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ASSESSMENT TOOLS FOR PRESSURE ULCERS: A Literature
Review

THESIS
CENTRIA UNIVERSITY OF APPLIED SCIENCES
Degree Programme in Nursing
December 2014

ABSTRACT

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Degree programme Bachelor in Nursing		
Name of thesis Assessment tools for pressure ulcers		Pages 38
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<p>Chronic wounds are a huge burden to the patients, health care professionals and the health care system. This translates to a significant number of persons involved in this process and costs a large sum of money annually. One must comprehend the best assessment tools that can assist in assessing development of pressure ulcers to be able to prevent these chronic wounds.</p> <p>The purpose of this research was to find out more information on pressure ulcer assessment tools. It also revealed ways of scaling pressure ulcers on patients who have developed pressure ulcers. The goal was to provide information to nurses, nursing students and other health care professionals on pressure ulcer risk factors and prevention strategies. The study applied literature process and analyzed data through comparative and content analysis.</p> <p>The theoretical framework discussed of four assessment tools namely, Braden, Waterlow, Norton and Jackson-Cubbin Scales. These scales have their own sub-scales that aid in assessing pressure ulcer development.</p> <p>The study identified six different assessment tools used: Braden, Waterlow, Garvin, Glamorgan, Braden Q and Braden Q+P Scales. In the study, Braden Scale was identified as the most valid assessment tool.</p>		
Key words Assessment tools, pressure ulcer, prevention, risk factors		

ABBREVIATIONS

EBRARY	Electronic Library
EBSCO	Elton Bryson Stephens Company
EPUAP	European Pressure Ulcer Advisory Panel
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ICU	Intensive Care Unit
NPUP	National Pressure Ulcer Advisory Panel
PICUs	Pediatric Intensive Care Units
THL	Terveyden ja Hyvinvoinnin Laitos: Finnish National Institute for Health and Welfare
USA	United States of America

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1 INTRODUCTION

Chronic wounds are a huge burden to the patients, health care professionals and the health care system. This translates to a significant number of persons involved in this process and costs a large sum of money annually. One must comprehend the best assessment tools that can aid understand the extension of the pressure ulcer to be able to prevent these chronic wounds. A pressure ulcer is one of the common types of chronic wounds and is therefore defined as the result of continuous pressure causing ischemic changes. (National Pressure Ulcer Advisory Panel 2007.) Pressure ulcers can affect critically ill patients whose mobility is impaired and the elderly hence, affecting the overall quality of life.

The theoretical framework discussed of four assessment tools namely, Braden, Waterlow, Norton, and Jackson-Cubbin Scales. These scales have their own sub-scales that aid in assessing pressure ulcer development. The study identified six different assessment tools used: Braden, Waterlow, Garvin, Glamorgan, Braden Q and Braden Q+P Scales. In the study, Braden Scale was identified as the most valid assessment tool.

The authors have read and identified various researches about pressure ulcer prevention. The existing methods found were for example use of support surfaces either on bed or on a chair, how to position and the duration of each positioning.

The purpose of this research was to find out more information about different pressure ulcer assessment tools, understand each and every tool and how to prevent further damage when using them.

The goal of this study was to provide information to nurses, nursing students and other health care professionals on pressure ulcer risk factors and prevention strategies.

2 ASSESSING PRESSURE ULCERS

National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel (EPUAP) have provided national guidelines for health care professionals on pressure ulcer prevention and treatment. The guideline is to identify ways of assessing pressure ulcers and to provide information on the suitable material for the pressure ulcer. (NPUAP 2012.) According to NPUAP (2007) there are included two more categories namely, unstageable and deep tissue injury. Nurses need to have an intensive risk and skin assessment investigation in order to know if a patient is prone to pressure ulcers or not.

Every nurse needs to have skills that enable him/her to know how a pressure ulcer develops and ways of preventing it. Risk assessment principles are to aid nurses to develop better judgement, review and document every stage of the pressure ulcers and to discuss with the other health care team members on ways to proceed. Patients are different so pressure ulcer development may arise depending on the individual needs. According to NPUAP (2012), risk assessment should be carried out during admitting a patient and as many times as possible depending on the current health needs of the patient.

