patients admitted, discharged and transferred divided by patient days and multiplied by one hundred. Thus, one hundred percent turnover indicates that, for each patient-day, there was one admission, discharge or transfer

Data analysis

For descriptive purposes, frequency, mean, standard deviation (SD), median, interquartile range (IQR) and percentage were used. Logistic regression using a Generalized Estimating Equation approach adjusts for the clustering of patients within the wards. To investigate the simultaneous effect of the included independent variable, all independent variables were included simultaneously for each of the dependent variables. The results of the logistic regressions are presented in odds ratios (OR) and p-values. The significance level was set at 0.05 (two-tailed).

Study III and IV

Settings

The two studies were performed at a general hospital in central Sweden. The hospital included 344 beds on five surgical and eight medical wards. Each ward had 18-26 patient beds. The staff at the wards consisted of 22-32 RNs and 1-11 ANs. Included were three surgical and two medical wards during the intervention period January 2012 to June 2013.

Intervention focusing on implementation of PU prevention

Before the intervention began, a multi-professional team was formed that supported, taught and coached on the wards. The team consisted of one RN (ES), one physiotherapist, one occupational therapist and one dietician.

The multi-professional team summarized the international and national guidelines and set out the guideline for the County Council. Barriers to evidence-based pressure ulcer prevention in the organization (using PARIHS) were identified by the team as lack of: knowledge and awareness, time for quality improvement work and equipment for pressure relief. The PARIHS framework's different elements for successful implementation guided the planning of the activities in the intervention. One or two contact nurses (RN, AN) were pointed out by the first-line managers on each ward. The intervention was tested on five wards prior to the study onset, strategies discussed between the team members and support to first-line managers was expanded.

The intervention consisted of three different parts: (1) Introduction, (2) one-day training for the RNs and ANs and (3) monthly quality measurements with feedback to the staff (n=6). Between 75%-100% of the RNs and ANs at the wards participated in the one-day training. A tablet computer application was designed for data collection. This allowed feedback on results to be given the same day. The results were presented over time and, so that each patient's unique data could be seen. The intervention is presented in Table 10.

Table 10. *Descriptions of the intervention, the target group, activities, who performed the activities and the link to PARIHS.*

Target Group	Activities on the ward	Performed by
1. Introduction		
FLM	Information/discussions of factors to consider for successful implementation (E, C, F)	Team nurse
RN/AN	One/two internal contact nurse/s were identified and appointed (C,F)	FLM
RN/AN/FLM	Quality measurement (pressure ulcer prevention and prevalence) (E, F)	Team nurse Contact nurse
Ward	Inventory of equipment for pressure ulcer prevention (C,F)	Team members
2. One-Day training		
RN/AN	Discussions of the ward routines regarding pressure ulcer prevention (E, C)	Team nurse
RN/AN/FML	Feedback on the ward results (quality measurements) regarding pressure ulcer prevention and prevalence (C, F)	Team nurse
RN/AN/FLM	Lecture on evidence-based pressure ulcer prevention and repositioning techniques combined with practical training (E, C)	Team members
RN/AN/FLM	Recommendation of equipment available to reduce pressure on the skin (E, C)	Occupational therapist
3. Quality measurement and feedback. Repeated once a month (n=6)		
RN/AN	Quality measurement of pressure ulcer prevalence and prevention performed one day/month (C, F)	Team nurse Contact nurse
Contact nurse/RN/AN	During quality measurements, education, support and coaching related to evidence-based prevention were provided (E, C, F)	Team nurse
RN/AN	Information to the RN and AN responsible for patients' needs for prevention (E, C, F)	Team nurse Contact nurse
FLM	Same-day feedback to the first-line manager on the results and discussions of prevention improvements needed (E, C, F)	Team nurse Contact nurse
RN/AN	Feedback to the RNs/ANs on results and discussions of quality improvements (C)	FLM

FLM = First-line managers, RN = Registered nurse, AN = Assistant nurse

E = Evidence, C = Context, F = Facilitation

Study III

Participants

Patients: Adult patients (≥ 18 years), admitted to the wards before midnight on the days when PU prevalence surveys were conducted, was included. In total, 251 patients participated in the pre-test and 255 in the post-test. No differences between the pre-test and post-test groups regarding patients' de-

mographic data were found (Table 11), neither in the total group of patients nor in the group of at-risk patients.

Table 11. *Demographic data on patients in pre- and post-test*

	Total		At risk patients	
	Pre-test	Post-test	Pre-test	Post-test
Gender, Man, n (%)	131 (52)	122 (48)	31 (58)	28 (54)
Age, mean (SD)	69 (± 17)	68 (± 17)	76 (± 12)	75 (± 14)
Days at hospital, mean (SD)	8.1 (± 9.7)	8.6 (± 12)	12 (± 13)	12 (± 12)
Risk patients (Modified Norton ≤ 20), n (%)	53 (21)	52 (21)		
Total Modified Norton, mean (SD)	23 (± 3.8)	23 (± 3.7)	17.7(± 2.6)	17.2 (± 2.0)

RNs and ANs: Nurses working on the wards were invited to answer a knowledge and attitudes questionnaire. In total, 145 nurses participated in the pre-test and 130 in the post-test. The participants' mean age was 39, (SD ± 12), mean years in care 15 (SD ± 11), and mean years at the wards 7 (SD ± 7).

Data collection

In Study III, the wards were included at different time points. A description of the process over time regarding inclusion, pre-and post-measurements and the intervention performed is presented in Table 12.

Table 12. *Description of the inclusion, pre- and post-measurements and the intervention.*

<i>Ward 1</i>	Pre-test	Intervention		Post-test				
<i>Ward 2</i>		Pre-test	Intervention		Post-test			
<i>Ward 3</i>			Pre-test	Intervention		Post-test		
<i>Ward 4</i>				Pre-test	Intervention		Post-test	
<i>Ward 5</i>					Pre-test	Intervention		Post-test

Patients: The procedure followed the methodology outlined by the EPUAP (Vanderwee *et al.* 2007). The method includes data collection on risk and skin assessment, observation of preventive activities at the bedside and a review of patients' records. On the day of data collection, a skin expert nurse and the contact nurse visited each patient's bedside. Afterwards, a retrospective audit of the electronic health records was conducted. In the study, PU prevention is defined as the prevention activities described in Table 13.

Table 13 . *Definitions of PU prevention in study III*

Risk and skin assessment documented within 24 hours of admission to the ward
Pressure redistributing material in bed and in chair
Pressure relief/offload of heels
Turning schedule in bed and in chair (having a turning schedule bedside)
Sliding sheets in bed and in chair
Other equipment to reduce pressure on the skin

If a PU was observed during the skin inspection, it was classified as belonging to Category 1-4 (Table 1). A ward-acquired PU was defined as an observed PU not documented in the patient record within 24 hours of admission to the ward.

RNs and ANs: A questionnaire, Knowledge Assessment Tool (Beeckman *et al.* 2010b) and Attitudes toward Pressure ulcer (Beeckman *et al.* 2010a), was used. The questionnaire had previously been translated to Swedish (Gunningberg *et al.* 2013b). The knowledge questions include 26 items and the attitude questions 13 items. A mean knowledge score $\geq 60\%$ and a mean attitudes score $\geq 75\%$ were considered acceptable (Beeckman *et al.* 2011).

Data analysis

Patients: Logistic regression models were used to evaluate the intervention effects on dichotomous variables, with time point (pre- versus post-test) and ward as explanatory variables.

RNs and ANs: The answer to each knowledge question was dichotomized (correct – incorrect). Missing data and duplicated answers were considered “incorrect” and a mean score was calculated. The total score on attitude questions for each person was calculated. Incomplete/duplicate responses were replaced by the mean value for the respective questions. Between-group differences were tested using Student’s t-test. The significance level was set at 0.05 (two-tailed).

Study IV

Participants

Thirty-six informants participated in the study (RNs, ANs and first-line managers); all were female, had a median age of 42 (range 32 to 55 years). The participants’ had worked 10 years (median) in the profession (range 4 to 20 years) and 8 years (median) on the ward (range 3 to 13 years). The first-line managers had worked as registered nurse before they took office as

mangers and three of them had completed management training programs. The years as a first-line manager varied between 0.5 to 23 years.

Data collection

A semi-structured interview guide was developed based on the PARIHS framework. The questions covered different factors described in the framework as prerequisites for successful implementation (evidence, context and facilitation), and the questions focused on the participant's experiences/perceptions of the intervention. The opening question concerned the informant's way of working with and reflections on the PU prevention intervention was used, to determine whether their thinking and way of working had changed owing to the intervention. Examples of questions were: *'How do you work with and reflect on the intervention performed? What are your experiences of the one-day training? What are your experiences of working with qualitative measurements and feedback on results? What are your thoughts on the multi-professional team and the contact nurses?'* During the interviews, probing questions – such as, *'What do you mean?'*, *'Can you tell me more about this please?'* – were asked to encourage the informants to provide extensive descriptions of their experiences.

RNs and ANs: The RNs and ANs were asked by first-line managers to participate in focus group interviews. If the RNs and ANs agreed to participate, the first-line managers arranged their schedules to allow time for the interviews. All interviews were carried out at the hospital in a room outside the wards. Five focus group interviews, one for each ward, were carried out. The five groups were composed of RNs, ANs and the appointed contact nurse. The interviews were conducted by two researchers (A-GM, LF), one acting as a moderator and the other as an observer. The observer's role was to ask questions about topics that required more explanation and to ensure that all questions in the interview guide were covered (Patton 2002). After each focus group interview, the moderator and observer discussed how the interview process had turned out. The focus group interviews lasted between 35–105 minutes, all were audio recorded and transcribed verbatim.

First-line managers: One of the two researchers mentioned above asked the first-line managers to participate in individual interviews and after agreement performed the interviews. All the interviews were carried out at the hospital in a room outside the wards. The interviews lasted between 43–48 minutes, all were audio recorded and transcribed verbatim.

Data analysis

Data from the interviews were analyzed using qualitative content analysis (Graneheim & Lundman 2004, Patton 2002). The procedure of reading, coding and grouping subcategories was performed as it is described in Study I. When reading the texts, the 'sense of the whole' was perceived to be similar in the focus group interviews and the individual interviews, and the data were initially analyzed in combination. During the analysis procedure, the interviews were divided and analyzed separately. During the analysis, the codes, subcategories and categories were discussed between the authors and a theme was formulated.

Ethical considerations

Study I, III and IV were approved by the Regional Ethical Review Board (Reg. no. 2008/28 for Study I, reg. no. 2011/397 for Study III, IV). Study II was approved by the Research Ethics Committee of the Faculty of Medicine at Uppsala University (Reg. no. 01-502). Ethical standards for scientific work were followed and based on The Declaration of Helsinki and national and local ethical guidelines for research [83]. All participants were informed about the study, and told that participation was voluntary and that they could withdraw at any time. All data have been treated confidentially and results are presented at the group level.

