

# **PREVENTION OF PRESSURE ULCERS**

## **Systematic literature review**

**Heidi Kavonen**

**Bachelor's thesis**  
**May 2009**

**School of Health and Social Studies**



**JYVÄSKYLÄN AMMATTIKORKEAKOULU**  
**JAMK UNIVERSITY OF APPLIED SCIENCES**

Tekijä(t) Kavonen Heidi	Julkaisun laji Opinnäytetyö	
	Sivumäärä 39	Julkaisun kieli Englanti
	Luottamuksellisuus <input type="checkbox"/> Salainen saakka	
Työn nimi  PREVENTION OF PRESSURE ULCERS Systematic literature review		
Koulutusohjelma Degree programme of nursing		
Työn ohjaaja(t) Irmeli Katainen & Jaana Perttunen		
Toimeksiantaja(t)		
Tiivistelmä <p>Painehaavojen hoitaminen vie paljon hoitohenkilökunnan aikaa ja on kallista sekä inhimillisten kärsimysten sekä voimavarojen käytön kannalta. Tämän tutkimuksen tarkoitus oli kerätä ja koota yhteen tutkittua tietoa painehaavojen ehkäisemisestä. Tutkimus tehtiin systemaattisena kirjallisuuskatsauksena. Tulosten avulla tietoa ja osaamista painehaavojen ehkäisemisestä voidaan lisätä ja päivittää. Tuloksia voi hyödyntää jokainen painehaavojen parissa työskentelevä.</p> <p>Systemaattinen kirjallisuuskatsaus on määrällinen tutkimus, johon on otettu mukaan 16 tutkimusta. Tutkimusten julkaisemisen aikajana oli 10 vuotta, jotta tulokset olisivat mahdollisimman ajanmukaisia. Aineistohaku suoritettiin keräämällä ensin tutkimusaineistoa elektronisesti Nelli-portaalin tietokannoista. Tämän jälkeen tehtiin manuaalinen haku. Aineistoa haettiin kolmella kielellä: suomeksi, ruotsiksi sekä englanniksi.</p> <p>Systemaattinen kirjallisuuskatsaus osoitti, että painehaavat voitaisiin estää seuraavin keinoin: käyttämällä riskiluokitusasteikkoa (Braden, Norton tai Waterlow) 24 tunnin sisällä potilaan vastaanottamisesta; liikuntakyvyttömän potilaan asennon vaihtaminen kahden tunnin välein (tai neljän tunnin välein mikäli hoitoon on yhdistetty tarkoituksenmukainen painetta jakava alusta, kuten ilmapatja); ihon tarpeettoman hankauksen vähentäminen; asianmukaisten alustojen, kuten patjojen, päällysteiden, lampaannahkojen, sänkyjen sekä muiden välineiden käyttö; yhteistyö koko sairaanhoitohenkilökunnan välillä (painehaavojen ehkäisy tulisi olla henkilökunnan yhteinen tavoite); potilaan ravitsemuksen huomioonottaminen; paineen poistaminen jo olemassa olevalta haavalta; ajan uudelleenjärjestäminen painehaavojen ehkäisevää työtä painottaen sekä nostamalla painehaavojen tärkeysjärjestystä. Esille tulivat myös uusimman teknologian hyödyntäminen, kuten painehaavoille alttiiden ihoalueiden paikallistaminen ultraäänen avulla, sekä ihon painekartoitus niin kutsutun painematon avulla.</p>		
Avainsanat (asiasanat) pressure ulcers, prevention, painehaava, ehkäiseminen		
Muut tiedot		

Date \_\_\_\_\_

Author(s) Kavonen Heidi	Type of Publication Bachelor's Thesis	
	Pages 39	Language English
	Confidential <input type="checkbox"/> Until	
Title PREVENTION OF PRESSURE ULCERS Systematic literature review		
Degree Programme Degree programme of nursing		
Tutor(s) Jaana Perttunen & Irmeli Katainen		
Assigned by		
<p>Abstract</p> <p>Treating a pressure ulcer takes lots of nursing personnel's time and is costly both in terms of human suffering and use of resources. The aim of this study was to collect and assemble research data about the prevention of pressure ulcers. The study was done as a systematic literature review. With the results, the knowledge and know-how of pressure ulcers' prevention can be increased and updated. The results can be utilised by everyone working with pressure ulcers.</p> <p>The systematic literature review is a quantitative study consisting of 16 studies. The timeline of publication of the studies was ten years (from 1999 till 2009) in order to receive as up-to-date results as possible. The material search was carried out by collecting research material electronically from then databases of the Nelli Portal. After that a manual search was performed. Material was collected in three languages: Finnish, Swedish and English.</p> <p>The systematic literature review showed that pressure ulcers could be prevented by following means: the usage of risk assessment scales (Braden, Norton or Waterlow) within 24 hours from patient's admission; repositioning an immobile patient every two hours (or four hours when treatment is combined with an appropriate pressure redistribution surface, for example an air mattress); avoidance of unnecessary friction of the skin; the usage of appropriate support surfaces, like mattresses, overlays, sheepskins, beds and other devices; co-operation between the whole nursing staff (prevention of pressure ulcers should be the staff's common goal); taking care of a patient's nutrition; offloading the pressure from the already existing pressure ulcer; re-organizing more time for preventive work and putting pressure ulcers into higher priority. Also taking the advantage of modern technology like discovering skin areas to pressure ulcers by ultrasound or the skin's pressure survey by a pressure map were introduced.</p>		
Keywords pressure ulcers, prevention, painehaava, ehkäiseminen		
Miscellaneous		

# CONTENTS

1 INTRODUCTION.....	3
2 PRESSURE ULCERS.....	4
2.1 What is a pressure ulcer.....	4
2.2 Pressure ulcer classification.....	5
2.3 The risk factors of a pressure ulcer and recovery.....	6
2.4 The costs of pressure ulcer treatment.....	7
2.5 Effects on the patient.....	8
3 PREVENTION OF PRESSURE ULCERS.....	9
3.1 What is prevention?.....	9
3.2 Pressure ulcer risk assessment scales.....	10
4 AIM AND PURPOSE OF THE STUDY.....	11
RESEARCH QUESTION.....	11
5 IMPLEMENTATION OF THE STUDY.....	12
5.1 Research material.....	12
5.2 Research method.....	16
5.3 Reliability and Validity.....	16
5.4 Data analysis.....	17
6 RESULTS.....	18
7 DISCUSSION.....	21
8 IMPLICATIONS FOR FUTURE RESEARCH.....	23
9 CONCLUSION.....	24
10 REFERENCES.....	26

## APPENDICES

Appendix 1: The Norton scale.....	29
Appendix 2: The Braden scale.....	30
Appendix 3: Finnish articles.....	31
Appendix 4: Foreign articles.....	33
Appendix 5: Bachelor's Thesis and Master's Thesis works.....	38

## FIGURES

Figure 1. The most common location of pressure ulcers.....	5
Figure 2. Results from Finnish databases.....	13
Figure 3. Results from international databases.....	14
Figure 4. Choosing the material electronically.....	15
Figure 5. Abstracts and full texts.....	18

# 1 INTRODUCTION

A pressure ulcer (pressure sore, decubitus ulcer, pressure injury) is a local damage on the skin or in subcutaneous tissue caused by pressure, friction or shear. The pressure ulcer develops when a part of the body is predisposed to continuous, external pressure so that the pressure causes lack of oxygen in the tissues below and leads to a local tissue necrosis (Hietanen, Iivanainen, Seppänen & Juutilainen 2002).

Pressure damage is common in many healthcare settings across Europe, affecting all age groups, and is costly both in terms of human suffering and use of resources. The European Pressure Ulcer Advisory Panel (1998) states that with an ageing population, and changes in patterns of sickness, the pressure ulcer problem will increase unless action is taken. The risk of pressure damage should therefore be highlighted in all care settings.

Treating a pressure ulcer takes a lot of nursing personnel's time and is expensive both to the society and to the patient. According to a survey made by Stakes, the Finnish National Institute for Health and Welfare, in 2000 pressure ulcers as main diagnosis caused altogether 20 000 working days at hospitals. In the same survey it was estimated that pressure ulcers caused approximately a 3 million euro bill to the society (Soppi 2006, 36-37). This estimate was, however, evaluated to be strongly under evaluated. The article also points out that living with a chronic wound is also demanding for the patient and for his/her relations.

The study aims to find out the methods used for pressure ulcer prevention. According to the guidelines of EPUAP (1998) pressure ulcers could be preventable by emphasizing the preventive approach in the treatment. Therefore, it is important to know what factors are causing pressure ulcers and how these factors could be decreased. The study was done as a systematic literature review including articles from Europe, Australia and The

United States. In order to get up-to-date results, the timeline of the studies was set to be ten years, between 1999 and 2009.

According to the Finnish wound care specialist Arvonen (2009), the responsibility of the treatment and prevention of pressure ulcers is mainly on nurses. Therefore, nurses' self-education and updating the recommended prevention methods regularly would be important. The results of this study will provide information for nurses, nursing students and health care providers. With the results, the nurses' knowledge and know-how of pressure ulcers' prevention can be updated and increased.