Skin assessment is vital in discovering a pressure ulcer; the timing is the key. Nursing knowledge is needed though educating nurses on how to inspect the skin. Patients can assist in identifying their own skin changes. If a patient uses a medical device, it is important to inspect the skin keenly and document. Skin changes like redness might not be visible in all patients especially those with darker skins. Therefore, nurses should take note of this factor. A patient's own inspection and use of any risk assessment tool could assist in detecting a pressure ulcer beforehand. The stages of pressure ulcer development are as follow:

Stage one is unbroken skin, local redness typically in bony prominence. The place can be painful, firm, soft or the surrounding tissue might feel either colder or warmer.

Stage two: Open wound, the bottom of the wound can be red or pink color. There can also be unbroken skin with body fluid or body fluid mixed with blood kind of

vesicle. This type of wound might be difficult to recognize from dark pigmented skin.

Stage three: Full thickness and skin loss. The subcutaneous fat might be visible, but muscle, bone or tendons are not exposed. Slough might be present but it does not obscure the depth of tissue loss. This may include undermining or tunneling.

Stage four: Full thickness skin loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. This often includes undermining and tunneling.

Unstageable stage: Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.

The last stage is deep tissue injury: purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. (NPUAP 2007.)

3 ASSESSMENT TOOLS

Different grading and assessment tools are available to aid assess the potential risk of the patient's pressure ulcer development and to minimize the damage of the pressure. There are tools which are more suitable for health care professionals to use. According to most researches, use of more than one risk assessment tool is more effective than using one in a healthcare setting. (Guy 2012.) These risk assessment tools are as follow:

3.1 Braden Scale

In United States of America (USA), Braden Scale is the most preferred pressure ulcer assessment tool. (Fosco 2012). This scale provides a detailed information on a patient's activities of daily living. It is highly recommended since it has a vast use in terms of settings for example: it can be used in acute care, home care and long-term institutionalized care. This scale is clearly defined with sub-scales which enable nurses to easily interpret the outcomes. There are two types of these sub-scales; ones which helps to know the factors that predispose them to intense and prolonged pressure. These include sensory perception, activity and mobility. The other set of sub-scales help determine how much pressure the tissue can handle and they include nutrition, moisture and friction/shear. (Noonan, Quigley & Curley 2011.)

Sensory perception is the ability to respond in a developmentally way to pressure pain. This could show the levels of fast or slow body reactions. Activity is ways in which a patient can the amount of activities being performed. The ability to change and control one's body position on a bed is defined by mobility. If the movement is lesser, the chances of the pressure ulcer is higher. Nutrition is another sub-scale which ensures all healthy eating habits are practised. According to Noonan et al. (2011), moisture comes by the frequency the body is in contact with dampness through body's physiological processes for example sweating, drainages, urine, etc. Moisture is detected whenever the patient is turned from one side of the bed to the other.

When the skin moves against a support surface, it causes friction on it. A patient who is bedbound constantly needs lifting and positioning using sheets which create friction on their body. Shear then occurs when skin and adjacent bony slide across one another. Another factor to consider when using this scale is tissue perfusion and oxygenation which identifies the risk groups of pressure ulcers. Patients with hypotension and have a <50 mmHg or newborns with <40 mmHg have a possibility of developing pressure ulcers. The other risk group is patients who do not normally tolerate positionings.

The subscales are divided into four categories and the sum of the score range is between six and 23. A patient who receives low scores is at a risk of developing pressure ulcers. Higher scores may be interpreted as a patient not being in any pressure ulcer risk development. (Fosco 2012.)

Patients with points of 16 or less are defined as: 15 to 16 is low risk, 13 to 14 is adequate risk and 12 or less is severe risk. (Healthcare Improvement Scotland 2009.)

It is recommended that situation of the patient is evaluated within six hours for hospitalized patients or when having the first home visit for homecare patients. It is vital to repeat the evaluation especially if the patient's condition is worsening. (U.S. National Library of Medicine 2012.)

TABLE 1. Braden risk assessment tool (Adapted from Healthcare Improvement Scotland 2009).