Patients in Study II and III received oral and written information and informed consent was obtained. The patients in Study III gave their written consent to participate. The studies (II and III) did not entail any risks for the patients. A skin assessment was performed during data collection, but skin assessment should be performed during ordinary patient care. In Study I observations of RNs PU prevention were performed bedside. The patients were not the primary focus during observations, but were an integral part of the study. Given that the patients could conceivably have felt their privacy was being violated, informed consent was obtained from them as well.

The RNs' in Study I were told they were being observed in their nursing care. It is possible that the RNs' could have had feelings of frustration if they were uncertain about how well they performed the care. The RNs' were told they could contact the author (ES) and were called on the telephone one week after the observation.

Quality measurements in Study III were able to show inadequate PU prevention care. Therefore the RNs', ANs' and first-line managers' may have had a feeling of not providing care of good quality. The RNs' and ANs' may also had experienced a feeling of time pressure due to higher workload related to the intervention, but all wards had control over their own quality improvement work.

Summary of results

Study I

The aim of Study I was to describe how RNs perform, document and reflect on PU prevention in a specific nurse-patient care situation as well as generally on hospital wards.

Although the patients involved were at risk, the RNs' attention to PU prevention was lacking. On the whole, few prevention actions were performed by the RNs'. The results from the observations revealed that use of the risk assessment scale was not observed. Pressure reducing activities with repositioning was often associated with daily activities, such as support with medicine or food intake. Discussions and reports about PUs between the RNs', ANs' and other professionals' were conducted during the observations. Results from the interviews concerning the specific nurse-patient situation revealed that the RNs' assessed fewer patients as being at risk than was assessed by the observer. The RNs' documentation showed deficits on all wards. RNs' general perception was mirrored by the theme "Marked by the caring culture on the ward – from planned PU prevention actions to unplanned and temporary solutions". On one ward, the RNs' stated that structured working methods ensured safe nursing care. On another ward, the RNs' described that mobility was in focus when new patients arrived, and that patients who were confined to their bed were given an air mattress. Finally, on one ward, the RNs' reported that pressure reduce for patients was performed automatically. In Table 14, the theme and categories are presented. Almost all patients in one ward had risk- and skin assessment documented together with at care plan. At two wards, the documentation was lacking for more than 50 % of the patients.

Table 14. *Theme and categories capturing RNs' reflections on PU prevention in general*

	Ward I	Ward II	Ward III
Theme	Marked by the caring culture on the ward – from planned pressure ulcer prevention actions to unplanned and temporary solutions		
Category	Organized work based on guidelines	Striving toward guidelines and organized work	Unorganized work
	Trust in and dialogue with ANs	Trust in and dependence on ANs	Trust in and delegated responsibility to ANs

Study II

The aim of Study II was to investigate the associations between variables on different levels in the healthcare setting (patient, ward, hospital) and the documentation of (1) risk assessment and (2) skin assessment within 24 hours of admission, the use of (3) pressure-reducing mattresses and (4) planned repositioning in bed.

The results revealed differences in what independent factors were associated with performance of PU prevention. Older patients were associated with risk and skin assessment documented within 24 hours of admission, and at-risk patients (Braden <17) were more likely to have skin assessment documented within 24 hours of admission, pressure-reducing mattresses and planned repositioning. Hospital type and ward type were significantly associated with all the four dependent variables. Nurse staffing and workload played a minor role. The results are presented in Table 15.

Table 15. *Results from logistic regression in Study II*

	Risk assessment documented			Skin assessment documented			Pressure-reducing mattresses			Planned repositioning in bed		
	OR	95%CI	P-Value	OR	95%CI	P-Value	OR	95%CI	P-Value	OR	95%CI	P-Value
Patients characteristics												
Patient's age	1.015	1.004-1.026	0.007	1.020	1.009-1.031	<0.001	1.006	0.995-1.016	0.306	1.016	0.988-1.046	0.286
Gender Man	1.000			1.000			1.000			1.000		
Woman	0.877	0.631-1.218	0.432	0.893	0.646-1.235	0.495	1.062	0.767-1.470	0.718	1.484	0.810-2.689	0.193
Day of hospitalization	0.994	0.897-1.001	0.093	0.995	0.989-1.002	0.173	1.022	1.011-1.033	<0.001	1.009	0.999-1.019	0.088
Braden ≥ 17	1.000			1.000			1.000			1.000		
Braden < 17 At risk	1.461	0.906-2.255	0.120	1.916	1.216-3.019	0.005	1.751	1.153-2.658	0.009	26.824	13.540-51.140	<0.001
Type of hospital and ward												
University hospital	1.000			1.000			1.000			1.000		
General hospital	0.038	0.021-0.070	<0.001	0.061	0.038-0.100	<0.001	0.673	0.453-0.999	0.050	3.226	1.564-6.647	0.002
Geriatric wards	1.000		0.006	1.000		<0.001	1.000		0.014	1.000		<0.001
Medical wards	2.601	1.270-5.237	0.009	4.320	2.134-8.745	<0.001	0.432	0.231-0.809	0.009	4.112	1.629-10.380	0.003
Surgical wards	1.630	0.801-3.318	0.178	1.847	0.938-3.637	0.076	0.395	0.216-0.722	0.003	0.412	0.142-1.190	0.101
Nurse staffing and workload												
Total hours of care per patients day	0.989	0.989-1.090	0.829	1.025	0.937-1.122	0.584	0.856	0.785-0.933	<0.001	1.195	1.046-1.365	0.009
RNs' percent of care	1.006	0.986-1.026	0.570	0.997	0.978-1.017	0.782	1.007	0.989-1.024	0.463	0.961	0.932-1.000	0.839
Percent turnover/patient day	0.981	0.971-0.992	0.001	0.993	0.984-1.002	0.135	0.998	0.991-1.006	0.634	0.999	0.980-1.009	0.839

Study III

The aim of Study III was to evaluate whether a multi-faceted, ward-tailored intervention using evidenced-based pressure ulcer prevention affects: 1) the performance of PU prevention, 2) the prevalence of PUs and 3) knowledge and attitudes concerning PU prevention among RNs and ANs.

The pre- and post-test results will be presented in the group of all patients and in the group of at-risk patients (Modified Norton <21).

In the group of all patients, statistically significantly more patients received PU prevention ($p=0.001$) and more prevention was given to each patient ($p=0.021$) after the intervention. Almost all patients had a pressure-reducing mattress at both pre- and post-test. No statistically significant differences were revealed regarding chair cushions, the use of other equipment and the use of a turning schedule in bed and in chair ($\leq 3\%$). Prevention activities displaying statistically significant results are presented in Table 16.

Corresponding results were shown in the group of patients assessed as being at risk for developing PUs. No statistically significant differences were revealed regarding the use of a chair cushion, the use of other equipment and the use of a turning schedule in bed and in chair ($\leq 15\%$). Documented skin assessment was performed for $\leq 90\%$. Prevention activities with statistically significant results are presented in Table 17.

Table 16. *The statistically significant results of performed PU prevention activities on the group of all patients.*

Prevention activities	Pre-test n (%)	Post-test n (%)	OR	95 % CI	P-value
Patients with prevention	21 (8)	46 (18)	2.7	1.6, 4.8	<0.001
Three or more prevention activities per patient	4 (1.6)	13 (5.2)	3.9	1.2, 12.3	0.021
Documented risk assessment	151 (60)	211 (84)	3.5	2.2, 5.3	<0.001
Documented skin assessment	200 (79)	229 (90)	2.3	1.4, 3.9	0.002
Offloading of heels	6 (2.4)	36 (14)	7.7	3.1, 18.9	<0.001
Sliding sheet in bed	2 (0.8)	10 (4.0)	5.8	1.2, 26.9	0.026

Table 17. *The statistically significant results for performed PU prevention in the group of at-risk patients (Modified Norton <21).*

Prevention activities	Pre-test n (%)	Post-test n (%)	OR	95 %CI	P-value
Patients with prevention	15 (29)	27 (52)	3.4	1.4, 8.1	0.009
Three or more prevention activities per patient	4 (7.8)	13 (25)	7.7	1.8, 31.9	0.005
Documented risk assessment	32 (60)	45 (86)	4.1	1.4, 11.6	0.008
Offloading of heels	4 (7.8)	17 (32)	8.5	2.3, 31.3	0.001
Sliding sheet in bed	2 (3.9)	10 (19)	8.1	1.6, 42.6	0.013

The prevalence of PUs classified at Category 1-4 did not decrease after the intervention. In the group of all patients, PU prevalence was 11% and in the group of at-risk patients it was 18%, both in pre- and post-test. No statistically significant results were shown in the group of all patients regarding the prevalence of ward-acquired PU: 8.4% in pre-test and 9.0% in post-test. For the group of at-risk patients, the prevalence of ward-acquired PU was 30% at pre-test and 29% at post- test.

The RNs and ANs' knowledge about pressure ulcer prevention increased from mean 57 to mean 63 correct answers ($p<0.001$). Positive attitudes toward pressure ulcer prevention remained high between pre- and post-test (almost 90).

Study IV

The aim of Study IV was to describe RNs', ANs' and first-line managers' experiences and perception of a multi-faceted intervention focusing on implementing evidence-based PU prevention.

The findings revealed an implementation process in which, initially, every step depends on the previous step; thereafter, the process is characterized by a back-and-forth movements. A theme was formulated, '*Changed thinking enable changed actions – through one's own performance and reflection of pressure ulcer prevention*', four categories and nine subcategories. The theme and categories are described in Figure 1.

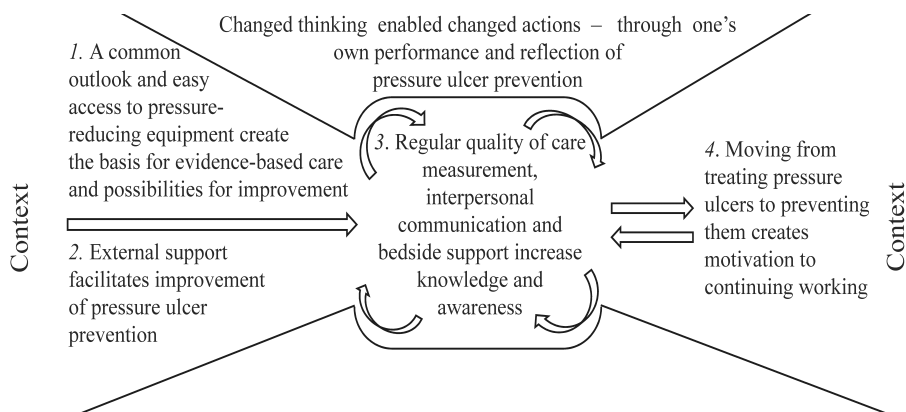


Figure 1. Description of the theme and the process of categories.

The *first category* (1) described the effects from the one-day training and possibilities for pressure-reducing equipment. Almost all RNs' and ANs' had participated in the one-day training, which was considered fundamental. The day was reported to have provided a comprehensive view of PU prevention and a common outlook on preventive care. Now, they also have easy access to pressure-reducing equipment.

The *second category* (2) described the need for external support. Support from the team nurse over a longer period of time was considered necessary. The informants described how, while caring for patients, questions came up and how they needed bedside support to progress with their preventive care. A quality register, Senior Alert, was used but not fully implemented. The informants reported that the intervention and the quality register supported each other.