The study begins with information on pressure ulcers, the target group, risk factors and financial costs. Thereafter, the reasons and methods for pressure ulcer prevention and the aim and the purpose of the study are presented. Eventually, the results and conclusions of the study are presented and discussed.

The results of the study can be used by students during their nursing education. The Bachelor's thesis could be placed into the Optima system where it could serve the students and teachers of the school as learning and teaching material.

## 2 PRESSURE ULCERS

### 2.1 What is a pressure ulcer?

Pressure ulcer usually develops on bony parts of the body, like heels, hip, elbows, lumbar region and buttocks. According to European Pressure Ulcer Advisory Panel (1998) a pressure ulcer has developed, when there is redness on intact skin that doesn't disappear within 30 minutes after releasing the pressure. Muscle tissue can develop irreversible damages already after two hours, if the position is not changed (Hietanen, Iivanainen, Seppänen & Juutilainen 2002).

The prevalence of pressure ulcers development is highest among the older adult population. It has been estimated that 70 percent of pressure ulcers occur in patients older than 70 years of age. The figure below (FIGURE 1) shows the locations where a pressure ulcer is most likely to develop.

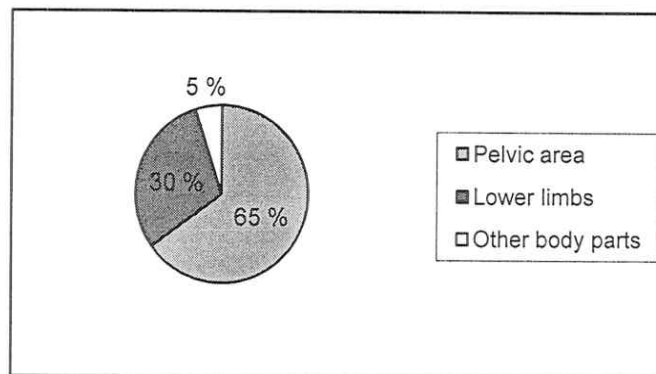


FIGURE 1. The most common location of pressure ulcers (Pressure ulcer management outline- management of pressure ulcers in older adults 2000)

## 2.2 Pressure ulcer classification

The European Pressure Ulcer advisory Panel (EPUAP) has developed a pressure ulcer classification system that classifies pressure ulcers into four different stages. The classification is created to ease the evaluation of the stage of the pressure ulcer and to choose the right treatment from the very beginning (Pressure ulcer prevention guidelines 1998)

The first stage of a pressure ulcer reaches to epidermis but not to other tissues. The first stage of the wound can be seen as redness of the skin that doesn't disappear after changing the position. In the early stages of a wound there can also appear changes of the skin colour, gleam, swelling and hardening of the skin (Hietanen et al.2002). According to Defloor, Schoonhoven, Fletcher, Furtado, Lubbers, Witherow, Heyman, Lyder, Lindholm, Gunningberg, Paquay, Verdu Soriano (2006) discolouration of the skin, warmth, oedema, induration or hardness may also be used as



indicators, particularly on individuals with darker skin. In this stage, the pressure should be removed from the area, the skin should be protected with padding and kept moist with moisturisers (Hietanen et al. 2002).

The second stage of the pressure ulcer is a partial-thickness skin loss involving epidermis, dermis or both. The ulcer is superficial and presents clinically as an abrasion or blister (Defloor et al. 2006). The progression of the ulcer should be prevented by removing the pressure and making an individual care plan for the wound. The wound secretion should be removed systematically with wound care instruments or by absorbing wound care material and dressings. An ideal growth environment should be created for the wound bed by keeping it moist and free from secretion (Hietanen et al. 2002).

The third stage of the pressure ulcer is a full-thickness skin loss that involves damage or necrosis of subcutaneous tissue. The pressure ulcer reaches the subcutaneous fat layer but does not puncture fascia, the membrane located under the skin and the muscles. Ulcer presents clinically as a deep crater with or without undermining of adjacent tissue (Defloor et al. 2006). In this stage, the subcutaneous fat layer may be necrotic and should be removed systematically (Hietanen et al. 2002).

The fourth stage of the pressure ulcer of a pressure ulcer is a wide tissue damage. The necrosis reaches to muscles, joints, bones or tendons. The wound often creates a cavity under the skin. The skin can, despite of the cavity, stay intact. According to Hietanen et al (2002), a wound in fourth stage cannot be healed without a repairing operation.

### 2.3 The risk factors of a pressure ulcer and recovery

Pressure ulcers are most common among elderly people, but can also occur among young people with constricted agitation possibilities, for example at hospital care. According to Hietanen et al (2002) immobilisation is the most

remarkable factor effecting on the development of a pressure ulcer. Immobilisation can derive from physical incompetence due to an illness or trauma or from a sense disorder at which point the pain caused by tissue ischemia doesn't awake the person to change the position. Hokkanen (2000) describes that patients most prone to pressure ulcers are quadriplegia patients, elderly patients with hip fractures and intensive care patients.

Understanding the healing process of a pressure ulcer requires knowledge of the skin's anatomy and physiology. Single factors of a patient like age, physical condition, functional ability, nutrition and psychological factors must be taken into consideration in pressure ulcer treatment (Hokkanen 2000). Also the recovery from pressure ulcers is individual and depends on the patient's general health condition, nutritional state, mobility, orientation, the size of the pressure ulcer, the current pressure of the wound and motivation (Holmia, Murtonen, Myllymäki & Valtonen 2006). In the article of Hokkanen (2000) the author emphasizes that all these factors have a combined effect on the healing process; if some factor is neglected, the treatment may be prolonged even though other factors would be in order.

## 2.4 The costs of pressure ulcer treatment

In the United States, approximately one million people are affected by pressure ulcers, with a cost of \$1,6 billion annually. Stage 1,2 and 3 pressure sores cost an estimated \$2,000 to \$30,000 per hospital stay, while a stage 4 pressure sore is estimated as high as \$70,000 (Moody, Gonzales & Cureton 2004).

There are no exact statistics about the expenses of pressure ulcers in Finland. Relander (1996) however is estimating that if a pressure ulcer has developed, its conservative treatment takes five to six weeks. According to another study by Häätinen & Juutilainen (2004), in 2000 approximately 200 patients were operated due to a pressure ulcer. A pressure ulcer that needs operational care takes an average 6 months to cure. The total cost of the

treatment of a deep pressure ulcer and the patient's rehabilitation is evaluated to be 20 000-40 000€, so already the treatment expenses of this group are 3-6 million euro (Soppi 2006).

## 2.5 Effects on the patient

In addition to the costs, pressure ulcers add the patients' mortality rate, agony and lower the quality of life (Soppi 2006). According to a study, estimated 2,5 million pressure ulcers are treated on a yearly basis; 900 000 patients develop a new pressure ulcer each year; and 60 000 patients die from complications due to hospital-acquired pressure ulcers each year (Pope 2008).

There have been only few studies about what kind of disadvantages pressure ulcers cause the patient. A study made by Hopkins, Dealey, Bale, Defloor & Worboys (2006) interviewed patients over 65 years with a stage 3 or 4 pressure ulcer. The patients found that the pressure ulcer caused pain, restricted their activities and had an impact on their families. In addition, for some, the restrictions delayed their rehabilitation.

According to the interview with Arvonen (2009), the wound care specialist in Jyväskylä area:

*"Pressure ulcers cause both economical covenant to the state and a major health risk to the patient. The patient's other illnesses, like unstable diabetes, may delay the healing process and can even lead to a limb amputation. I would say that pressure ulcers have clear negative effect on the patient's quality of life."*

The study of Hopkins, et al. (2006) states that although a larger study is required to obtain European perspective, it is still reasonable to conclude that the issues of pain and restrictions should be considered in the development of pressure ulcer treatment and prevention guidelines.

## 3 PREVENTION OF PRESSURE ULCERS

### 3.1 What is prevention?

Prevention is a remedy that prevents or slows down the course of an illness or disease. Prevention takes place at primary, secondary and tertiary prevention levels. Primary prevention avoids the development of a disease; most population-based health promotion activities are primary preventive measures. Secondary prevention activities are aimed at early disease detection, thereby increasing opportunities for interventions to prevent progression of the disease and emergence of symptoms. Tertiary prevention reduces the negative impact of an already established disease by restoring function and reducing disease-related complications (Gordon 1987).

The best treatment for pressure ulcers is preventing them. According to Hokkanen (2000) the responsibility of pressure ulcer prevention is primarily on nurses. Recognizing the patients at risk, preventive methods, documentation and guidance are in key position in pressure ulcer prevention; nonexistent pressure ulcers are an indicator of good care.

Prevention of pressure ulcers means the interventions that are done in order to prevent pressure ulcers from developing. There are several preventive interventions in nursing: patient's mobilisation as one of them. If the patient is immobile, bed-ridden or in a wheel chair, the nursing staff should take care of changing the patient's position regularly in order to prevent long-lasting pressure directed at tissues (Holmia et al. 2006).