Sensory Perception	1. Completely Limited	2. Very Limited	3. Slightly Limited	4. No Impairment	
- Ability to respond meaningfully to pressure related discomfort	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.	Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness. OR has a sensory impairment that limits the ability to feel pain or discomfort over ½ of body.	Responds to verbal commands, but cannot always communicate discomfort or need to be turned. OR has some sensory impairment that limits ability to feel pain or discomfort in 1 or 2 extremities.	Responds to verbal commands. Has no sensory deficit that would limit ability to feel or voice pain or discomfort	
Moisture	1. Constantly Moist	2. Very Moist	3. Occasionally Moist	4. Rarely moist	
- Degree to which skin is exposed to moisture	Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient/client is moved or turned.	Skin is often, but not always, moist. Linen must be changed at least once a shift.	Skin is occasionally moist, requiring an extra linen change approximately once a day.	Skin is usually dry. Linen only requires changing at routine intervals.	
Activity	1. Bedfast	2. Chairfast	3. Walks Occasionally	4. Walks Frequently	
- Degree of physical activity	Confined to bed	Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	Walks outside the room at least twice a day and inside the room every 2 hours during waking hours.	
Mobility	1. Completely Immobile	2. Very Limited	3. Slightly Limited	4. No Limitations	
- Ability to change and control body position	Does not make even slight changes in body or extremity position without assistance.	Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	Makes frequent though slight changes in body or extremity position independently.	Makes major and frequent changes in position without assistance.	

Nutrition	1.Very Poor	2.Probably Inadequate	3.Adequate	4.Excellent	
-Usual food intake pattern	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 and/or maintained on clear liquids or IV's for more than 5 days	Rarely eats a complete meal and generally eats only about ½ 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.	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 regimen which probably meets most of nutritional needs.	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	
Friction and Shear	1.Problem	2.Potential Problem	3.No Apparent Problem		
	Requires moderate to maximum assistance in moving.	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.	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.		
Indicate appropriate number and add the total score				Total Score:	
Name of the patient	Social security number	Attending nurse	Room number		

Note:

Individuals with 16 or less are considered at risk:

15-16=low risk, 13-14=moderate risk, 12 or less=high risk

Undertake and document the risk assessment within 6 hours of admission or on first home visit.

Reassess if there is a change in individual's condition and repeat regularly according to local protocol.

3.2 Waterlow Scale

According to Papanikalou, Lyne & Anthony (2006), this scale is used better to assess patients on a wheel chair than any other. Unlike the Braden Scale, it does not have a comprehensive sub-scales on assessing pressure ulcer risks. It discusses mainly about disease and treatment risks.

The Waterlow Scale includes two categorizes. The first category includes weight, skin type, sex, age, nutrition level, continence and mobility. The second category is the special risks such as tissue malnutrition, neurological deficit and major surgery or trauma. This scale is widely used in the United Kingdom and applicable to all areas of care. It has guidance on good nursing care and ways of preventing pressure ulcers. The scoring system is set as: more than 10-14 points: one is at risk; more than 15-19 points: one is at a high risk and lastly, more than 20 points: one is at a very high risk. (Healthcare Improvement Scotland 2011).

3.3 Norton Scale

This scale contains the least amount of variables as compared to the other three. It is also widely used in the USA. The scale has scores from five to 20; the less the points, the higher the risk of pressure ulcer development. Every risk factor has points whereby more than 18 points shows patients at a lower risk, between 18 and 14 shows average risk, between 14 and 10 shows higher risk and lastly, less than ten points shows very high pressure ulcer risk. Physical condition, mental status, activity, mobility and continence constitute this scale. (Balzer, Pohl, Dassen & Halfens 2007).

The criteria for the variables in this scale are assessed as having a possibility to choose one of the four variables stated and in the end getting a total score. Physical condition has good to very bad variables. The psychological wellbeing of a patient is assessed by having alert, apathetic, confused or stupor variables checked. If a patient is ambulant, uses walking aids, is chair or bed bound; the activity of him/her is assessed also. Mobility variable ensures the physical flexibility of a patient, if movement is slightly impaired, very limited or immobile. Continence is described as the amount of urine or feces passed by a patient.

3.4 Jackson-Cubbin Scale

This risk assessment scale is a tool used by the European critical care units. Although it has been used in critical care settings, it has been tested on a very small scale of patients for it to be accurate. Jackson-Cubbin Scale is also known for its validity. (Garcia-Fernandez, Pancorbo-hidalgo, Agreda & Torres 2013). Its variables include condition of skin, age, mental health, weight, mobility, breathing, nutrition, continence, hemodynamic status and personal hygiene.