The *third category* (3) described how the regular quality measurement, interpersonal communication of feedback of results and bed-side support increased the knowledge and awareness of PU prevention, which was crucial to the change process. The first-line managers described implementation of PU prevention as an everyday task that required their presence. They stressed that more support concerning how to work effectively with implementation would have helped them. Time had been allocated to perform the monthly bedside quality measurements. Immediate feedback of results from those quality measurements was crucial, as the results could be related to the specific patient's status and workload. It helped them improve the care. The participants felt proud when they saw positive results, and negative results motivated them to make improvements. Furthermore, difficulties interpreting the results were mentioned and more support from the team nurse was requested. The bedside advice given during the quality measurements contributed to more knowledge, made the care concrete, promoted gradual im-

provement and changed the RNs' and ANs' own perspectives on how PU prevention could be performed. The contact nurses were reported to be key persons in sustainable improvement of PU prevention on the wards, were available in the daily care, and described as having specific knowledge.

The *fourth category* (4) described improvements in preventive care and a will to continue with the quality improvement work. The intervention had helped in developing and changing the way they worked and their perspective had changed from treating to preventing PUs. The RNs' and ANs' collaboration in the care had improved. The ongoing reflections led to enhanced awareness of the PU prevention performed on the ward. Now they set goals for the care even if the goals were not reached. New routines for pressure reduce of specific groups of patients, routines including daily rounding for nutrition support, had been introduced together with improved documentation, but the participants reported that continued quality improvement was still needed. The quality improvement prevention work was planned to continue, otherwise they would lose control over PU prevention. The participants described several threats to future PU prevention, e.g., not being supported by an external expert, high workload, high staff turnover and lack of PU prevention training for newly employed RNs' and ANs'.

Discussion

The results from the studies in the present thesis show a need for quality improvement in PU prevention (Study I-IV). Risk assessment documented within 24 hours of admission was lacking, as was performance of PU prevention for at-risk patients (Study I-III). The RNs' had low attention to PU prevention during their daily work with at-risk patients (Study I). However, if patients' were at risk this status was significantly related to documentation of skin assessment, use of pressure-reducing mattresses and planned repositioning, as comparing with other factors (hospital type, ward type, nurse staffing, workload). The results also highlight differences in PU prevention between different hospitals and ward types (Study II). Based on interviews with the RNs' on three different wards, it was found that the caring culture ranged from planned to unplanned structure (Study I).

The intervention showed significant improvements in PU prevention regarding risk assessment documented within 24 hours of admission, offload of heels and use of a sliding sheet in bed (Study III). The RNs', ANs' and first-line managers' described different steps regarding the prerequisites for successful implementation. Increased knowledge, new equipment available for pressure reducing activities and external support increased the RNs' and ANs' desire to develop PU prevention. Repeated quality measurements and immediate feedback of results resulted in ongoing communication among the RNs', ANs' and first-line managers' concerning how to improve the care. Key persons in these communications were the contact nurses' and the first-line managers' (Study IV). Surprisingly, even if the results showed improvement in PU prevention, ward-acquired PU prevalence remained at the same level (Study III). The intervention did help to improve the RNs' and ANs' knowledge of PU prevention (Study III-IV) and their perspective, shifting it from treating to preventing PUs (Study IV).

Pressure ulcer prevention

Risk assessment related to pressure ulcer prevention

A lack of risk assessment, using a validated risk assessment tool documented within 24 hours of admission, was revealed in the present studies (Study I-

III). This is in line with findings from other studies (Moore *et al.* 2013, SALAR 2014, Samuriwo & Dowding 2014).

Even if risk assessment was lacking, the present results indicate awareness among RNs' of patients at risk for developing PUs. At-risk patients were more likely to have had documented skin assessment, a pressure-reducing mattress and planned repositioning (Study II). The results also indicate that a documented risk assessment score was not always followed by PU prevention, as more patients were risk assessed (86%) than received prevention measures (48%) (Study III). The impact of risk assessment on PU prevention has been examined in a number of studies, but the results are not clear cut. A Cochrane review indicated that performed risk assessments with validated risk assessment tools do not affect the care (Moore & Cowman 2014); in another review, the authors recommend the use of a risk assessment tool (Garcia-Fernandez *et al.* 2014). According to Tescher *et al.* (2012) by using the subscales of a risk assessment tool, the prevention could be more focused on the specific patient needs. When carrying out an implementation, it is important that the target group find it compatible with their needs (Rogers 2003). If the sub-scores in the risk assessment tool are used, instead of the total score, the RNs and ANs will obtain information on what kind of prevention the patient needs, thus making the risk assessment tool useful for nurses. According to the newly revised international guidelines, it is important to perform risk assessment (NPUAP/EPUAP 2014), but assessment must be followed by a plan for PU prevention if the patient is at risk.

Differences in nursing care in relation to pressure ulcer prevention

The present results showed differences in PU prevention care (Study I-II). At the micro-level, the caring culture on the wards ranged from using planned to unplanned prevention in relation to using or failing to use the guidelines (Study I). At the meso-level and looking at ward type, the medical wards were associated with risk and skin assessment within 24 hours of admission and planned repositioning. Surgical wards were associated with the use of pressure-reducing mattresses. At the macro-level, the university hospital was associated with performance of risk and skin assessment and use of pressure-reducing mattresses, and the general hospital with planned repositioning (Study II). These results of differences in the care are in line with studies internationally (Eberlein-Gonska *et al.* 2013, Vanderwee *et al.* 2011) as well as with Swedish national PU prevalence surveys (SALAR 2014).

Magnet hospitals perform quality measurements. Park *et al.* (2014) showed that these hospitals had a lower rate of PUs. The university hospital had per-

formed quality measurements for several years, which was not the case at the general hospital (Study II). The participants in Study IV described that immediate feedback of results from the performed quality measurement was crucial. Otherwise they felt insecure about what PU prevention they performed and what quality improvements were needed. Receiving feedback on results the same day due to the application of tablet was valuable, as it helped them interpret the results in a deeper way, in relation to the present patients. Reports of difficulties in interpreting the results based on graphs were also revealed. Feedback is described by PARIHS as one element of importance (Kitson *et al.* 1998, Kitson *et al.* 2008), which is in line with what others report to be important for successful implementation (Greenhalgh *et al.* 2004, Rogers 2003). A Cochrane review stated that the effect of feedback generally leads to small effects, but potential improvements in professional practice (Ivers *et al.* 2012). The effects were larger if feedback was, for example, given more than once, when there was a need for major changes to achieve evidence-based care and when the person responsible for feedback is a colleague or a supervisor (Ivers *et al.* 2012, Ivers *et al.* 2014). Feedback is widely used in healthcare settings by a range of stakeholders (ANCC 2014, CALNOC 2014, SALAR 2014), but it has to be provided in a way that enables the target group to understand and act based on the findings. Strategies must be carefully planned, and measures must be taken to ensure that the message is delivered to and understood by the target group.

Nurse staffing in relation to pressure ulcer prevention

The present results showed that nurse staffing played a minor role in relation to performance of PU prevention (Study II). The effects of the intervention revealed gradual improvement in PU prevention, without increased nurse staffing (Study III-IV). A benchmarking project between the two Swedish hospitals (Study II) and CALNOC hospitals in the U.S. showed that the CALNOC hospitals had higher nurse staffing levels and lower prevalence of PU and performed more PU prevention than did the Swedish hospitals (Gunningberg *et al.* 2011). This is in line with an increasing amount of research demonstrating that patient outcomes are related to nurse staffing levels (Aiken *et al.* 2014, Blegen *et al.* 2011).

When examining nurse staffing levels and PU rate/prevalence, the relationship is not clear cut. One study performed in Swish hospitals show no relationship (Ausserhofer *et al.* 2013). A review examining more than 465 hospitals in the U.S. did find differences. Higher nurse staffing was associated with lower incidence of PUs (Park *et al.* 2014). In quality improvement work in Australian hospitals, a seven-graded classification system related to workload (patient complexity, the presence of high-dependency beds and patient

turnover together with increased nurse staffing levels) was introduced. The nurse staffing level was determined based on the grade the ward received in the classification system. The results showed a decreasing rate of PU when the staffing levels were established based on the classification system (Twigg *et al.* 2011). Nurse staffing levels are an important factor and are described as being related to the quality of care (Aiken *et al.* 2014), but it is difficult to make comparisons between different contexts. Every setting has its own arrangements for performing PU prevention. This could mean, for example, variation between structured and unstructured PU prevention care, as in Study I, it could mean differences in possibilities (resources) to perform PU prevention as well as differences in the RNs' and ANs' education regarding PU prevention. It could also be depending on managers and cultures.

Knowledge in relation to pressure ulcer prevention

In Study III, the RNs' and ANs' knowledge was shown to have increased as a result of the intervention. A changed perspective, from treating ulcers to preventing ulcers, was also revealed (Study IV). The goal of the PU intervention was to increase knowledge through several strategies: a) lectures on evidence-based PU prevention, together with practical training, b) discussion and support of PU prevention during quality measurements at bedside and c) during feedback of results (Study III). All of the different aspects were important to the interpersonal communication taking place on the wards (Study IV). The PARIHS framework does not describe concept of knowledge explicitly, but states in the core element, 'Evidence', that the target group needs a shared understanding of the benefits, disbenefits, and advantages of the new over the old, thus a team effort (Kitson *et al.* 2008).

Rogers explained knowledge as a process that includes five different parts, from understanding of the innovation to using and reinforcing it. If implementation of an innovation in organizations is to succeed, a collective decision to adopt it must be made (Rogers 2003). Whether or not adoption of the innovation takes place depends on the advantages ascribed to it by the target group. It is also important that the innovation is consistent with existing values, not terribly complex, and if there is any degree of ownership by the target group (Rogers 2003). There is also some degree of uncertainty in believing able to perform the new task. To overcome uncertainty, the individual progress through different steps, from belief to be capable to perform the new and to be able to perform the task in stressful situations (Townsend 2011).

Review papers have shown that training of healthcare professionals commonly results in modest improvements in practice (Forsetlund *et al.* 2009, Greenhalgh *et al.* 2004), but education is nevertheless the necessary first step

in implementation of evidence-based practice (Grol *et al.* 2013). Any education offered should be tailored to the target group's needs (Grol *et al.* 2013). However, it is also important to provide support in terms of knowledge all the way through, from the beginning of an implementation process, until almost everyone in the target group understands and is certain about how to perform the new tasks. It is possible that the RNs' and ANs' in the present studies (III and IV) needed support over a longer period of time to get through their state of uncertainty regarding knowledge and how to perform the tasks. Even if evidence-based guidelines are available, every patient is unique, and PU prevention needs to be individualized through consultation with the patient, in a way that best prevents him/her from developing PUs.