Taking care of a patient's skin is also an important prevention method: incontinence, sweating and wound secretion should be taken care of on time and with appropriate methods. According to Holmia et al. (2006) also other factors like taking care of a patient's nutritional status, managing anaemia, and preventing patients from having too low body temperature are effective means in pressure ulcers prevention.

When a pressure ulcer has already developed, preventive interventions, like removing pressure from the damaged area, should be done in order to stop the ulcer from worsening, and prevent the patient to develop new pressure ulcers (EPUAP 1998).

### 3.2 Pressure ulcer risk assessment scales

The biggest concern in pressure ulcer prevention is to recognize the patients that are at risk of getting a pressure ulcer. Since 1960 different kinds indicators have been tried to develop in order to help finding the patients at risk of pressure ulcer. The most common risk assessment scales in use are Braden, Norton and Waterlow scales (Lepistö 2005). The Norton and Braden scales can be found in appendixes 1 and 2; from Waterlow no example was available.

One of the published and most commonly used pressure ulcer risk assessment instruments is the Braden scale (Created by Braden, B.J., Bergstrom, N., Laguzza, A. and Holman, V. in 1987). The Braden scale is a clinically validated tool that facilitates nurses and health care providers, scoring a patient's level of risk for developing pressure ulcers. Six specific risk factors are consistently identified: sensory perception, moisture, activity, mobility, nutrition and friction. These specific risk factors are rated from 1 to 4; with 1 representing the most severe and 4 representing no impairment. The lower the score the higher the risk for the development of pressure ulcers. A normal score for an adult without a risk is 23. In an increased pressure ulcer risk the score is 18 or below (Wurster 2007).

The Norton (created by Norton D., McLaren, R., Exton-Smith, AN. in 1962) scale consist of five factors: physical condition, mental state, functional ability, mobilisation and incontinence. From each factor the patient gets a score from 1-4 and the total score is 5-20. The risk limit for pressure ulcer is 14 points or less (Hietanen et al. 2002).

The Waterlow scale (created by Waterlow, J. in 2005) is modified from the Norton scale and it consists of eight factors: the structure of the patient, the description of the skin in risk area, age, sex, continence, mobilisation, appetite, medication and special factors. Points are received variably from 0-3 or from 0-5 depending on the sector. The more points the patients get in the scale, the more likely is the development of a pressure ulcer (Hietanen et al. 2002).

The pressure ulcer risk assessment scales enable nurses and staff to constantly and uniformly identify patients who are at risk, and to calculate the severity of risk (Wurster 2007). The usage of risk assessment scales does not solely prevent pressure ulcers from developing, but it increases the awareness of the pressure ulcer problem and enhances nurses to get involved with the treatment (Lepistö 2005). The National Pressure Ulcer Advisory Panel (2001) recommends that patients should be assessed on admission and throughout their hospital stay.

#### 4. AIM AND PURPOSE OF THE STUDY

This research study is done as a systematic literature review in order to find out the recommended prevention methods of pressure ulcers. The aim of the study is to collect existing knowledge about the prevention of pressure ulcers and assemble the received information together. The purpose is to make the information available for nurses, nursing students and everyone interested in wound care and by so increase and update the nurses knowledge on the prevention of pressure ulcers. The Bachelor's thesis could be placed into the Optima system where it could serve nursing students and teachers as learning and teaching material during the nursing education.

#### RESEARCH QUESTION

What are the latest methods for pressure ulcer prevention?

## 5 IMPLEMENTATION OF THE STUDY

### 5.1 Research material

In this systematic literature review can be found altogether 16 versatile, international studies that all handle the prevention of pressure ulcers. The material consists of studies, scientific articles, systematic literature views and Bachelor's thesis or Master's thesis works. The studies had been published in scientific magazines or in research institutes between the years 1999 and the beginning of 2009. 11 of the studies have been published in scientific magazines like American Family Physician, Australian Nursing Journal, Chatman, Duodecim, Journal of Tissue Viability, Nursing Economic\$, Nursing Homes, Nursing Management, Ostomy Wound Management, Ostomy & Continence Nursing and Sairaanhoitajalehti.

The research material was for start collected electronically and after that a manual search was performed. The electronic research material was gathered from the databases of the Nelli Portal during February and March 2009. Through the Nelli-portal databases like Aleksi, Arto Cinahl, Bentham, Cochrane Library, Ebrary (an electronical book collection), Linda and OVID were found. Also the service page Google was used in order to find comprehensive results. The manual search was performed by going through articles, studies and thesis works at the Jamk library and the regional library of Helsinki. In the figure 2 can be seen how was the material searched with Finnish key words.

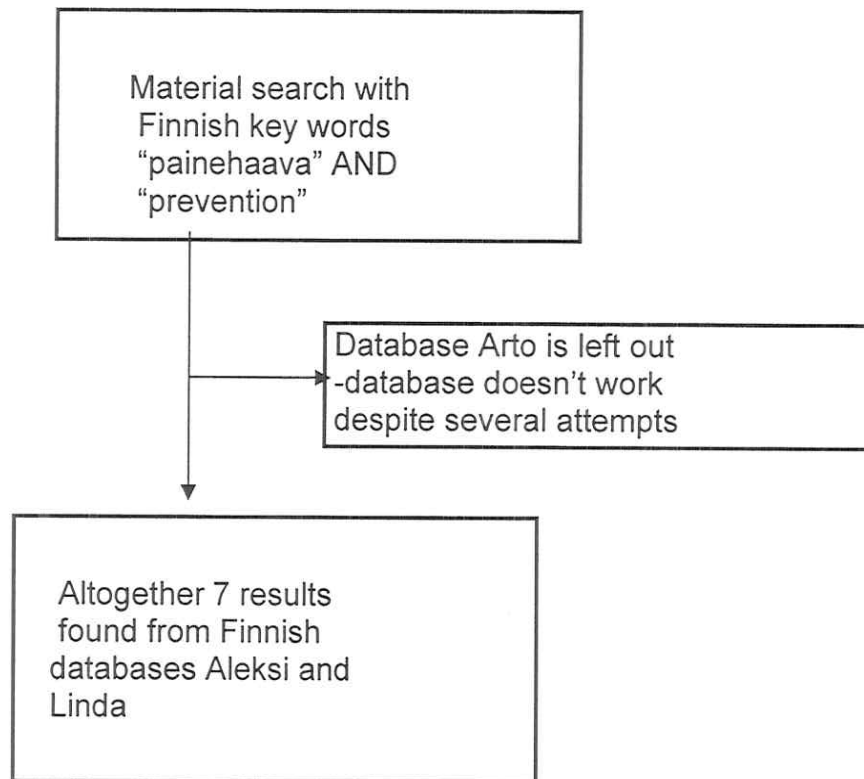


FIGURE 2. Results from Finnish databases

Material was collected in English, Finnish and Swedish. Studies and articles were searched from databases with the advanced search option using the AND operator and different words were combined. In English the following key words were used: pressure ulcer, prevention, preventive work, decubitus ulcer, bed sore, wound care, heels and sacrum. In Finnish the key words were: painehaava, ehkäisy, ehkäiseminen, ennaltaehkäiseminen, decubitus-haava, makuuhaava, kantapää and haavanhoito. In Swedish the following key words were used: trycksår, prevention, förebyggande, förhindrande, decubitus sår and liggesår. The figure 3 demonstrates the material search in Swedish and English.