The total number of scores in this scale ranges from 12 to 48 points. The risk of pressure ulcers increases with a score of less than or equal to 29 points. A study completed in Greece 2009 revealed that the risk of pressure ulcer is 98.5% greater in patients with a score of less or equal to 29 points. Other factors that influenced were a patient older than 70 years of age, if a patient stays longer at the critical care unit, history of diabetes mellitus, bloodstream infection, hemodialysis and administration of ionotropic drugs. However, no incidence of pressure ulcers was shown by corticosteroids, sedatives and shock. (Apostolopoulou, Tselebis, Terzis, Kamarinou, Lambropoulos & Kalliakmanis 2014).

TABLE 2. Variable comparison is all the four types of pressure ulcer risk assessment tools. (Adapted from Cooper 2013)

Braden Scale	Waterlow Scale	Norton Scale	Jack son Cubbin Scale
Sensory perception	Sex	Physical condition	Age
Moisture	Age	Mental status	Weight
Activity	Build	Activity	Skin condition
Mobility	Appetite	Mobility	Mental status
Nutrition status	Nurse's assessment of skin	Continence	Mobility
Friction/shear	Mobility		Nutrition
	Continence		Respiration
	Tissue malnutrition		Continence
	Neurologic deficits		Hygiene
	Major surgery/trauma		Hemodynamic status
	Medication		

In all of the four types of risk assessment tools discussed above, all have specific variables which uniquely identify them. Braden, Norton and Jackson-cubbin scales stated that lower the scores were associated with higher chance of developing a pressure ulcer. Waterlow Scale is the only scale with a different rule: higher scores, results to higher pressure ulcer development risk.

A lot of pressure is exerted onto a patient's or person's body if the position has not been changed for a longer time. Positioning is very vital in relieving pressure from a patient's body. The patient's body should be turned every two hours alternating the lateral and supine positions and the heels should not be touching the mattress. The head of the bed should be elevated not more than 30° and the body of the patient should be laterally turned 30°. In intubated patients however, the head of the bed

should be elevated more than 30° to prevent ventilator-associated pneumonia. (Augustyn 2007).

4 RISK FACTORS IN PRESSURE ULCER PREVENTION

The number of tissue layers are reduced by friction; the epidermis layer is fully diminished and this also affects the dermis layer that protects the tissue. It is very vital for patients to eat a balanced diet especially the ones at risk of developing a pressure ulcer. Less proteins in the body results to edema and tissue death. A study by Low, Vasanwala & Tay (2014) revealed that, patients at risk of developing pressure ulcers should follow strict nutrition guidelines. These authors recommended the intake of calories a minimum of 30-35 kilocalories per kg per day, the intake of protein 1.25-1.5g per kg per day and the intake of fluids 30ml per kg per day. Strict nutritional intake highly depends on how large and the severity of the pressure ulcer development. Screening tools to determine a malnutrition patient is to acquire more comprehensive knowledge. High-risk patients can be referred to dieticians for further assessment. (EPUAP 2009.)

Persons who have advanced age are at a risk of developing a pressure ulcer because there is low count of subcutaneous fat. Older people and those who do not obtain proper nutrition guidelines may tend to have a lot of bony prominences which provide a suitable environment for pressure ulcers. Mechanical ventilation is sought when there is need to provide ventilation and oxygen to a patient. This is performed when there is less oxygen in the blood causing less oxygen in the tissues. The length for mechanical ventilation can be a risk factor in pressure ulcer development because there is the use of devices; device-related pressure ulcers. In the Intensive Care Unit (ICU), patients use various devices to ensure their survival for example, endotracheal tubes, tracheostomy tubes and fecal containment devices. As common as these devices are in the ICU, no researches have been investigated to address this particular issue. According to Cooper (2013), approximately 10% of pressure ulcers occur as a result of using these devices. Pressure ulcers in intubated patients can occur on the lips. Hence, most manufacturers of endotracheal tubes have recommendations on who is able to use them. Protruding teeth, facial and lip edema are risk factors of device related to pressure ulcers. These recommendations further clarify the tube should be repositioned every two hours to prevent pressure ulcer incidence.