Prevalence in relation to pressure ulcer

The results from Study III did not show any improvement in the prevalence of PUs and ward-acquired PUs. This requires further discussion. When examining classification of PUs, there were fewer (but not significantly fewer) patients with Category 3-4 sores. Among the at-risk patients, 4 of 16 had a ward-acquired ulcer at pre-test, and 0 out of 15 patients at post-test. The same patients were not included at pre- and post-test, as point prevalence surveys were used for data collection, which could be another possible explanation. The Modified Norton scale was used to assess patients' risks. The scale contains the key factors for increased risk of developing PUs. In the research, other factors have been described as risk factors (Coleman *et al.* 2014). Thus it is possible that some differences exist, but have not been measured.

Implementation of evidence-based pressure ulcer prevention in relation to PARIHS

The intervention studied here was planned using the PARIHS framework (Kitson *et al.* 1998, Kitson *et al.* 2008). The different elements described as conditions for successful implementation were considered in relation to barriers in the context. The *evidence* was considered strong for a potential change in practice. Evidence-based guidelines were available (NPUAP/EPUAP 2014, SALAR 2011), and PU prevention is a well-known area for healthcare professionals. The one-day training focused on increasing RNs' and ANs' knowledge of the guidelines and achieving the same level of knowledge among the nurses. In the context were several elements assessed as barriers. The main problem prior to the intervention was assessed to be a lack of awareness among RNs, ANs and first-line managers of what PU prevention are performed and PU prevalence, lack of adequate equipment and

the importance of involving first-line managers. *Facilitation* was assessed as crucial, both external (multi-professional team, especially the team nurse) and internal (contact nurse). The role of the team nurse was to increase the RNs' and ANs' knowledge at bedside, especially the contact nurses'. The team nurse role was also to provide support in interpreting results from quality measurements and engaging the RNs', ANs' and first-line managers' in joint quality improvement work. For example, it was the nursing staff and first-line managers on the wards who decided, during the intervention and the quality improvement work, what needed to be improved. Study III showed a significant improvement in PU prevention, but it was only partial. Prevention practices were lacking for almost 50% of the patients. Increased use of prevention was seen in relation to protecting heels from pressure and use of sliding sheets in bed.

Still there is a lack of knowledge regarding the best strategy for implementing evidence-based care. Different strategies have been applied in a range of different contexts, in a range of different areas, most of them not focusing on nursing care and especially not on PU prevention (Baker *et al.* 2010, Flodgren *et al.* 2011, Forsetlund *et al.* 2009, Giguere *et al.* 2012, Ivers *et al.* 2012, O'Brien *et al.* 2007, Shojania *et al.* 2009). The strategies used in the present studies are in some respects common in implementation, and the effects in other studies, have been moderate to small (Boaz *et al.* 2011, Grimshaw *et al.* 2012). Some researchers have shown that multi-faceted interventions have more effect than a single strategy does (Boaz *et al.* 2011), while others have shown no differences (Grimshaw *et al.* 2012). Wensing *et al.* (2010) suggest that multi-faceted interventions could be more effective than single interventions if they address barriers to change. There are several problems when comparing the effects of implementation strategies. One problem is the considerable variation across studies concerning the strategy that has been used, for example strategies for using staff education can range from simple one-session training, to a more complex and ongoing activity (Forsetlund *et al.* 2009, Giguere *et al.* 2012).

A Cochrane review did focus on nursing care and implementation. Only one study was included, which was focusing on PU prevention. The authors concluded the need for more well design studies (Flodgren *et al.* 2012). However, one review focused on PU and on how to successfully implement evidence-based care (Soban *et al.* 2011). The most frequently used strategies were implementation of protocol-based care, staff education, implementation of risk assessment tools and collection of process or outcome data. Their results indicated that overall PU incidence decreased after the interventions (Soban *et al.* 2011). However, Kajermo *et al.* (2010) argue that barriers needs to be measured specific to the particular context to achieve successful implementation.

The PARIHS framework was easy to use and provided a guide on elements to consider in relation to evidence, context and facilitation of successful implementation. PARIHS does not point out which strategies should be used. Neither does the framework help in determining how to deal with barriers to successful implementation. This experience is in line with experiences of using the framework described by Ullrich *et al.* (2014) and a request on how interventions and measures are mapped to specific PARIHS elements (Helfrich *et al.* 2010, Ullrich *et al.* 2014). However, the different strategies used in the intervention did result in significant improvement in PU prevention. In the present thesis, interpersonal communications was found to be one core element of improvement in care. Communications is not mentioned as an element of importance in the framework. Rycroft-Malone *et al.* (2013) evaluated a large intervention study using PARIHS and discovered the importance of the interplay between professionals, and then proposed an extension of the framework to enhance its usefulness.

There are other implementation frameworks/models available (Bartholomew *et al.* 2011, Berlowitz 2011, Grol *et al.* 2013, Meyers *et al.* 2012), as well as theories aimed to explain, understand and perceive what influence changes on individuals (Per 2014). Examples of theories are “The Normalization Process model” (May 2006) and “Diffusion of Innovations” (Rogers 2003). Bartholomew *et al.* (2011) used a mapping system, where different hindrances to or goals for change practices should be linked to different theories to ensure that the implementation is successful. Still there is a need to build a consistent body of knowledge on how and why research implementation strategies do or do not work (Boaz *et al.* 2011, Helfrich *et al.* 2010, Squires *et al.* 2012, Wallin 2009). Another implication is how well healthcare professionals are able to use the model/theory. There is a need to reach a consensus on what models/theories actually help healthcare professionals and managers when evidence-based care is to be implemented.

Methodological considerations

In the present thesis, both a qualitative approach (I, IV) and a quantitative approach were used (II, III). Using different approaches is a strength, as they can be seen as complementary to each other (Malterud 2001). Qualitative studies give a deeper understanding of the phenomenon and quantitative studies give a broader understanding.

Study I and IV

The aim of Study I was to generate broad knowledge of how RNs work with PU prevention in care of at-risk patients as well as in general. In Study IV,

the perspective was to describe experiences of an intervention (Study III). A qualitative approach was found to be appropriate for the two studies (Patton 2002, Polit & Beck 2008). To understanding more completely the RNs' performance of PU prevention (Study I), a multi-method approach was used (non-participant observations, interviews and review of patient records). Using multi-methods can help in obtaining a more complete and contextualized portrait of the phenomenon under study (Polit & Beck 2008), and can minimize the weakness of any single approach (Patton 2002). The use of individual and focus group interviews (Study IV) was found to be appropriate for capturing the participants' experiences and perceptions (Patton 2002, Polit & Beck 2008). Focus group interviews (Study IV) are advantageous when participants have a common frame of references and when, for example, education programs are going to be evaluated (Patton 2002).

When using qualitative methods, trustworthiness needs to be considered in terms of credibility, dependability and transferability. To achieve trustworthiness, several aspects were considered during the research process (Graneheim & Lundman 2004, Patton 2002, Polit & Beck 2008). Credibility refers to how well the data and analysis processes address the study aim. There are several aspects to discuss here. First, participation (Study I and IV) was in some ways dependent on the individual's own time schedule. RNs and ANs who wished to participate but who were not able to could have affected the result. However, the participants varied greatly in terms of age and years of work experience. Including participants who ranged from 'novice to expert' was considered important for ensuring variation of the phenomenon under study and a strength in both studies.

Collecting data through observations (Study I) was considered appropriate, as it can give clues as to what can improve nursing practice (Polit & Beck 2008). There are some limitations associated with using observations, however. There is a risk that the participants may modify their actions because they know they are being observed (Patton 2002, Polit & Beck 2008). To minimize this, RNs' were told that nursing care was the focus of the observations. Afterwards, discussions with RNs' revealed feelings of insecurity in the situation, but also that they 'forgot' about the observations during the day. It is reasonable to assume that credibility was achieved when comparing all the collected data on the same ward.

In both studies, questions were asked about a specific phenomenon the nurses had been part of: a specific work shift (Study I) and strategies in an intervention (Study IV). Therefore, with regard to the concept of credibility, it is relevant to discuss at what point in time the interviews were conducted. In Study I, it was preferable that the interviews be performed directly after the observation. Due to the study design, this was not possible, because it could

have affected the RNs' actions regarding PU prevention during the observation. To remind the RNs', every interview started with a discussion of the observed work shift and the RN reminded themselves about the patients. The RNs' proved to have good memories, because, owing to the observation, that day was a special day for them and had they forgotten patients the interviewer would have reminded them. In Study IV interviews were performed two to twenty weeks (one ward) after the effect evaluation (Study III). Elapsed time is a threat to their memory. However, quality measurements have been continued on the wards and the participants did not give the impression of having forgotten.

The interviews were transcribed verbatim by the author (ES) (Study I) and by a secretary (Study IV) and were verified by the author to ensure a high level of accuracy. During the analysis process, codes, subcategories, categories and themes were created and formulated. Credibility was supported through the analysis process through close collaboration among the co-authors, who are experienced qualitative researchers.

Dependability refers to the degree the data change over time. A strength in both Study I and IV was that all data collection was performed by the same interviewers, in Study I by the first author and in Study IV by the co-authors. It was not possible for the first author to conduct the interviews, as she was involved in the intervention (Study III) as the team nurse. To enhance dependability, the author discussed the observations and interviews with the co-authors during the data collection. In Study IV, the interviews were performed by experienced researchers. Observation protocols and interview guides were developed for the data collection. In Study IV, the participants in the first individual and focus group interview described the intervention in almost only positive terms. That was discussed by the authors, and probe questions were added with the aim try to capture more breadth of experience.

Finally, how can the results from Study I and IV be characterized regarding the concept of transferability? The two studies were performed on three (Study III) and five (Study IV) wards. The fact that the studies included a limited number of wards means that they can only be transferable if the context is taken into consideration. However, they can promote a better understanding of the RNs' work with PU prevention and how evidence-based PU prevention can be implemented in a positive fashion.

Study II and III

In Study II, the association between different levels in the healthcare setting and PU prevention was investigated. A cross-sectional design (Study II) is appropriate to use when describing relationships among phenomena at a

fixed point in time (Polit & Beck 2008). Study III investigated the effects of a multi-faceted intervention focusing on PU prevention. A quasi-experimental clustered pre- and post-test design was used. Use of a randomized control trial would have been preferable. However, having a control group was assessed as difficult due to contamination between wards. The possibility of selecting a control group in another county council district was discussed. Quality improvement work had started in many other districts due to the national patient safety initiative, and therefore it was assessed as difficult. One limitation of using pre- and post-tests without a control group is reduced control of whether improvement has been made for reasons other than the intervention. However, the participant in Study IV did not talk about another quality work, except for the quality register introduced prior to the intervention, and the team nurse had visited the wards every month (Study III). To strengthen the study, the wards were included at different points in time. The statistics in the two studies took into account the clustered design of the study.

When using quantitative methods, the validity, reliability and generalizability of the study are important. Validity refers to the degree to which the study measures what it is supposed to measure, for example, that the items in a questionnaire generate answers that are tied to the study aim. Reliability refers to the consistency with which it measures the target attribute. For example, the less variation in repeated measures the higher is the reliability. Reliability also refers to the degree to which several independent observers agree about the scoring (Polit & Beck 2008).