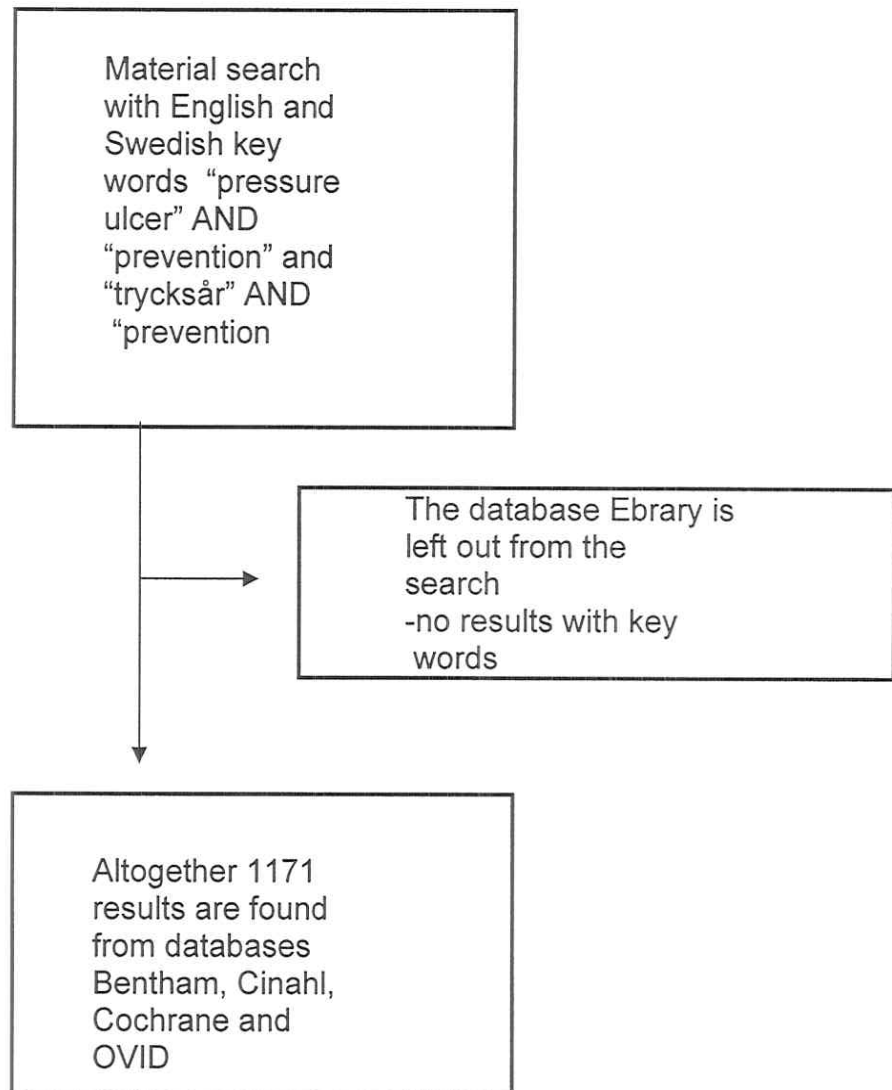


FIGURE 3. Results from international databases

The most effective key word combinations turned out to be pressure ulcer AND prevention, painehaava AND ehkäisy and trycksår AND prevention. Combinations like sacrum AND pressure ulcer or heels AND wound care produced hardly any relevant results in any of the databases. All researches and articles that were related to pressure ulcer prevention could be found with key words pressure ulcer AND prevention and painehaava AND ehkäisy and trycksår AND prevention. Therefore, in the end only these key words were used in the search. The publishing timeline was set to be from 1999 to 2009 in order to filter the amount of results. In the figure 4 can be seen how the electronically searched material was chosen to the study.

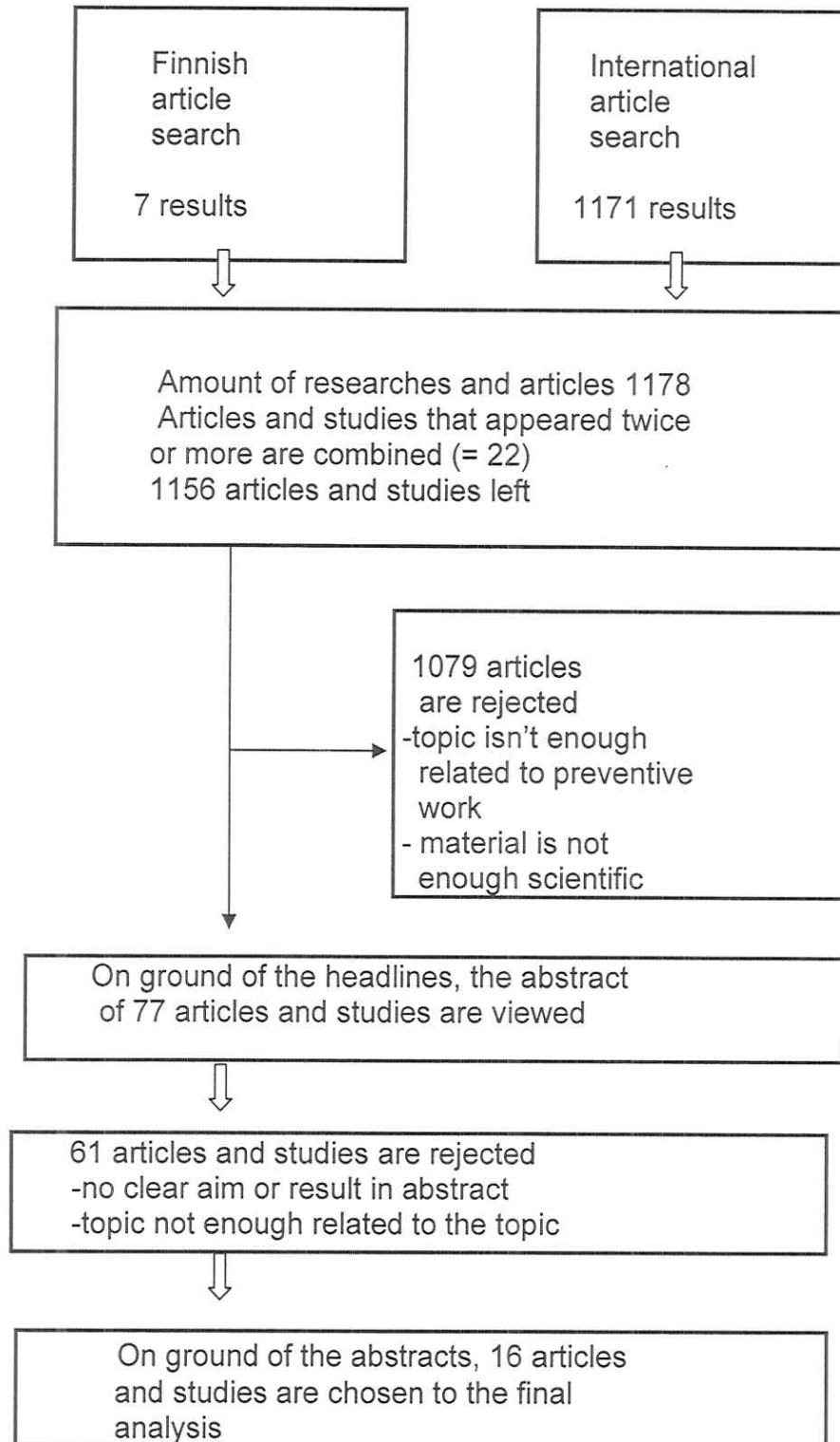


FIGURE 4. Choosing the material electronically

## 5.2 Research method

This research study was done as a systematic review of the literature related to the prevention of pressure ulcers. Systematic literature review is meant to be a scientific research method for identifying and collecting existing knowledge, appraising the quality of knowledge and synthesizing the result on a limited topic retrospectively and extensively (Kääriäinen & Lahtinen 2004). A systematic review helps the reader to perceive the whole ensemble of researches that already exist. By collecting together researches related to one topic, can be created an overview about how much research information exists and what are the content and technique of the researches (Johansson 2007). Also by a systematic review the chosen research question can be rationalized or specified and reliable generalizations on the topic can be made (Cook, Sackett & Spitzer 1995).

Scientific information has specific criterion. One of the fundamental criterion is the publicity of the information. Information is scientific only if it's public and available, evaluated and used by everyone (Leino-Kilpi 2007). A systematic review may either increase the need for primary research or prevent the start-up of unnecessary new studies. Thus, an up-to-date systematic review on a certain topic, may be of notable help for a student, teacher or anyone in need of information (Kääriäinen & Lahtinen 2004).

## 5.3 Reliability and Validity

The systematic literature review is a quantitative study. In a quantitative study the research maker evaluates the reliability during the whole research process (Eskola & Suoranta 1998, 211-212). The choosing process of the chosen material was described precisely by declaring the key words and search methods in a way that the research is possible to be repeated. In addition to this, the amount of accepted and rejected material, and the reasons of rejection was reported.

The validity of the study can be examined by reflecting if the chosen research material gives an answer to the research questions, how is material collected and if the research material is representative (Nieminen 1997, 215-216). In order to ease to evaluate the validity of the study, the researcher has made notes during the whole research process so that the information that has been analyzed has been able to verify during the research process if necessary.

A systematic literature review is a demanding and time consuming method. Therefore mistakes can have happened in all phases of the research process (Nieminen 1997, 215). The researcher's insignificant experience and the skills of searching the original studies may have had an effect on the validity of the research. Using two or more researches for evaluating the quality of the original studies and in the articles' search process would increase the reliability of the study (Kääriäinen & Lahtinen 2004). In this study the evaluation is, however, based on only one researcher's consideration.

With the systematic literature review the researcher has collected and outlined already existing research data about the prevention of pressure ulcers. The researcher has familiarized herself carefully with the chosen material so that it would be possible to know the contents of them well enough in order to make an analysis of the results (Burns & Grove 2001, 108, 619). The results can be considered directional. This research study provides information on how the prevention of pressure ulcers has been studied and what kind prevention methods are being used.

## 5.4 Data analysis

The English key words "pressure ulcer" together with "prevention" brought a really large amount of results (1178), while the Finnish key words "painehaava" together with "ehkäiseminen" brought only 7. One of the

Finnish articles was searched and found manually (Wiskman 2006), all the others were found from electronic databases.

There would have been more Finnish articles about prevention of pressure ulcers, but to my annoyance they didn't exist in databases and the manual search showed that the nursing magazines where the articles and studies were publishes, were no longer in the library's selection.