The length of stay in the hospital depends on the critical condition of the patient. There is a lot of friction from sliding on the bed when resting and being unable to change position resulting to pressure ulcer development. There is a need for high specification foam support mattress and dynamic support surface mattress are needed for patients at risk or at higher risk of developing a pressure ulcer. (McInness, Jammali-Blasi, Bell-Syer, Dumville & Cullum 2011). Children and neonates could be hospitalized too in the Pediatric Intensive Care Units (PICUs) and are prone to pressure ulcer development. Device-related to pressure ulcers are also common with the children and they could be severe since they have soft skins and are still developing. The risk assessment tools discussed here are not suitable for assessing pressure ulcers among children. Hence, there is a need for more research according to Schlüer, Cignacco, Müller & Halfens (2009).

Pressure ulcer prevention entails proper nutrition, risk assessment, support surfaces, skin care, education and mechanical loading. Persons who are bed/chair bound and whose ability to be repositioned is impaired are at risk of pressure ulcers. It is vital to use an assessment tool that is valid and reliable to every age group so as to suit assessment of individual risk factors. Assessment of all patient and residents should be regularly checked based on the severity of the illnesses. Patients on acute care should be assessed on admission, repeated after every 24 hours or sooner depending on how the patient's condition changes. Residents with long-term care plan should be assessed on admission, weekly for four weeks, quarterly and lastly, according to the condition of the patient. Persons who are on home care should be assessed on admission then thereafter after every nurse's visit. Identification of individual risk factors and all the scores should be documented to aid implement a risk-based prevention plan. (Baharestani & Ratliff 2007; NPUAP 2007).

Proper hygiene care is vital in preventing pressure ulcers. NPUAP (2007) mentioned that, a complete head to toe skin assessment should be carried out daily and attention should be on pressure points for example, ischium, heels, sacrum, elbows, trachaters and the back of the head. Mild cleansing agents should be used also, avoid excessive rubbing and hot water. Lotion should be applied on the skin after bathing. Patients who have incontinence problems should

be attended at the time of soiling, clean the skin gently and apply barrier creams to protect the skin. Massage should be avoided especially on the pressure points.

All persons who are at a risk of developing pressure ulcers need to have nutrition guidelines to assist them in eating all required nutrients. It is recommended that when turning a patient/resident, offer a glass of water to keep them hydrated. Multivitamins can be offered to them but only with doctor's prescriptions.

Chair-bound persons should be repositioned every four hours and bed-bound, every two hours. Persons on chairs or wheelchairs should be positioned in a way that their weight should be evenly distributed on the surface. Chair-bound persons who are able to move should be taught methods of shifting their weight every 15 minutes. The ones at risk of pressure development should be placed on pressure-redistributing and chair cushion surfaces. Use of lifting objects to lift patients from one surface to another should be carried out as a safe positioning method. Pillows should be placed under the body of the patient or person to avoid contact of the body and chair or bed surfaces.

Implementation of a good nursing care plan in preventing pressure ulcers requires great education knowledge. Pressure ulcer prevention educational programs should be initiated and directed towards health care personnel, patients, caregivers and families. This program includes educational information such as risk factors for pressure ulcers, risk assessment tools and in what ways they are used, skin assessment, use of support surfaces and their selection, nutrition guidelines, bowel and bladder management and data documentation. (NPUAP 2007).

4.1 Challenges with assessment tools

The risk assessment tool's purpose is to correctly identify the patient who is having the risk of developing a pressure ulcer or a patient who already has one. The tool will correctly show if the patient does not have any risk for developing pressure ulcer. The risk assessment tool is able to obtain same results throughout the assessment and regardless of who carries it out is considered to be reliable and valid. (Guy 2012.)

Various risk assessment tools have been investigated in previous researches. In these researches, possible weaknesses affecting the assessment of pressure ulcer risks have been found. The risk assessment tools might not have clearly defined sections and the personnel can under- or overestimate the risk of a pressure ulcer. Some of the factors can be unrelated to the risk, the reliability and validity is unknown. The same risk assessment tool with the same patient from two different nurses might obtain different kind of scores even when the circumstance is the same. Some of the risk assessment tools might not predict a patient to have any risk to get pressure ulcer even if there already exists one or then predict the patient to have increased risk to develop pressure ulcer who actually would have low risk to develop pressure ulcer. The incidence of pressure ulcers is not reduced even when the pressure ulcer risk assessment tool is used.