To ensure validity in the two studies, the knowledge and attitudes questionnaire used in Study III has been extensively validated (Beeckman *et al.* 2010a, Beeckman *et al.* 2010b) and in the collection of PU prevalence and prevention (Study II and III) an established method outlined by EPUAP (Vanderwee *et al.* 2007) was used. The knowledge and attitudes questionnaire (Study III) was developed in Belgium (Beeckman *et al.* 2010a, Beeckman *et al.* 2010b) and translated to Swedish (Gunningberg *et al.* 2013b). A knowledge score of 60% or more has been considered satisfactory (Beeckman *et al.* 2011). In one Swedish study, the knowledge questions were criticized for being difficult (Gunningberg *et al.* 2013b) and in another study, the results revealed that the attitudes questions were not ideally suited to representing the Swedish sample of nurses (Florin *et al.* 2014). It is possible that a new instrument measuring knowledge and attitudes has to be developed and tested in Sweden.

Regarding reliability, there is a need to discuss the method outlined by EPUAP for collecting data on PU prevention and prevalence. The method is a point prevalence survey, meaning that the data are collected on all wards,

on the same day. In Study II, data were collected by an external RN and a staff nurse. To increase the reliability, the RNs participated in a half-day seminar, presenting information on study procedures and data collection with a specific focus on clinical assessment of patients. The RNs also completed a 1-hour e-learning lesson that included training on and classification of PUs and differentiation of these from moisture lesions. In Study III, a skin expert RN collected the data with the contact nurse on the ward. When there was disagreement about classification of ulcers, the external nurse or skin expert RN made the final decision (Study II and III).

Data on nurse staffing and workload (Study II) were drawn from computerized administration systems. The computerized administration system was the same as the RNs' and ANs' salary was paid through, which strengthens the reliability. Nurse staffing and workload were also followed over a three-month period to check for accuracy in the data.

A discussion of whether the results could be generalized needs to be pursued. The results in the two studies can contribute to a greater understanding of factors of importance for PU prevention and for implementation of evidence-based care.

Intervention

There are certain factors that could have strengthened the intervention. Grol *et al.* (2013) discussed the option of performing interviews or having meetings with the different professionals prior to the intervention to collect data on and consider possible hindrances to successful implementation. If that had been the case in the present intervention, the first-line managers' need for more support could have been discovered from the outset. Education and more support during the intervention could have been offered. However, on the whole, the informants described the intervention in a positive way, which would not have occurred if the strategies had not helped them in their quality improvement work.

According to the participants in Study IV, their goals were not achieved and quality improvement was still needed, which is supported by the results in Study III. This indicates the need for a time period longer than the six to eight months the intervention actually ran. It is possible that the effects of the intervention on performance of PU prevention would have been greater if this had been the case.

Conclusions

This thesis investigates pressure ulcer prevention at different levels in hospital settings and the effects and experiences of an intervention on pressure ulcer prevention. The conclusions are:

- Quality improvements regarding evidence-based pressure ulcer prevention were needed for patients at risk.
- Factors associated with pressure ulcer prevention were related to all levels in the hospital settings.
- Comprehensive intervention with short-term follow-up showed statistically significant improvement, but a need for a longer implementation period.
- The knowledge level among registered and assistant nurses increased due to the work with the intervention as well as the common outlook on the wards.
- Interpersonal communication between registered and assistant nurses' and first line managers', based on quality measurements was the key factor for improvement.

Clinical implications

The hospital described in the Preface was in the early phase of performing point prevalence surveys. Since then, there has been a national focus on PUs that has revealed the need to improve patient safety. It is possible that healthcare professionals and managers are asking themselves the same question as I did: “Why” is PU prevention lacking and “how” can we improve the care? The present thesis can provide answers to some of the questions. Being able to succeed with implementation of evidence-based PU prevention is related to the individual, as well as the context and organization in which the implementation is going to take place.

This thesis shows a lack of evidence-based PU prevention in hospital settings. The results also show that the care was not equal. Successful implementation is long-term work but can be supported by a person with a specific role to facilitate the process. There is a range of different roles the facilitator can have (Ivers *et al.* 2014). Therefore, the role should be tailored to the specific needs of the context and organization. One way to determine barriers for successful implementation is to perform interviews with the target group prior to the planning of the strategies to use.

Managers from the micro- to the macro-level have to know the conditions for PU prevention and, given their position, ensure that the necessary prerequisites are in place. One important factor for successful implementation is awareness. Awareness was in this thesis created through quality measurements and reflections of the care. Therefore, managers at different levels need to discuss and act based on results from quality measurements to improve PU prevention. In this work, it is crucial to develop networks and learn from each other (Gunningberg *et al.* 2010). It is an advantage to involve all RNs and ANs on the wards in reflecting on their own PU prevention based on quality measurements. Here, a positive, built-in driving force is in place, namely healthcare professionals’ desire to give patients good quality of care.

Although the RNs and ANs had some knowledge they needed more, i.e. knowledge of evidence-based PU prevention as well as specific patients’ needs. To make changes in PU prevention care it is a great advantage to educate RNs and ANs in the same outlook level of knowledge and to have bedside support. Even if PU prevention should be well known the results

show a need for support when starting to use new routines. RNs with specific knowledge working at the wards could act as facilitators in the implementation process and support with knowledge. RNs' are responsible for the nursing care and need to take responsibility but they need adequate knowledge and skill for the task.

During my work with the studies in the thesis, I have learned how complex and demanding PU prevention and implementation of evidence-based PU prevention are. But I have also seen patients', nurses' and first-line managers' satisfaction when the evidence-based PU prevention is provided for patients in need. Supporting such driving forces is a further step toward ensuring safe patient care.

Svensk sammanfattning (Swedish summary)

Att få ett trycksår leder till lägre livskvalitet och personer beskriver bland annat konstant smärta, ångest, depression och svårigheter att delta i det sociala livet. Det finns idag mycket forskning om orsaker till varför personer får trycksår samt hur trycksår förebyggs. Internationella och nationella riktlinjer baserade på forskning finns som stöd för hälso- och sjukvårdspersonal för vården att förebygga uppkomst av trycksår. Trots riktlinjer visar undersökningar att patienter på sjukhus ändå har trycksår. Studier gjorda i Europa har visat att mellan 9 -18 % av patienter på sjukhus har trycksår. I Sverige har nationella undersökningar genomförts för att undersöka förekomsten, den senaste, år 2014, visade att 14 % av patienter inlagda på sjukhus hade trycksår.

Trycksår orsakas av syrebrist på grund av ett ökat tryck mot huden. Ett evidensbaserat arbetssätt för att förebygga trycksår innebär tidig risk- och hudbedömning. Om patienten bedöms ha en ökad risk för trycksår ska vården planeras med mål och utvärdering tillsammans med patienten. Detta ska dokumenteras i patientens journal. Att förebygga orsaken till trycksår innebär att minska tryck och skjuv mot huden. Det kan göras genom att öka hudens kontaktyta mot underlaget eller genom att totalavlasta den del av huden som är utsatt för trycksårsrisk. Tryckreducerande material i säng och i stol ska användas och planerad lägesändring i säng och stol utföras. Andra exempel på riskfaktorer är fuktig hud, undernäring och cirkulationsrubbingar. Om ett trycksår uppkommer ska det kategoriseras och dokumenteras enligt en skala från 1 till 4, där 1 är röd hud som inte bleknar vid tryck och 4 är död hud in till senor och muskler.

Att införa evidensbaserad vård i hälso- och sjukvården är komplext. Det finns en mängd olika faktorer att ta hänsyn till både hos individer och i organisationer. Olika teorier och ramverk finns dock till hjälp för att införa evidensbaserad vård, bland annat Promoting Action on Research Implementation in Health Services (PARIHS). Detta ramverk beskriver tre olika faktorer, 1) evidens, 2) kontext och 3) underlättare (personer som underlättar införandet) som man behöver ta hänsyn till för att lyckas. Det finns forskning om hur effektiva olika strategier är gällande införandet av nya arbetssätt. Resultaten av denna forskning visar effekter på hur ändrat arbetssätt sker men de

är små. Således saknas det kunskap om hur man bäst inför evidensbaserad vård.

Det övergripande syftet i denna avhandling var att undersöka faktorer inom hälso- och sjukvården av betydelse för trycksårsförebyggande vård. Ett annat syfte var att utvärdera en intervention med fokus på att införa evidensbaserad trycksårsförebyggande vård.

Delarbete I och II har en beskrivande design. I Studie I undersöktes nio sjuksköterskors trycksårsförebyggande arbete genom observationer, intervjuer och granskning av patientjournaler. Studien genomfördes på tre avdelningar och sjukhus. Resultatet visade att sjuksköterskorna utförde få trycksårsförebyggande åtgärder för patienter med trycksårrisk. Resultatet från intervjuerna visade olikheter mellan avdelningarna i rutiner för trycksårsförebyggande vård, från ett organiserat arbete till ett oorganiserat arbete. Sjuksköterskans samarbete med undersköterskan varierade också mellan avdelningarna, från att ha dialog med undersköterskan i arbetet till att helt lämna över ansvaret.

I delstudie II undersöktes sambandet mellan faktorer hos patienten (bland annat ålder och trycksårrisk) och organisationen (vilken typ av avdelning och sjukhus, hur många timmar direkt vård patienterna fått och vårdtyngden) på utförande av förebyggande trycksårsvård. I studien deltog 825 patienter inlagda på 44 avdelningar. Äldre patienter hade större möjlighet att få risk- och hudbedömning i samband med inkomst till sjukhuset. Riskpatienter hade större möjlighet att få tryckreducerande madrass och planerad vändning i säng. Betydelse för förebyggande arbete var även vilken typ av avdelning (medicinsk, kirurgisk eller geriatrisk) samt typ av sjukhus (universitets- eller länssjukhus) patienten vårdades på. Sjuksköterske- och undersköterskebemanningen och vårdtyngden spelade mindre roll. Resultatet från både studie I och II visade att det trycksårsförebyggande arbetet var bristfälligt.

Med fokus på att införa evidensbaserat arbetssätt på vårdavdelningar har en intervention utförts. Till hjälp i planeringen av interventionen användes PA-RIHS. Interventionen bestod av 1) introduktion, 2) en endagsutbildning och 3) kvalitetsmätningar avseende trycksårsförebyggande vård och förekomsten av trycksår. Till stöd för att underlätta införandet av evidensbaserad vård fanns ett multi-professionellt team (sjuksköterska, arbetsterapeut, sjukgymnast och dietist). Teamets sjuksköterska besökte avdelningarna en gång i månaden för att tillsammans med en sjuksköterska på avdelningen (kontakt-sjuksköterska) genomföra kvalitetsmätningar. Under kvalitetsmätningarna gav teamets sjuksköterska stöd, undervisning och diskuterade trycksårsförebyggande vård. Återkoppling skedde i direkt anslutning till avslutad mätning.