The articles and studies were chosen to be read and considered to the research study if the name referred clearly to pressure ulcers and prevention. Articles that handled pressure ulcers but not the prevention of them were rejected. Also some articles or studies with promising names needed to be rejected because the aim and results of the study were not clearly told or the abstract of the study was unclear. The figure 5 shows the amount of articles that could be found with abstract and with both abstract and full text.

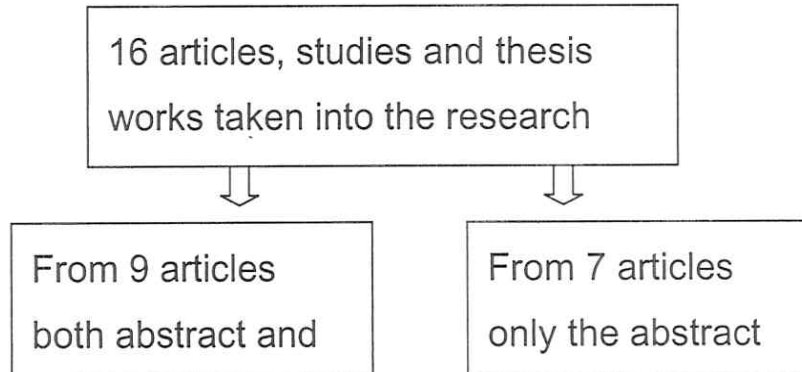


FIGURE 5. Abstracts and full texts available

## 6 RESULTS

The subjects of the articles were variable; they reached from pressure surveys to studies about nurse leaders effect on reducing pressure ulcers.

All the studies that are referred in the result section can be found in the appendices.

The articles offered several interventions for pressure ulcer prevention. The *Braden scale* was utilised in many articles (Wilskman 2006, Garza, Okere, Igbinoba, Novosad & Pexton 2006, Pressure ulcers –Prevention of pressure related damage 2008) and it was found to be a very effective method in all these articles. The articles described how the use of the Braden scale was introduced to the nursing staff and they were been motivated to make a Braden evaluation for all the patients in risk within 24 hours after entering the ward. After a while the results were analysed and it showed that a reduction of pressure ulcers had occurred. Reduction of pressure ulcers also brought remarkable economic savings to the hospitals (Garza et al. 2006).

In addition to the Braden scale, other pressure ulcer evaluation scales like the *Norton and Waterlow scales* were also mentioned. Both the Norton and Waterlow scales were mentioned in one article (Pressure ulcers –Prevention of pressure related damage 2008). Norton was found to be a good scale for pressure ulcer prevention, just like the Braden scale, but Waterlow was not found to be precise enough. However, the study by Garza et al. (2006) emphasized that using any preventive scale is more effective than trusting to nurses own adjustments.

The results of using *support surfaces* were alternating. The study by McInnes, Bell-Syer, Dumville, Legood & Cullum (2008) stated that with people at high risk of pressure ulcer development should be used *higher specification foam mattresses* rather than standard hospital foam mattresses should be used. The study also recommended that the use of some forms of pressure relief for high risk patients in the operating theatre should be used. In the systematic review (Pressure ulcers –Prevention of pressure related damage 2008) the articles gave lots of adversarial information on the advantages and disadvantages of support surfaces, and no consistent results were received. However, the Finnish thesis work (Nousiainen 2008) praised *woollen support surfaces* in the prevention of pressure ulcers. According to the research, woollen products whether improved the healing

process of pressure ulcers or even made them heal completely. Also according to the study of McInnes et al. (2008) medical grade sheepskins are associated with a decrease in pressure ulcer development.

Two completely new prevention methods came up. The study of *pressure survey* (Kärki, Lehto & Lekkala 2006) introduced a method that, according to the article, can be very useful in the development of preventive devices, like air mattresses. Another less-known intervention was using *ultrasound* for detecting pressure ulcers (Stopping pressure ulcers –before they start 2004). According to the article the ultrasounds detect developing pressure ulcers in their very first stages, when they cannot yet be noticed by sight or touched.

*Repositioning* as a prevention method was discussed in one article. According to the systematic literature view by Gray (2008) it is as effective to reposition the patient every 4 hours as every 2 hours as long as the pressure redistribution surface is appropriate.

According to Gunninberg (2004) the prevalence of pressure ulcers is higher than expected. The study states that more attention should be focused on *risk-assessment skills* and the use of appropriate *preventive strategies* based on the level of risk. According to the systematic literature view by Fowler, Scott-Williams & McGuire (2008) the easiest and best preventive method is found to be *pressure relief*.

Nurses and nurse leaders were the topic of three studies. Wuster (2007) emphasised the task of a nurse leader in the preventive work; *co-operation* between chief nursing officers, the unit manager and the bed-side nurse is necessary in order to prevent pressure ulcers. The two Swedish thesis works had studied the nurses' database about pressure ulcers and their attitudes against them. According to the study of Engdal & Kvist (2008) the nurses' knowledge about pressure ulcers is sufficient but the knowledge isn't always been applied to practice. The article states that pressure ulcers should have a *higher priority* in nurses' work. Also the lack of time and badly organized routines take their toll on the preventive work (Andersson 2007).

## 7 DISCUSSION

The articles and studies in this systematic literature review handled the prevention of pressure ulcers with variable means and objectives. Writing this Bachelor's thesis has been an interesting process and it has given the researcher plenty of new advice in the prevention of pressure ulcers.

Before an electronic and manual material search performed it was known that pressure ulcer prevention methods are following: patient's mobilisation, taking care of skin condition and nutritional status, managing anaemia and the prevention of low body temperature, and relieving the pressure on tissues that have an already existing pressure ulcer (Holmia et al. 2006).

The new data reveals that there are several more methods for preventing pressure ulcers, for example: the usage of risk assessment scales (Braden, Norton or Waterlow); repositioning an immobile patient every two or four hours; avoidance of unnecessary friction of the skin; the usage of appropriate support surfaces; co-operation between the whole nursing staff; taking care of a patient's nutrition; offloading the pressure from the already existing pressure ulcer; re-organizing more time for preventive work and putting pressure ulcers into higher priority. Also taking the advantage of modern technology like discovering skin areas to pressure ulcers by ultrasound or the skin's pressure survey by a pressure map were introduced.

None of the studies mentioned the management of anaemia or prevention of low body temperature as suggested in Holmia's (2006) study. However, all the wanted articles and studies were not available, and therefore some of the prevention recommendations were undiscovered.

Nine studies out of 16 were done whether in the United States, Great Britain or Australia. Four studies were made in Sweden and three in Finland. Two of the prevention methods, the pressure survey by Kärki et al. (2006) and the ultrasound technology (Stopping pressure ulcers -Before they start 2004)



would need special technology in order to prevent pressure ulcers, and therefore they may be a challenging and less commonly used prevention method. The other preventive methods were, however, more practical and easier to use in everyday nursing. The results of the systematic literature review are versatile, but rather simple to adapt. Almost all of the prevention methods are easy to be carried out in hospitals, home nursing or in other health care facilities.

Searching of the material first appeared to an impossible task: the first search in Finnish provided seven results, and from this amount only two studies were available. Thereafter a search in English and Swedish was performed, and that brought all of 1178 results. Going through all the results, even only the topics, was tiring and plenty of concentration was needed to find out what studies actually were related to both pressure ulcers and prevention. After choosing the material by the topics and reading the abstracts, a demanding phase was also to evaluate the quality and reliability of the material. As a beginner researcher this was naturally a difficult phase as well.

By knowing the profession of the authors could have helped to evaluate the reliability of the material. In most of the studies, however, the authors' profession wasn't mentioned and it also couldn't be found with a separate search on the Internet either, so the researcher was obliged to evaluate the reliability of the studies with a slight criticism and an approximate analysis. All the studies that were taken to the thesis gave, however, a reliable impact: according to the language that was used in the studies the researcher drew a conclusion that the authors most likely were wound care professionals, health care researches or doctors.

To the researcher the results were satisfying. It was delightful to notice, how many different methods there are for pressure ulcer prevention and thus how easily pressure ulcers could be prevented if only more attention was paid to them. The researcher finds that the goals of the study are met, and that the study is succeeded. The researcher found the research process an interesting possibility to increase one's knowledge and to educate others. It

is desirable that the information that has been received from this study could be utilized by as many nurses as possible. In fact, now the role changes from the researcher to the reader: how well are the new prevention methods affiliated by nurses and applied to practice?

## 8 IMPLICATIONS FOR FUTURE RESEARCH

The theory part of this study stated that the existence of a pressure ulcer is demanding both on patient's and on nursing personnel's perspective. By reading through the studies that were chosen in to this literature review, this image was reinforced even more: approximately half of the studies emphasized the expensiveness of pressure ulcer treatment and lifted up the high costs as one the biggest reasons why pressure ulcers should be prevented. However, only few studies mentioned the disadvantages and agony caused for patients due to pressure ulcers. This would be an interesting and important topic for a further study: how does living with a pressure ulcer change patient's life; does it have an effect on the patient's quality of life?