4.2 Challenges in prevention

The pressure ulcer risk assessment tools help with the prevention of the pressure ulcers but there are still challenges with prevention even if the patient knows he/she belongs to a pressure ulcer risk group. Challenges in pressure ulcer prevention can be as: a patient who is reluctant to change the position as often as possible, or the patient might decline the use of a pressure-relieving mattress. When assessing the risks, the nurses should think of the patients' lack of capacities such as: If a patient is having a permanent or temporary brain or mind impairment. Hence, the patient might not be able to decide clearly. It is important for a nurse to think if the patient can understand the relevant information as well as decide clearly.

End of life care is as vital as any other stage in a human's life. The patient's skin is an organ and at some point, the skin does not work the same way when the patient was younger. Skin changes at old age should be considered at life's end (SCALE) and this might be that the pressure ulcers cannot be avoided. The SCALE provides explanation to the patient and one's family why the care will not help in this kind of situations. This might therefore, reduce the complaint of pain and the patient's situation and treatment. (Guy 2012.)

5 PREVIOUS RESEARCHES

Previous researchers have used all of the above discussed assessment tools. Norton and Waterlow scales have had some limitations in interpreting data and they seemed unreliable and insufficient data. Braden Scale on the otherhand, is the most preferred by nurses but further researches need to be performed so that the reliability is updated. (Papanikalou, Lyne & Anthony 2006.)

Pressure ulcer repositioning prevention strategies based on the two-hour rule is not scientifically proven according to Augustyn (2007). There is needed more research to identify the positioning and the ideal repositioning frequency.

Device-related pressure ulcers have been discussed previously but not widely. They are very common and challenging as pressure ulcers in any other part of the body. This topic needs to be further developed scientifically as well as the pressure ulcer risk scales in critical care nursing.

Kottner, Dassen and Halfens (2009) investigated a research about the Braden Scale and EPUAP system used in the Netherlands in home care settings. The study was supposed to provide information about the reliability of the scale scoring and the nurses' knowledge on ways to use the scale. The clients of the home care participated voluntarily. According to the results, there were some errors with the evaluations. Therefore, future research is needed to obtain better descriptions of the sections. Ultimately, the results were achieved when Braden scale was tested reliable.

Moore and Cowman (2008) researched on pressure ulcer development tools. The research was finished in a health care setting and there was structured and un-structured risk assessment tools used. In the results, there were no significant differences when structured or un-structured assessment tool was used. According to this research, there were differences in the results of these tools and there was a need for further research.

6 THESIS PURPOSE, AIM AND TASKS

The purpose of this research was to find out more information about different pressure ulcer assessment tools, understand each and every tool and ways to prevent further damage when using them. It also provided information of the risks when using the assessment tools and how to prevent pressure ulcers.

The goal of this study was to provide information for nurses, nursing students and other health care professionals on pressure ulcer risk factors and prevention strategies.

The following questions are reviewed in this study through a literature review:

1. What kind of different grading and assessment tools are used to assess pressure ulcers?
2. What risk factors are involved when preventing and grading pressure ulcers?
3. How can pressure ulcers be prevented?

7 METHODOLOGY

7.1 Literature review

This study was a literature review that identifies appropriate interventions for pressure ulcer prevention and risk assessment. This method was chosen to provide a wide perspective and scientific evidence based method.

The literature review interprets with the literature which relates to the chosen topic; also a comprehensive study. When the authors chose to investigate the literature review, they considered a research question and finding an answer by searching and analyzing different kind of relevant articles, books and journals with systematic approach. The review then leads the author to create a new insight of the subject when the relevant information is seen in full context. (Aveyard 2010.)

7.2 Data collection

The preliminary search for pressure ulcer encountered many studies located in the science direct, ebrary, ovid, EBSCO, sage and CINAHL. Key words such as assessment tools, Braden Scale, pressure ulcer, prevention and risk factors were utilized for the search in this study. These studies revealed definitions of pressure ulcer. The results obtained a lot of materials and it was limited between years 2006 to 2014. There were also different internet sources used such as THL (2010), NPUAP (2012), EPUAP (2012). The sources provided information of pressure ulcers development, stages, prevention and treatments.