Delstudie III och IV utvärderade den utförda interventionen. Resultatet visade att förbättringar hade skett i det trycksårsförebyggande arbetet. Statistiskt signifikant fler patienter fick förebyggande åtgärder och fler förebyggande åtgärder hade sats in per patient. Trots förbättringar så saknades prevention för cirka 48 % av riskpatienterna och trycksårsprevalensen var den samma som före interventionen, det vill säga 11 %. Kunskapen om evidensbaserad vård ökade statistiskt signifikant från 57 % till 63 % hos sjuksköterskor och undersköterskor. Deltagarna i Studie IV beskrev att det trycksårsförebyggande arbetet hade förbättrats och deras perspektiv hade förändrats från att behandla trycksår till att förebygga trycksår. Det stöd de fått genom teamets sjuksköterska var viktigt och underlättade processen. Andra viktiga personer i den processen var vårdenhetschefen och kontaktsjuksköterskan. Den kommunikation som skedde mellan personal och vårdenhetschef baserat på ny kunskap och resultat från kvalitetsmätningarna möjliggjorde förbättringar i det trycksårsförebyggande arbetet. Det arbetet var enligt deltagarna inte färdigt. Att utvärdera den egna vården skapade motivation till förbättringar hos personalen.

Sammanfattningsvis visar studierna i avhandlingen att evidensbaserad trycksårsförebyggande vård behövde implementeras. Den trycksårsförebyggande vården var till stor del beroende av andra faktorer än patientens risk. En intervention baserad på kvalitetsmätningar, snabb återkoppling av resultat samt tid avsatt för diskussion och reflektion resulterade i förbättringar i det trycksårsförebyggande arbetet. Det var viktigt att ha personer som arbetade med att underlätta införandet av nya rutiner. Vårdenhetschefen var en viktig person i kvalitetsarbetet. Resultatet visade också att kvalitetsarbetet behövde fortsätta.

Det är av betydelse att chefer på alla nivåer inom hälso- och sjukvårdsorganisationen är engagerade och bidrar från sin position till att skapa möjlighet för evidensbaserat trycksårsförebyggande arbete. Det är också av betydelse att ha någon person med rollen att underlätta införandet av nya rutiner. Den rollen bör vara anpassad till den egna organisationens hinder i införandet av nya arbetssätt. Sjuksköterskor och undersköterskor behöver ha tid för reflektion av det egna arbetet, denna reflektion ska vara baserad på kvalitetsmätningar. Det skapar medvetenhet om hur den egna trycksårsförebyggande vården bedrivs och hur den kan förbättras.

Acknowledgements

I am here today because of the efforts, engagement and support of many people. I express my sincere gratitude to **all of you**. Especially I want to thank:

All the **patients** who kindly participated in the studies. The **registered nurses, assistant nurses** and **first-line managers** who shared their experiences. I also appreciate the **health care professionals**, especially the first-line managers and contact nurses on the wards who cooperated and dedicated time for the intervention. Without all of you, this research would never have been possible.

Lena Gunningberg, my main supervisor. You have shared your scientific knowledge with me and challenged me many times during the years - invaluable for me in my research work. The discussions of research designs, methods and how to “package” the findings in a proper way, has led me forward in my knowledge on research. You have always read my manuscript with engagement, full of suggestions to improve. I appreciate that you have encouraged me to participate in conferences and when finally there, took care of me. Thanks for always being available when needed, even on New Year’s Day.

Marieann Högman, my co-supervisor. You led me into this field by believing in me. It has been a fantastic journey - as you told me. You have supported me all the way through. Your engagement and knowledge made it possible to perform the intervention at the County Council. I am grateful for that. By doing that you opened the door to implementation research. I also appreciate the work and engagement you had in the development of the application for tablets.

Anna-Greta Mamhidir, my co-supervisor. We have discussed analysis, results, and manuscripts by telephone for hours - I really appreciate this. Special thanks for the support during the writing of my first manuscript. You were so patient when trying to get me on the right track. I can’t believe you are still here with me after that. You have increased my understanding and interest in qualitative research and you have given me support whenever I needed.

Hans Högborg, my co-author and adviser for questions on statistics. You can explain statistics in relation to my world - health care. I do appreciate the time I spent with you asking statistics questions, which were hard for me to understand. You gave me the best support even when I asked the same question for the third time.

Lennart Fredriksson, my co-author. I appreciate your engagement as a co-author. It is very inspiring to have discussions with you. You have asked questions, making me reflect and further develop my thoughts. I always looked forward to our meetings. Thank you for supporting me with practical things concerning, for example, the layout of the thesis and for proofreading.

Ewa Idvall, my co-author. Thank you for contributing your knowledge to my work.

Camilla Johansson, dermatology nurse. Thank you so much for the data collection in Study III. You made a great work every time. I really appreciate the accuracy in which you perform the data collection and the cooperation with the wards.

Magnus Höghjelm, at the University of Gävleborg. Thank you for your development of the application for tablets. You know, the application is still in use.

Magnus Keller, the former head of the Clinical Training Centre, **Raul Jonsson**, the present head of the Clinical Training Centre and **Pia Johansson**, the present heads of Utvecklingsavdelningen. Thank you for providing me time to work on research.

My dear fellows in the intervention team: **Lena Holmgren**, **Lena Sjökvist**, **Anneli Olsson**, and **Birgitta Thelberg**. You all have been invaluable during the intervention, with your engagement, knowledge, and support—I am really grateful. I could not have been part of a better team, and I do hope the friendship will continue.

My friends in Lena Gunningberg's research group—for all the discussions and advice during the years. When travelling to Uppsala, knowing you were there waiting for me gave me energy. We have had fantastic discussions during the work. I have learned so much from you. **Anna-Karin Gunnarsson** for "chats", especially when finishing the thesis. It was easier knowing I could call you whenever I wanted. **Eva Jangland**, you have fantastic thoughts and it is inspiring to converse with you. **Åsa Muntlin**, you are always positive and inspiring. I have wonderful memories with you; for example, the days at Eva's island and the days in Gotland.

All former and present researchers and doctoral students at the Centre for Research and Development, Uppsala University/County Council of Gävleborg. Thank you for your support during the years with my PhD project. A special thanks to **Catrine Björn, Kristina Wroland-Nordstrand, Elisabeth Sundgren, Magnus Lindberg, Maria Lindberg** and **Per Fessé**. Sharing time with you has been a pleasure, both in scientific discussions and discussions of “real life”. You have been fantastic workfellows and I appreciate the laughs we had. **Per Liv**, you have provided excellent statistical advice. Always willing to help, explain, and discuss statistics questions. I am very grateful, your advices was invaluable. I also thank **Karl-Erik Westergren** for statistical advices. **Inga-Lill Stenlund**, always service minded. So many times you have helped me during the years - I felt you really cared. Thank you so much for all the service. **Dag Risen**, thank you for chats during coffee breaks.

To the Department of Public Health and Caring Sciences at Uppsala University. Thank you everyone, including former and present doctoral students, senior researchers, and lecturers for your support during the years. I appreciate the constructive criticism in seminars on research design, statistics, and manuscripts. A special thanks to **Christina Leo-Swenne, Bernice Skytt, Catrine Björn** and **Petronella Bjurling-Sjöberg**, for reviewing an early draft of the thesis.

My workfellows at the Clinical Training Centre: **Helena Kvarnberg, Eva Reidmar, Eva Morén, Ann Hurtig, Susanne Högberg, Ia Sundin, Tina Rosvall och Torbjörn Jonsson**. Thank you for the support and patience you all had in our daily work. Despite my leave of absence I always felt part of the gang. You invited me to coffee breaks, to participate in “after works”, and chats.

Former and present staff of the library at Gävle Hospital, especially thanks to **Maj Mosell**. All of you have provided excellent service in bringing me articles and books.

Catrine Björn, it has been fantastic to have you as my room fellow. You have supported me both in my work with my project as well as my personal life. I really loved our discussions and laughs, hope it will continue. And one more thing—thank you for taking me to Plan 13.

Kristina Wroland-Nordstrand, my other room fellow. It has been a pleasure to share the room with you. Thank you for the discussions both on research and personal life, as well as the support you have given me. I hope we can discuss RCT and qualitative research in the future.

Catrine Björn, Kristina Wroland-Nordstrand, Elisabeth Sundgren, Magnus Lindberg, and Maria Lindberg, thank you for reviewing this thesis.

To my close family:

Amanda and **Johan**, for being invaluable in my life. You have reminded me of “real life”, the most important part of life. I love you so much. I know you think I have worked too much, and in the future I will be more available.

My dear husband **Tommy**. Without you this has not been possible. You have shared my research life in a way I did not think was possible. You have listened to me when I was frustrated, when I was sad, and when I was happy. Thank you for all the hours, the support, and believing in me.

My dear sister **Anna Sving-Sjöblom**. Thank you for being you. You supported my work by believing in me. You have in many ways given me energy to go on. The first person I told about the published manuscript was you. I know you don’t read them but I appreciate the mail you sent back to tell me that you admired my work.

My mother and father, **Birgitta** and **Erik**, who are no longer with us. I know you would have liked to follow my journey through the years. I also know you had supported me in the best ways.

This thesis was supported by funding from the Centre for Research and Development, Uppsala University/County Council of Gävleborg and the Uppsala-Örebro Regional Research Council in Sweden.

References

- AHCPR (1992) Pressure Ulcers in Adults: Prediction and Prevention. Clinical Practice Guideline Number 3. Agency for Health Care Policy and Research, <http://www.eric.ed.gov/PDFS/ED357247.pdf> (accessed October 14 2014).
- Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Griffiths P, Busse R, Diomidous M, Kinnunen J, Kozka M, Lesaffre E, McHugh MD, Moreno-Casbas MT, Rafferty AM, Schwendimann R, Scott PA, Tishelman C, van Achterberg T & Sermeus W (2014): Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet* **383**, 1824-1830.
- ANA (2003) National Database of Nursing Quality Indicators. American Nurses Association, <https://www.nursingquality.org/> (accessed October 19 2014).
- ANCC (2014) American Nurses Credentialing Center. American Nurses Credentialing Center, <http://www.nursecredentialing.org/Magnet/MagnetNews/2008-MagnetNews/NewMagnetModel.html> (accessed September 30 2014).
- Athlin E, Idvall E, Jernfalt M & Johansson I (2010): Factors of importance to the development of pressure ulcers in the care trajectory: perceptions of hospital and community care nurses. *J Clin Nurs* **19**, 2252-2258.
- Ausserhofer D, Schubert M, Desmedt M, Blegen MA, De Geest S & Schwendimann R (2013): The association of patient safety climate and nurse-related organizational factors with selected patient outcomes: a cross-sectional survey. *Int J Nurs Stud* **50**, 240-252.
- Baath C, Idvall E, Gunningberg L & Hommel A (2014): Pressure-reducing interventions among persons with pressure ulcers: results from the first three national pressure ulcer prevalence surveys in Sweden. *J Eval Clin Pract* **20**, 58-65.
- Baharestani MM, Black JM, Carville K, Clark M, Cuddigan JE, Dealey C, Defloor T, Harding KG, Lahmann NA, Lubbers MJ, Lyder CH, Ohura T, Orsted HL, Reger SI, Romanelli M & Sanada H (2009): Dilemmas in measuring and using pressure ulcer prevalence and incidence: an international consensus. *Int Wound J* **6**, 97-104.

- Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S & Robertson N (2010): Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, CD005470.
- Bartholomew LK, Parcel GS, Kok G, Gottlieb NH & Fernández ME (2011) *Planning health promotion programs; an Intervention Mapping approach*,. Jossey-Bass, San Francisco.
- Beeckman D, Clays E, Van Hecke A, Vanderwee K, Schoonhoven L & Verhaeghe S (2013): A multi-faceted tailored strategy to implement an electronic clinical decision support system for pressure ulcer prevention in nursing homes: a two-armed randomized controlled trial. *Int J Nurs Stud* **50**, 475-486.
- Beeckman D, Defloor T, Demarre L, Van Hecke A & Vanderwee K (2010a): Pressure ulcers: development and psychometric evaluation of the attitude towards pressure ulcer prevention instrument (APuP). *Int J Nurs Stud* **47**, 1432-1441.
- Beeckman D, Defloor T, Schoonhoven L & Vanderwee K (2011): Knowledge and attitudes of nurses on pressure ulcer prevention: a cross-sectional multicenter study in Belgian hospitals. *Worldviews on Evidence-Based Nursing* **8**, 166-176.
- Beeckman D, Vanderwee K, Demarre L, Paquay L, Van Hecke A & Defloor T (2010b): Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. *Int J Nurs Stud* **47**, 399-410.
- Berlowitz D, VanDeusen, C., Parker, V., Niederhauser, A., Silver, J., Logan, C., Ayello, E., Zulkowski, K. (2011) Preventing Pressure Ulcers in Hospitals . A Toolkit for Improving Quality of Care. Agency for Healthcare Research and Quality, <http://www.ahrq.gov/research/ltc/pressureulcertoolkit/> (accessed October 19 2014).
- Blegen MA, Goode CJ, Spetz J, Vaughn T & Park SH (2011): Nurse staffing effects on patient outcomes: safety-net and non-safety-net hospitals. *Med Care* **49**, 406-414.
- Boaz A, Baeza J & Fraser A (2011): Effective implementation of research into practice: an overview of systematic reviews of the health literature. *BMC Res Notes* **4**, 212.
- Braden BJ & Maklebust J (2005): Preventing pressure ulcers with the Braden scale: an update on this easy-to-use tool that assesses a patient's risk. *American Journal of Nursing* **105**, 70-72.
- CALNOC (2007) *Code-Book Part I & II, Coordinating and Using CALNOC Data in the Hospital Setting*. San Francisco, CA: UCSF School of Nursing, Center for Nursing Research & Innovation, Collaborative Alliance for Nursing Outcomes.
- CALNOC (2014) Collaborative Alliance for Nursing Outcomes. Collaborative Alliance for Nursing Outcomes, <http://www.calnoc.org/?page=A1> (accessed 26 September 2014).

- Coleman S, Nelson EA, Keen J, Wilson L, McGinnis E, Dealey C, Stubbs N, Muir D, Farrin A, Dowding D, Schols JM, Cuddigan J, Berlowitz D, Jude E, Vowden P, Bader DL, Gefen A, Oomens CW, Schoonhoven L & Nixon J (2014): Developing a pressure ulcer risk factor minimum data set and risk assessment framework. *J Adv Nurs* **70**, 2339-2352.
- Dealey C, Posnett J & Walker A (2012): The cost of pressure ulcers in the United Kingdom. *J Wound Care* **21**, 261-262, 264, 266.
- Eberlein-Gonska M, Petzold T, Helass G, Albrecht DM & Schmitt J (2013): The incidence and determinants of decubitus ulcers in hospital care: an analysis of routine quality management data at a university hospital. *Dtsch Arztebl Int* **110**, 550-556.
- Ek AC (1987): Prediction of pressure sore development. *Scand J Caring Sci* **1**, 77-84.
- Essex HN, Clark M, Sims J, Warriner A & Cullum N (2009): Health-related quality of life in hospital inpatients with pressure ulceration: assessment using generic health-related quality of life measures. *Wound Repair Regen* **17**, 797-805.
- Flodgren G, Conterno LO, Mayhew A, Omar O, Pereira CR & Shepperd S (2013): Interventions to improve professional adherence to guidelines for prevention of device-related infections. *Cochrane Database Syst Rev* **3**, CD006559.
- Flodgren G, Parmelli E, Doumit G, Gattellari M, O'Brien MA, Grimshaw J & Eccles MP (2011): Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, CD000125.
- Flodgren G, Rojas-Reyes MX, Cole N & Foxcroft DR (2012): Effectiveness of organisational infrastructures to promote evidence-based nursing practice. *Cochrane Database Syst Rev* **2**, CD002212.
- Florin J, Baath C, Gunningberg L & Martensson G (2014): Attitudes towards pressure ulcer prevention: a psychometric evaluation of the Swedish version of the APuP instrument. *Int Wound J*.
- Forsetlund L, Bjorndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, Davis D, Odgaard-Jensen J & Oxman AD (2009): Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, CD003030.
- Garcia-Fernandez FP, Pancorbo-Hidalgo PL & Agreda JJ (2014): Predictive capacity of risk assessment scales and clinical judgment for pressure ulcers: a meta-analysis. *J Wound Ostomy Continence Nurs* **41**, 24-34.
- Giguere A, Legare F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A, Makosso-Kallyth S, Wolf FM, Farmer AP & Gagnon MP (2012): Printed educational materials: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev* **10**, CD004398.

- Gillespie BM, Chaboyer WP, McInnes E, Kent B, Whitty JA & Thalib L (2014): Repositioning for pressure ulcer prevention in adults. *Cochrane Database Syst Rev* **4**, CD009958.
- Gorecki C, Brown JM, Nelson EA, Briggs M, Schoonhoven L, Dealey C, Defloor T & Nixon J (2009): Impact of pressure ulcers on quality of life in older patients: a systematic review. *J Am Geriatr Soc* **57**, 1175-1183.
- Gorecki C, Closs SJ, Nixon J & Briggs M (2011): Patient-reported pressure ulcer pain: a mixed-methods systematic review. *J Pain Symptom Manage* **42**, 443-459.
- Gorecki C, Nixon J, Madill A, Firth J & Brown JM (2012): What influences the impact of pressure ulcers on health-related quality of life? A qualitative patient-focused exploration of contributory factors. *J Tissue Viability* **21**, 3-12.
- Graneheim UH & Lundman B (2004): Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* **24**, 105-112.
- Greenhalgh T, Robert G, Macfarlane F, Bate P & Kyriakidou O (2004): Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Q* **82**, 581-629.
- Grimshaw JM, Eccles MP, Lavis JN, Hill SJ & Squires JE (2012): Knowledge translation of research findings. *Implement Sci* **7**, 50.
- Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, Whitty P, Eccles MP, Matowe L, Shirran L, Wensing M, Dijkstra R & Donaldson C (2004): Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess* **8**, iii-iv, 1-72.
- Grol R, Wensing M, Eccles M & Davis D (2013) *Improving Patient Care. The implementation of cahges in health care*, Second edn. John Wiley & Sons, Oxford.
- Gunningberg L (2013) Kvalitetsindikationer för patienter med risk för att utveckla trycksår. In *Kvalitetsindikatorer inom omvårdnad* (Idvall E ed.). Gothia Fortbildning, Stockholm.
- Gunningberg L, Brudin L & Idvall E (2010): Nurse Managers' prerequisite for nursing development: a survey on pressure ulcers and contextual factors in hospital organizations. *Journal of Nursing Managment* **18**, 757-766.
- Gunningberg L, Donaldson N, Aydin C & Idvall E (2011): Exploring variation in pressure ulcer prevalence in Sweden and the USA: benchmarking in action. *J Eval Clin Pract* **18**, 904-910.
- Gunningberg L, Hommel A, Baath C & Idvall E (2013a): The first national pressure ulcer prevalence survey in county council and municipality settings in Sweden. *J Eval Clin Pract* **19**, 862-867.

- Gunningberg L, Martensson G, Mamhidir AG, Florin J, Muntlin Athlin A & Baath C (2013b): Pressure ulcer knowledge of registered nurses, assistant nurses and student nurses: a descriptive, comparative multicentre study in Sweden. *Int Wound J*.
- Gunningberg L & Stotts NA (2008): Tracking quality over time: what do pressure ulcer data show? *International Journal for Quality in Health Care* **20**, 246-253.
- Harvey G, Loftus-Hills A, Rycroft-Malone J, Titchen A, Kitson A, McCormack B & Seers K (2002): Getting evidence into practice: the role and function of facilitation. *J Adv Nurs* **37**, 577-588.
- Helfrich CD, Damschroder LJ, Hagedorn HJ, Daggett GS, Sahay A, Ritchie M, Damush T, Guihan M, Ullrich PM & Stetler CB (2010): A critical synthesis of literature on the promoting action on research implementation in health services (PARIHS) framework. *Implement Sci* **5**, 82.
- Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J & Oxman AD (2012): Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev* **6**, CD000259.
- Ivers NM, Sales A, Colquhoun H, Michie S, Foy R, Francis JJ & Grimshaw JM (2014): No more 'business as usual' with audit and feedback interventions: towards an agenda for a reinvigorated intervention. *Implement Sci* **9**, 14.
- Kajermo KN, Bostrom AM, Thompson DS, Hutchinson AM, Estabrooks CA & Wallin L (2010): The BARRIERS scale -- the barriers to research utilization scale: A systematic review. *Implement Sci* **5**, 32.
- Kitson A, Harvey G & McCormack B (1998): Enabling the implementation of evidence based practice: a conceptual framework. *Qual Health Care* **7**, 149-158.
- Kitson AL, Rycroft-Malone J, Harvey G, McCormack B, Seers K & Titchen A (2008): Evaluating the successful implementation of evidence into practice using the PARIHS framework: theoretical and practical challenges. *Implement Sci* **3**, 1.
- Lahmann NA, Halfens RJ & Dassen T (2010): Impact of prevention structures and processes on pressure ulcer prevalence in nursing homes and acute-care hospitals. *J Eval Clin Pract* **16**, 50-56.
- Langer G & Fink A (2014): Nutritional interventions for preventing and treating pressure ulcers. *Cochrane Database Syst Rev* **6**, CD003216.
- Lindgren M, Unosson M, Krantz AM & Ek AC (2002): A risk assessment scale for the prediction of pressure sore development: reliability and validity. *J Adv Nurs* **38**, 190-199.
- Malterud K (2001): Qualitative research: standards, challenges, and guidelines. *Lancet* **358**, 483-488.
- May C (2006): A rational model for assessing and evaluating complex interventions in health care. *BMC Health Serv Res* **6**, 86.