Other topics for further studies would be a study about the nurses' knowledge of pressure ulcer prevention methods in Finnish hospitals. This topic was discussed in one of the Swedish studies (Engdahl et al. 2007) and according the study the nurses' knowledge of preventive methods was sufficient, but the knowledge wasn't always applied to practice. Would be interesting to read a study about what is the pressure ulcer prevention knowledge of Finnish nurses and is the possible know-how used in everyday nursing.

## 9 CONCLUSION

According to the results of the systematic literature review, the pressure ulcers could be prevented by everyday means at hospitals, in home nursing and in other nursing facilities if only the priority of preventive work was higher and the nursing staff actually used and apply to practice the knowledge that they have about prevention of pressure ulcers. Nurses seem to have a key role in the preventive work. (Engdahl 2007, Andersson 2007).

The research question of the study was: what are the latest methods for pressure ulcer prevention? The results were versatile and useful. The nine following methods can be kept as the most important means for prevention of pressure ulcers:

1. The usage of risk assessment scale within 24 hours from admission. Braden was the most used and praised, but also Norton and Waterlow were reported to be better than trusting a nurse's own evaluation (Wilskman 2006, Senaida et al. 2006, Pressure ulcers –prevention of pressure related damage 2008).
2. Taking care of the repositioning of an immobile patient. According to two studies patients should be turned at least every two hours (Whittington 1999, Hoffmann 2002), but according to a third study turning the patient every four hours is adequate when the treatment is combined an appropriate pressure redistribution surface (Gray 2008). Wheelchair patients should be repositioned hourly or more often (Hoffmann 2002).
3. Unnecessary friction of skin should be avoided: for example elevation of the patient's head should not be more than 30 degrees. Mealtimes make an exception (Whittington 1999).
4. The usage of appropriate support surfaces, like mattresses, overlays, sheepskins, beds and other devices. There are an enormous selection of support surfaces available, so nurses should receive education about what

product actually are useful in prevention and what not. A person in charge could be selected for educating others and keeping up with the latest recommendations (Hoffmann 2002).

5. Co-operation between chief nursing officer, the unit manager, the physiotherapists, diatitian and the bed-side nurse is essential in prevention of pressure ulcers. The leader nurse has a strong role in motivating the staff for preventive work (Wuster 2007, Whittington 1999).
6. Taking care that the patients that are having a pressure ulcer or are at risk, receive adequate and good quality nutrition. Poor nutrition is linked with pressure ulcer incidence (Pressure ulcers –prevention of pressure related damage 2008).
7. The first aid for recently discovered pressure ulcer is pressure relief (Fowler 2008).
8. The lack of time or daily routines should not be the hindrance for preventive work. Badly organized routines should be re-organized in a way that enough time would be left for the prevention and treatment of pressure ulcers (Andersson 2007).
9. The prevalence of pressure ulcers is often higher than thought. The pressure ulcer can already exist underneath the skin, although it cannot be detected by sight or touch. Taking the advantage of the modern technology, like ultrasound and pressure survey, is highly recommendable –in case it is possible (Stopping pressure ulcers -before they start 2004, Kärki et al. 2006).

## 10 REFERENCES

Andersson, A. 2007. Prevention- ett sätt att förhindra uppkomsten av trycksår. Bachelor's Thesis. Högskolan i Halmstad/Sektionen för Hälsa och Samhälle.

Arvonen, S. 2009. Guidelines for pressure ulcer prevention. An e-mail interview 20.4.2009. Receiver Heidi Kavonen.

Brandeis, G., Berlowitz, D. & Katz, P. 2000. Are pressure ulcers preventable? A survey of experts. *Advanced skin and wound care* 14/2001, 244-248.

Burns, N., Grove, S.K. 2001. *The practice of nursing research. Conduct, critique & utilization.* 4<sup>th</sup> edition. USA: W.B. Saunders Company.

Cook, DJ., Sackett, DL. & Spitzer, WO. 1995. Methodologic guidelines for systematic reviews of randomized control trials in health care from the Potsdam consultation on meta-analysis. *Journal of Clinical Epidemiology* 48, 167-171.

Defloor, T., Schoonhoven, L., Fletcher, J., Furtado, K., Lubbers, M., Witherow, A., Heyman, H., Lyder, C., Lindholm, C., Gunningberg, L., Paquay, L., Verdu Soriano, J. 2006: Pressure Ulcer Classification. Referred 22.4.2009. <http://www.puclas.ugent.be/puclas/e/>.

Engdahl, H., Kvist, C. 2007. Sjuksköterskans preventiva arbete mot uppkomsten av trycksår på sjukhus -en litteraturstudie. Bachelor's thesis. Högskolan Kristianstad/Institutionen för hälsovetenskaper.

Eskola, J., Suoranta, J., 1998. *Johdatus laadulliseen tutkimukseen.* Tampere: Vastapaino.

Fowler, E., Scott-Williams, S., McGuire, JB., 2008. Practice recommendations for preventing heel pressure ulcers. *Ostomy Wound Management*, 2008 54, 42-8, 50-2, 54-7.

Garza, S., Okere, V., Igbinoba, J., Novosad, K., Pexton, C. 2006. *Reducing Hospital-Acquired Pressure Ulcers.* Lionheart Publishing.

Referred 17.2.2009.  
[http://www.ncbi.nlm.nih.gov.ezproxy.jamk.fi:2048/pubmed/19155823?ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed\\_ResultsPanel.Pubmed\\_DefaultReportPanel.Pubmed\\_RVDocSum](http://www.ncbi.nlm.nih.gov.ezproxy.jamk.fi:2048/pubmed/19155823?ordinalpos=5&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum)

Gordon, R. 1987. *An operational classification of disease prevention. Preventing Mental Disorders,* Rockville, MD: U.S. Department of Health and Human Services.

- Gunninberg, L. 2000. Prevention of pressure ulcers in patients with hip fractures: Definition, measurement and improvement of the quality of care. Master's Thesis. Uppsala University, Department of Public Health and Caring Sciences.
- Gunningberg, L. 2004. Risk, prevalence and prevention of pressure ulcers in three Swedish health care settings. *Wound Care* 13,2, 86-90.
- Gray, M. 2008. Does regular repositioning prevent pressure ulcers? *Journal of Wound, ostomy & Continence Nursing*, 2008 35, 571-7.
- Hietanen, H., Iivanainen, A., Seppänen, S., Juutilainen, V. 2002. *Haava*. Helsinki: WSOY.
- Hoffmann, N. 2002. Preventing pressure ulcers. *Chatham* 19, 9, 11-12.
- Hokkanen, H. 2000. Painehaavat, ennaltaehkäisy, ennaltaehkäisyn kehittämisen periaatteet. Pro-gradu research. Turku university, Department of Nursing Science
- Holmia, S., Murtonen, I., Myllymäki, H., Valtonen, K. 2006. *Sisätautien, kirurgisten sairauksien ja syöpätautien hoitotyö*. Helsinki: WSOY.
- Hopkins, A, Dealey, C, Bale, S, Defloor, T, Worboys, F 2006. Patient stories of living with a pressure ulcer. *Journal of Advanced Nursing*, 56, 1–9.
- Hätinen, P. & Juutilainen, V., 2004. Painehaava –vakavasti otettava asia. *Selkäydinvamma* 1, 5-7.
- Johansson, K 2007. Kirjallisuuskatsaukset - Huomio systemaattiseen kirjallisuuskatsaukseen. Systemaattinen kirjallisuuskatsaus ja sen tekeminen. Turku university, Department of Nursing Science. A:51/2007.
- Kärki, S., Lehto, M., Leikkala, J. 2006. Painekartoitus painehaavojen ehkäisyn apuna. *Duodecim* 122, 67, 1-6.
- Kääriäinen, M, Lahtinen, M. 2004. Systemaattinen kirjallisuuskatsaus tutkimustiedon jäsentäjänä. *Hoitotiede* 18, no 1/06.
- Leino-Kilpi, H 2007. Kirjallisuuskatsaus -Tärkeää tiedon siirtoa. Turku university, Department of Nursing Science. A:51/2007.
- Lepistö, M. 2004. Painehaavariskin arvioiminen pitkäaikaissairaanhoidossa. Instrumentin kehittäminen. Doctoral Thesis. Turku university.
- McInnes, E., Bell-Syer, SEM., Dumville, JC., Legood, R., Cullum, NA. 2008. Support surfaces for pressure ulcer prevention. *Cochrane Database of Systematic Reviews*, issue 4.: CD001735.
- Moody, P., Gonzales, L., & Cureton, V.Y. 2004. The effect of body position and mattress type on interface pressure in quadriplegic adults: A pilot study. *Dermatology nursing* 16, 507-512.

National Pressure Ulcer Advisory Panel (NPUAP) 2001. Pressure ulcers in America: Prevalance, incidence, and implications for the future. Referred 21.4.2009. <http://www.ncbi.nlm.nih.gov/pubmed>

Nieminen, H. 1997. Kvalitatiivisen tutkimuksen luotettavuus. Published in release "Vehviläinen-Julkunen K., Paunonen M.: Hoitotieteen tutkimusmetodiikka. Juva: WSOY.

Nousiainen, A-L. 2000. Ikääntyneiden ulkoisten painehaavariskien ehkäisy villahoitotarvikkeella. Bachelor's thesis. Rovaniemi University of Applied Sciences

Pope, C. 2008. The act of pressure ulcer prevention. *Materials Management in Health Care* 17.

European Pressure Ulcer Advisory Panel (EPUAP) 1998. Pressure Ulcer Prevention Guidelines. Referred 22.4.2009. <http://epuap.org/glprevention.html>.

Pressure ulcers –prevention of pressure related damage 2008. *Australian Nursing Journal* 15, 27-29.

Pressure Ulcer Management Outline –Management of Pressure Ulcers in Older adults 2000. Referred 22.4.2009. [www.npuap.org](http://www.npuap.org).

Pressure Ulcer Prevention Guidelines 1998. Created by European Pressure Ulcer Advisory Panel (EPUAP). Referred 22.4.2009. <http://epuap.org/glprevention.html>.

Relander, M. 1996. Painehaavan konservatiivinen ja kirurginen hoito. *Duodecim* 112, 1492-1496.

Soppi, E. 2006. Painehaavojen ennaltaehkäisy on taloudellisin vaihtoehto. *Haava* 1, 36-37.

Stopping pressure ulcers -Before they start. 2004. *Nursing Homes* 53, 5, 30-38.

Whittington, K., Moore, R., Wilson, W., Patrick, M. 1999. Managing pressure ulcers: A multisite CQI challenge. *Nursing Management* 10, 27-30.

Wilskman, K. 2006. Painehaavat hallintaan. *Sairaanhoitaja-lehti* 3, 5-7.

Wuster, J., 2007. What role can nurse leaders play in reducing the incidence of pressure sores? *ECONOMIC\$* 25, 5, 267-269.





## Appendix 2: The Braden scale

Patient's Name _____		Evaluator's Name _____		Date of Assessment			
				/	/	/	/
<b>Sensory perception</b> Ability to respond meaningfully to pressure-related discomfort	<b>1. Completely limited:</b> Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, OR limited ability to feel pain over most of body surface.	<b>2. Very limited:</b> Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body.	<b>3. Slightly limited:</b> Responds to verbal commands but cannot always communicate discomfort or need to be turned, OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	<b>4. No impairment:</b> Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.			
<b>Moisture</b> Degree to which skin is exposed to moisture	<b>1. Constantly moist:</b> Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	<b>2. Moist:</b> Skin is often but not always moist. Linen must be changed at least once a shift.	<b>3. Occasionally moist:</b> Skin is occasionally moist, requiring an extra linen change approximately once a day.	<b>4. Rarely moist:</b> Skin is usually dry; linen requires changing only at routine intervals.			
<b>Activity</b> Degree of physical activity	<b>1. Bedfast:</b> Confined to bed.	<b>2. Chairfast:</b> Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheel chair.	<b>3. Walks occasionally:</b> Walks occasionally during day but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	<b>4. Walks frequently:</b> Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.			
<b>Mobility</b> Ability to change and control body position	<b>1. Completely immobile:</b> Does not make even slight changes in body or extremity position without assistance.	<b>2. Very limited:</b> Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	<b>3. Slightly limited:</b> Makes frequent though slight changes in body or extremity position independently.	<b>4. No limitations:</b> Makes major and frequent changes in position without assistance.			
<b>Nutrition</b> Usual food intake pattern	<b>1. Very poor:</b> Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	<b>2. Probably inadequate:</b> Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than optimum amount of liquid diet or tube feeding.	<b>3. Adequate:</b> Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	<b>4. Excellent:</b> Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.			
<b>Friction and shear</b>	<b>1. Problem:</b> Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	<b>2. Potential problem:</b> Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	<b>3. No apparent problem:</b> Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.				
<b>Total Score:</b>							

## Appendix 3: Finnish articles

Author	Purpose	Research material and Target Group	Preventive Method	Outcome
<p>1. Kärki S., Lehto M., Lekala J. 2006.  Painekartoitus painehaavojen ehkäisyyn apuna.  Duodecim 122, 67, 1-6  Language: Finnish  Abstract: Finnish</p>	<p>To present a method called "pressure survey" in the prevention of pressure ulcers. With a pressure survey can be defined the patient's zones of the body where the pressure is directed the most in different situations.</p>	<p>Research material and target group didn't become evident.</p>	<p>Making a pressure survey to a patient can prevent the development of a pressure ulcer. In a pressure survey the pressure distribution of the body is presented by illustrative picture, a "pressure map" where the pressure peaks can be seen clearly. The pressure map shows the risk areas where a pressure ulcers is most likely to develop.</p>	<p>With a pressure survey the development of mattresses can be promoted. The risk of development of pressure ulcers and the expenses of care may be reduced. If the methods of pressure survey develop even more, the results can be used in clinical decision-making.</p>

<p>2. Wilskman, K. 2006. Painehaavat hallintaan. Sairaanhoidaja-lehti 3, 5-7.</p> <p>Language: Finnish</p> <p>Abstract: Finnish</p>	<p>The surgical ward of Hyvinkää hospital started using the Braden scale for predicting pressure sore risk. The aim was to stop the ulcers into 1st stage.</p>	<p>The nurses were introduced to the Braden assessment scale and were encouraged to use them. The long project was been able to sustain by naming project leaders who took care of the staff's education</p>	<p>The startup of using the Braden was the key to the prevention of pressure ulcers. The Braden evaluation is done to the patients in risk of pressure ulcers right after coming to a ward, and if the situation is being followed constantly. The staff does its best to minimize the risk and to immediately start the healing process of already existing pressure ulcer.</p>	<p>Using the Braden scale eased to point out patients with a clear risk for pressure ulcers. Choosing the right mattress and paying attention on the position are helping in risky situations; also the patients' skin is been controlled during every shift.</p> <p>The nurses have learned to co-operate better with nutritional therapeutics and hospital assistants in order to prevent pressure ulcers.</p>
---	--	--	--	--

## Appendix 4: Foreign articles

Author	Purpose	Research material and Target Group	Preventive Method	Outcome
<p>3. Whittington, K., Moore, R., Wilson, W., Patrick, M. 1999. Managing pressure ulcers: A multisite CQI challenge. <i>Nursing Management</i> 10, 30, 27-30.</p> <p>Language: English Abstract: English</p>	<p>Using CQI (Continuous quality improvement) for prevention of pressure ulcers.</p>	<p>A nursing committee of six leader nurses was formed to develop guidelines for pressure ulcer prevention. As a material the nurses used literature related to pressure ulcers and reflected the knowledge to their own experiences.</p>	<p>Using the instructions of continuous quality improvement can be helpful in the prevention of pressure ulcers.</p>	<p>Patients should be turned at least every 2 hours while in bed, and when up in chair, reposition hourly. Elevation of head should not be more than 30 degrees (except at mealtimes). In dietary problems, a dietitian should be consulted.</p>
<p>4. Hoffmann, N. 2002. Preventing pressure ulcers. <i>Chatman</i> 19, 9, 11-12.</p> <p>Language: English Abstract: English</p>	<p>To review the different preventive methods for pressure ulcers and compare them by reflecting the author's own experiences.</p>	<p>Research material and target group didn't become evident.</p>	<p>Using the pressure ulcer prevention recommendations can help to prevent pressure ulcers.</p>	<p>Repositioning after two hours is recommended for patients in bed. Wheelschair-bound patients may be repositioned hourly or more often. An ample of support surfaces and adequate staff education on the use of the different types of mattresses, overlays, beds, and other devices are key to pressure ulcer prevention.</p>

<p>5. Stopping pressure ulcers - Before they start. 2004.</p> <p>Nursing Homes 53, 5, 30-38.</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To introduce ultrasound technology in the prevention of pressure ulcers.</p>	<p>The ultrasound scanner has been in use in several facilities in the United States. The research material has been from these facilities on five years time.</p>	<p>The ultrasound scanner is able to detect developing pressure ulcers before they can be detected by sight or touch.</p>	<p>High-frequency ultrasound enables clinicians to view high-resolution images of the underlying few centimeters of the skin's soft tissue and to enable to detect changes beneath the skin surface that indicate that a pressure ulcer is developing. A 40-50% reduction in the incidence of pressure ulcers was met.</p>
<p>6. Gunninberg L. 2004. Risk, prevalence and prevention of pressure ulcers in three Swedish health care settings. Wound care 13,2, 86-90.</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To delineate risk, prevalence and prevention of pressure ulcers in a university hospital, a general hospital and a nursing home in Sweden.</p>	<p>A one-day survey followed the methodology developed by the European Pressure Ulcer Advisory Panel (EPUAP). A total of 695 patients were included: 612 from the university hospital, 38 from the general hospital and 45 from the nursing home. Each patient was visited by two registered nurses, their skin was inspected and any pressure ulcer classified according to the EPUAP grading system.</p>	<p>To find out the prevalence of pressure ulcers and to use appropriate preventive strategies.</p>	<p>Attention must focus on the appropriate risk-assessment skills and the use of appropriate preventive strategies, based on the level of risk.</p>
<p>7. Garza, S., Okere, V., Igbinoaba, J., Novosad, K., Pexton, C. 2006. Reducing Hospital-Acquired Pressure Ulcers. Lionheart Publishing.</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To reduce the amount of hospital-acquired pressure ulcers with a Six Sigma project and using the Braden scale.</p>	<p>The research was done in three different hospitals. The nurses were given instructions to use the Six Sigma project when taking care of a patient. The six Sigma project is built around five structured phases: Define, Measure, Analyze, Improve, and Control.</p>	<p>The reduce the incidence of pressure ulcers by using the Six Sigma project. To observe, if the decrease of pressure ulcers brings economical savings to the hospitals.</p>	<p>Using the Braden scale reduced the amount of pressure ulcers up to 50 per cent and brought economical savings to all of the three hospital that participated the project.</p>