- McCormack B, Kitson A, Harvey G, Rycroft-Malone J, Titchen A & Seers K (2002): Getting evidence into practice: the meaning of 'context'. *J Adv Nurs* **38**, 94-104.
- McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A & Kerr EA (2003): The quality of health care delivered to adults in the United States. *N Engl J Med* **348**, 2635-2645.
- McInnes E, Dumville JC, Jammali-Blasi A & Bell-Syer SE (2011): Support surfaces for treating pressure ulcers. *Cochrane Database of Systematic Reviews*, CD009490.
- McKibbon KA, Lokker C, Keepanasseril A, Colquhoun H, Haynes RB & Wilczynski NL (2013): WhatisKT wiki: a case study of a platform for knowledge translation terms and definitions--descriptive analysis. *Implement Sci* **8**, 13.
- Meyers DC, Durlak JA & Wandersman A (2012): The quality implementation framework: a synthesis of critical steps in the implementation process. *Am J Community Psychol* **50**, 462-480.
- Moore Z & Cowman S (2012): Pressure ulcer prevalence and prevention practices in care of the older person in the Republic of Ireland. *J Clin Nurs* **21**, 362-371.
- Moore Z, Cowman S & Conroy RM (2011): A randomised controlled clinical trial of repositioning, using the 30 degrees tilt, for the prevention of pressure ulcers. *J Clin Nurs* **20**, 2633-2644.
- Moore Z, Johansen E & van Etten M (2013): A review of PU risk assessment and prevention in Scandinavia, Iceland and Ireland (part II). *J Wound Care* **22**, 423-424, 426-428, 430-421.
- Moore ZE & Cowman S (2014): Risk assessment tools for the prevention of pressure ulcers. *Cochrane Database Syst Rev* **2**, Cd006471.
- Nelson EC, Godfrey MM, Batalden PB, Berry SA, Bothe AEJ, McKinley KE, Melin CN, Muething SE, Moore LG, Wasson JH & Nolan TW (2008): Clinical microsystems, part 1. The building blocks of health systems. *Joint Commission Journal of Quality and Patient Safety*. **34** 367-378.
- NPUAP/EPUAP (2009) *National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel. Pressure Ulcer Prevention and Treatment: clinical practice guideline*. Washington , DC: National Pressure Ulcer Advisory Panel (www.npuap.org)
- NPUAP/EPUAP (2014) *National Pressure Ulcer Advisory Panel European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline*. Cambridge Media, Perth, Australia.
- O'Brien MA, Rogers S, Jamtvedt G, Oxman AD, Odgaard-Jensen J, Kristoffersen DT, Forsetlund L, Bainbridge D, Freemantle N, Davis DA, Haynes RB & Harvey EL (2007): Educational outreach visits: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*, CD000409.

- Pablos-Mendez A & Shademani R (2006): Knowledge translation in global health. *J Contin Educ Health Prof* **26**, 81-86.
- Park SH, Boyle DK, Bergquist-Beringer S, Staggs VS & Dunton NE (2014): Concurrent and lagged effects of registered nurse turnover and staffing on unit-acquired pressure ulcers. *Health Serv Res* **49**, 1205-1225.
- Patton M, Q (2002) *Qualitative Research & Evaluation Methods*. Sage Publications, London.
- Per N (2014) Teorier för implementeringsforskning. In *Implementering av evidensbaserad praktik* (Agneta E ed.). Gleerups Utbildning AB, Falkenberg Sweden.
- Polit D & Beck CT (2008) *Nursing Research: Generating and Assessing Evidence for Nursing Practice* Lippincott Williams & Wilkins, Philadelphia.
- Rogers E, M. (2003) *Diffusion of Innovations*. Simon & Schuster, Inc, London.
- Rycroft-Malone J, Harvey G, Kitson A, McCormack B, Seers K & Titchen A (2002a): Getting evidence into practice: ingredients for change. *Nurs Stand* **16**, 38-43.
- Rycroft-Malone J, Kitson A, Harvey G, McCormack B, Seers K, Titchen A & Estabrooks C (2002b): Ingredients for change: revisiting a conceptual framework. *Qual Saf Health Care* **11**, 174-180.
- Rycroft-Malone J, Seers K, Chandler J, Hawkes CA, Crichton N, Allen C, Bullock I & Strunin L (2013): The role of evidence, context, and facilitation in an implementation trial: implications for the development of the PARIHS framework. *Implement Sci* **8**, 28.
- Sackett DL, Rosenberg WM, Gray JA, Haynes RB & Richardson WS (1996): Evidence based medicine: what it is and what it isn't. *BMJ* **312**, 71-72.
- SALAR (2008) *Förebygg trycksår i samband med vård. Nationell satsning för ökad patientsäkerhet*. Swedish Association of Local Authorities and Regions.
- SALAR (2011) Trycksår: åtgärder för att förebygga. Swedish Association of Local Authorities and Regions http://brs.skl.se/publikationer/index.jsp?http://brs.skl.se/publikationer/publdoc.jsp?searchpage=katasearch.jsp&db=KATA&from=1&toc_length=20&currdoc=1&search_titn=%2239907%22.
- SALAR (2014) Förebyggande åtgärder mot trycksår ökat något. Swedish Association of Local Authorities and Regions, <http://www.skl.se/halsasjukvard/patientsakerhet/trycksar/resultattrycksar.2125.html> (accessed September 29 2014).
- Samuriwo R & Dowding D (2014): Nurses' pressure ulcer related judgements and decisions in clinical practice: A systematic review. *Int J Nurs Stud*.

- Savitz LA, Jones CB & Bernard S (2005) Quality Indicators Sensitive to Nurse Staffing in Acute Care Settings. In *Advances in Patient Safety: From Research to Implementation (Volume 4: Programs, Tools, and Products)* (Henriksen K, Battles JB, Marks ES & Lewin DI eds.), Rockville (MD).
- Senior Alert (2014) Senior Alert. Ett nationellt kvalitetsregister för vård och omsorg. Kulturm, Landstinget i Jönköpings län, <http://plus.lj.se/infopage.jsf?nodeId=39305> (accessed September 2014 2014).
- SFS (2008) Svensk författningssamling. 2008:355 Patientdatalag (Socialdepartementet ed.), http://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Patientdatalag-2008355_sfs-2008-355/.
- SFS (2011) Svensk författningssamling. 2010:695 Patientsäkerhetslag. Sveriges Riksdag, http://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Patientsakerhetslag-2010659_sfs-2010-659/?bet=2010:659 (accessed September 29 2014).
- Shojania KG, Jennings A, Mayhew A, Ramsay CR, Eccles MP & Grimshaw J (2009): The effects of on-screen, point of care computer reminders on processes and outcomes of care. *Cochrane Database Syst Rev*, CD001096.
- Soban LM, Hempel S, Munjas BA, Miles J & Rubenstein LV (2011): Preventing pressure ulcers in hospitals: A systematic review of nurse-focused quality improvement interventions. *Jt Comm J Qual Patient Saf* **37**, 245-252.
- Socialdepartementet (2014) Patientsäkerhetssatsning 2014 överenskommelse mellan staten och Sveriges Kommuner och Landsting om förbättrad patientsäkerhet (Socialdepartementet ed.). Swedish Association of Local Authorities and Regions, <http://www.skl.se/download/18.59311cdd145ac7ef71c553de/1399551195837/skl-patientsakerhetssatsning-overenskommelse.pdf>.
- Squires JE, Reay T, Moralejo D, Lefort SM, Hutchinson AM & Estabrooks CA (2012): Designing strategies to implement research-based policies and procedures: a set of recommendations for nurse leaders based on the PARIHS framework. *J Nurs Adm* **42**, 293-297.
- Tannen A, Dassen T & Halfens R (2008): Differences in prevalence of pressure ulcers between the Netherlands and Germany--associations between risk, prevention and occurrence of pressure ulcers in hospitals and nursing homes. *J Clin Nurs* **17**, 1237-1244.
- Tescher AN, Branda ME, Byrne TJ & Naessens JM (2012): All at-risk patients are not created equal: analysis of Braden pressure ulcer risk scores to identify specific risks. *J Wound Ostomy Continence Nurs* **39**, 282-291.

- The Joint Commission (2014) Patient Safety. The Joint Commission, http://www.jointcommission.org/topics/patient_safety.aspx (accessed September 26 2014).
- Townsend L, Scanlan, J. (2011): Self-Efficacy Related to Student Nurses in the Clinical Setting: A Concept Analysis. *International Journal of Nursing Education Scholarship* **8**, 1-15.
- Twigg D, Duffield C, Bremner A, Rapley P & Finn J (2011): The impact of the nursing hours per patient day (NHPPD) staffing method on patient outcomes: a retrospective analysis of patient and staffing data. *Int J Nurs Stud* **48**, 540-548.
- Ullrich PM, Sahay A & Stetler CB (2014): Use of implementation theory: a focus on PARIHS. *Worldviews Evid Based Nurs* **11**, 26-34.
- Wallin L (2009): Knowledge translation and implementation research in nursing. *Int J Nurs Stud* **46**, 576-587.
- Wallin L, Bostrom AM & Gustavsson JP (2012): Capability Beliefs Regarding Evidence-Based Practice are Associated with Application of EBP and Research Use: Validation of a New Measure. *Worldviews Evid Based Nurs*.
- Wallin L, Estabrooks CA, Midodzi WK & Cummings GG (2006): Development and validation of a derived measure of research utilization by nurses. *Nurs Res* **55**, 149-160.
- van Achterberg T (2013): Nursing implementation science: 10 ways forward. *Int J Nurs Stud* **50**, 445-447.
- van Gaal BG, Schoonhoven L, Mintjes JA, Borm GF, Koopmans RT & van Achterberg T (2011): The SAFE or SORRY? programme. part II: effect on preventive care. *Int J Nurs Stud* **48**, 1049-1057.
- van Gaal BG, Schoonhoven L, Vloet LC, Mintjes JA, Borm GF, Koopmans RT & van Achterberg T (2010): The effect of the SAFE or SORRY? programme on patient safety knowledge of nurses in hospitals and nursing homes: a cluster randomised trial. *Int J Nurs Stud* **47**, 1117-1125.
- Vanderwee K, Clark M, Dealey C, Gunningberg L & Defloor T (2007): Pressure ulcer prevalence in Europe: a pilot study. *J Eval Clin Pract* **13**, 227-235.
- Vanderwee K, Defloor T, Beeckman D, Demarre L, Verhaeghe S, Van Durme T & Gobert M (2011): Assessing the adequacy of pressure ulcer prevention in hospitals: a nationwide prevalence survey. *BMJ Quality and Safety* **20**, 260-267.
- Waterlow J (1985): Pressure sores: a risk assessment card. *Nurs Times* **81**, 49-55.
- Wensing M, Bosch M & Grol R (2010): Developing and selecting interventions for translating knowledge to action. *Cmaj* **182**, E85-88.
- WHO (2004) Patient Safety. World Health Organization., <http://www.who.int/patientsafety/about/en/> (accessed September 26 2014).

WHO (2014) EVIPNet Country Knowledge Translation Platforms. World Health Organization, http://www.who.int/evidence/resources/country_reports/KTP/en/ (accessed September 29 2014).

Acta Universitatis Upsaliensis

*Digital Comprehensive Summaries of Uppsala Dissertations
from the Faculty of Medicine 1042*

Editor: The Dean of the Faculty of Medicine

A doctoral dissertation from the Faculty of Medicine, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine. (Prior to January, 2005, the series was published under the title "Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine".)



ACTA
UNIVERSITATIS
UPSALIENSIS
UPPSALA
2014

Distribution: publications.uu.se
urn:nbn:se:uu:diva-234028