<p>8. Wuster, J. 2007. What role can nurse leaders play in reducing the incidence of pressure sores? ECONOMIC\$, 25, 5, 267-269.</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To find out the role of a nurse leader in reducing pressure ulcers at wards. Pressure ulcers are increasingly common in hospitalised patients in the United with a 63% increase from 1993 to 2003.</p>	<p>The researcher has browsed through several american about the topic and is discussing about the issue in the light of her own experience.</p>	<p>A determined and professional nurse leader can have a magnificent role in motivating the staff for pressure ulcer prevention.</p>	<p>Collaboration between chief nursing officer, the unit manager and the bedside nurse is needed in order to prevent tissue injuries.</p> <p>The nurse leader must take a systematic approach in the prevention of pressure sores, with the strategy being consistent and motivating to the staff (in order to improve patient outcome).</p>
<p>9. Pressure ulcers – prevention of pressure related damage. 2008.</p> <p>Australian Nursing Journal 15, 27-29.</p> <p>Language: English</p> <p>Abstract: English'</p>	<p>To provide health care professionals with recommendations on how best to prevent pressure ulcers. The study compares different interventions for preventive pressure ulcer: risk assessment scales (Braden, Norton and Waterlow), support surfaces and nutritional changes.</p>	<p>A systematic review that looks at the effectiveness of risk assessment scales. Includes 30 studies on scale validation and three related to clinical effectiveness.</p>	<p>The amount of pressure ulcers can be reduced by using an appropriate risk assessment scales and by ensuring healthy nutrition to the patient.</p>	<p>Both Braden and Norton Scales were found to be better at risk prediction than the clinical judgement of nurses alone. Poor nutrition is linked with pressure ulcer incidence and severity. Pressure ulcers are in many cases preventable: a targeted preventive approach will be less costly than one that is focused on treating already established ulcers.</p> <p>The Waterlow scale has good risk prediction capacity and high sensitivity, but its specificity is low. The results of support surfaces were miscellaneous.</p>

<p>10. Fowler, E., Scott-Williams, S., McGuire, JB. 2008. Practice recommendations for preventing heel pressure ulcers. <i>Ostomy Wound Management</i>, 54, 42-8, 50-2, 54-7.</p> <p>Language: English Abstract: English</p>	<p>To view controlled clinical studies in order assess effectiveness and cost-effectiveness of available interventions.</p>	<p>A literature review, the amount of material is not reported.</p>	<p>Preventive methods are searched by a systematic review.</p>	<p>Pressure relief (offloading) is the most important aspect of heel ulcer prevention Reducing heel ulceration rates can be expected to improve patient outcomes, decrease costs associated with their care, and avoid costs related to hospital-acquired pressure ulcers.</p>
<p>11. Gray, M. 2008. Does regular repositioning prevent pressure ulcers? <i>Journal of Wound, ostomy &amp; Continence Nursing</i>, 35, 571-577.</p> <p>Language: English Abstract: English</p>	<p>To review the evidence on the efficacy of reposition as a pressure ulcer prevention intervention.</p>	<p>A systematic review of electronic databases MEDLINE and CINAHL, from January 1960 to July 2008. The amount of material is not told.</p>	<p>Repositioning according to the instructions can prevent the development of pressure ulcers.</p>	<p>Limited evidence suggests that repositioning every 4 hours, when combined with an appropriate pressure redistribution surface, is just as effective for the prevention of facility-acquired pressure ulcers as a more frequent (every 2 hours) regimen.</p>

<p>12. McInnes E., Bell-Syer SEM., Dumville JC., Legood R., Cullum NA. 2008.: Support surfaces for pressure ulcer prevention.</p> <p>Cochrane Database of Systematic Reviews, issue 4.</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To find out, to what extent do pressure-relieving cushions, beds, mattress overlays and mattress replacements reduce the incidence of pressure ulcers compared with standard support surfaces and how effective are different pressure-relieving surfaces in preventing pressure ulcers, compared to one another.</p>	<p>A systematic review. Four databases were used (Central, Medline, Embase and Cinahl).</p>	<p>Using appropriate support surfaces may help to reduce the amount of pressure ulcers.</p>	<p>Higher specification foam mattresses should be used for people at risk of pressure ulcer development rather than standard hospital foam mattresses.</p> <p>Medical grade sheepskins are associated with a decrease in pressure ulcer development.</p>
--	--	---	---	--



## Appendix 5: Bachelor's Thesis and Master's thesis works

Author	Purpose	Research material and Target Group	Preventive Method	Outcome
<p>13. Gunninberg, L. 2000. Prevention of pressure ulcers in patients with hip fractures: Definition, measurement and improvement of the quality of care</p> <p>Master's Thesis. Uppsala University, Department of Public Health and Caring Sciences</p> <p>Language: English</p> <p>Abstract: English</p>	<p>To survey the prevalence and incidence of pressure ulcers in patients with hip fracture and to investigate nursing staff knowledge and documentation regarding pressure ulcer prevention for the same patient group.</p>	<p>Between years 1997 and 1999 124 and 101 patients more than 65 years were followed with risk assessment and skin observation. Audit of patient records, a questionnaire to nursing staff and a focus group interview were also used.</p>	<p>Paying attention and improving the quality of care may reduce the incidence of pressure ulcers in hip fracture patients.</p>	<p>No significant differences in the prevalence/incidence of pressure ulcers between the experimental and control groups in the two experimental studies. A significant reduction of pressure ulcers has occurred 1997 and 1999 (from 55% to 29%). This was predicted to be because of changes in 1997 in nursing and treatment routines. The routine changes are not told in the study.</p>
<p>14. Engdahl H., Kvist C. 2007. Sjuksköterskans preventiva arbete mot uppkomsten av trycksår på sjukhus -en litteraturstudie.</p> <p>Bachelor's thesis. Högskolan Kristianstad/Institutionen för hälsovetenskaper</p> <p>Language: Swedish.</p> <p>Abstract: English</p>	<p>To illustrate the nurses' work to prevent the origin of pressure ulcers</p>	<p>A general literary study. Scientific articles were searched and found in electronic databases and through manual searches. Ten scientific articles were analyzed.</p>	<p>Investigation of nurses knowledge about pressure ulcers is used as a prevention method.</p>	<p>Nurses knowledge about pressure ulcers is satisfactory but the knowledge is not always put in to practice. The preventive interventions to prevent pressure ulcers must have a higher priority in the nurses' practical work.</p>

<p>15. Andersson, A. 2007. Prevention- ett sätt att förhindra uppkomsten av trycksår. Bachelors Thesis. Högskolan i Halmstad/Sektionen för Hälsa och Samhälle. Language: Swedish Abstract: Swedish</p>	<p>To find out, how could the start of a pressure ulcer be prevented by nurses.</p>	<p>A manual literature study. The amount of material was not reported.</p>	<p>The preventive method could not clearly be found.</p>	<p>A pressure ulcer risk evaluation should be done correctly and early enough for patients in risk. The nursing staff showed to be skilled to practice pressure ulcer prevention, but the lack of time and badly scheduled routines disturbed the practice of preventive work.</p>
<p>16. Nousiainen, A-L. 2008. Ikäntyneiden ulkoisten painehaava-riskien ehkäisy viltahoitotarvikkeella. Bachelor's thesis. Rovaniemi University of Applied Sciences. Language: Finnish Abstract: Finnish</p>	<p>To find out what kind of beliefs the nursing staff had about the curing effects of wool products in the prevention of exterior pressure wounds among elderly</p>	<p>The research material was been collected from six nursing representants in an elderly's service home and a rehabilitation institution. Qualitative material was been collected as theme interviews. Quantitative material was formed from the documented evaluation by the nursing representants</p>	<p>The usage of woollen product may be an effective preventive method for pressure ulcers.</p>	<p>In the treatment of first and second degree pressure ulcers, the usage of woollen products promoted the healing process or completely healed the ulcers. Wool reduces the pressure on critical areas, protects the skin, maintains and promotes the condition of the skin</p>