In the review process, one of the databases did not produce additional studies. The first 140 abstracts were identified and screened with only 22 of the 140 abstracts revealed interventions for pressure ulcer assessment tools. Most of the articles and books could be obtained from the library services. The study selected only 11 of the articles in the review because the evaluation provided similarities. Articles which were not used did not provide relevant information for the research

and were not in full text or were not in the language that the authors were able to interpret.

TABLE 3. Data analysis procedure.

Amount of articles	Criteria of selected amount of articles
140 Articles in Ebsco, Sage and Science Direct	Findings based on pressure ulcer assessment tools
Identified and screened 22 articles	Between years 2006 to 2014
Selected 11 articles	Based on full texts and keywords

There were comparative studies of different types of pressure ulcer risk assessment tools. For example, Tannen (2009) compared Braden Scale, Waterlow Scale and the Care Dependency scale. Page (2011), and Kottner and Dassen (2009) focused on pressure ulcers in acute and critical care settings. The other studies focused on the functionalities of the scales and the usage of the scales in pediatrics. (Anthony 2009; Kottner and Balzer 2010; Willock 2010; Noonan, Quigley and Curley 2011 and Richardson 2008.)

TABLE 4. The review process of the study.

Author, Country, Year	Purpose	Results	Method
Anthony, United Kingdom. 2009.	To collect information about the functionality of the assessment scales by testing	The assessment tools predict the risks	Organized situations
Kottner and Balzer, Germany. 2010.	The impact and validation of the assessment tools	Assessment tools are reliable to use in pediatrics	Systematic review

	in pediatric care research investigation		
Balzer, Pohl, Dassen and Halfens, Germany. 2011.	Diagnostic study of the trials for pressure ulcer assessment tools	The trials have low impact for the nurses' clinical judgments of the assessment tools.	Clinical evaluations and experimental studies
Page, Australia. 2010.	To develop and validate the risk assessment tools for acute care.	The tool predicts who have the most risk to develop pressure ulcer.	Organized conditions and job characteristics
Willock, United States. 2010.	To compare of three assessment tools in pediatrics. Study was made with data collection	One of the tools was more predicting with the pediatric pressure ulcer development.	Clinical evaluation
Kottner and Dassen Germany. 2009.	The reliability and validity of the risk assessment tools in critical care	The Braden scale is the best to use for the critically ill patient	Clinical comparison
Richardson, United Kingdom. 2008.	To evaluate is the Glamorgan scale adequate when used in clinical practice	The Glamorgan scale is reliable in pediatric settings	Job characteristics
Tannen, Germany. 2009.	Comparing two risk assessment tools and Care dependency scale (CDS).	Braden scale and CDS have the same kind of results when compared	Clinical comparison

Noonan, Quigley and Curley, United States. 2011.	Using the Braden Q scale to predict the risks for pressure ulcers in children. To give information of use and to evaluate the scores	Use the scale may lower the risk of the pressure ulcer. Needs to be education how to use the scale	Job characteristics
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Author, Country, Year	Purpose	Results	Method
Borlawsky and Hripcsak, United States. 2007.	To Evaluate the automated pressure ulcer risk assessment tools functionality	Automated could be improving the risk assessment of pressure ulcers	Qualitative study
Galvin and Curley, United States. 2012.	To Evaluate how Braden Q+P scale function when assessing the pediatric perioperative pressure ulcer risks	Using the tool lowered the pressure ulcer and the hospital stays	Literature Review

7.3 Data analysis

The content analysis is a qualitative research technique. Moreover, content analysis has three separate approaches: direct, summative or conventional. Furthermore, these three approaches are used to explain the meaning from the content of text data and hence, to bond to the naturalistic paradigm. The differences between the approaches are origins of codes, coding scheme, and threats to reliability. In the direct approach; the analysis will start with a theory or with relevant information of the research as guidance for initial codes. The summative approach includes collation and counting generally of the content or keywords and thereafter, it provides an interpretation of the underlying context. The coding categories are directly derived from text data in conventional content analysis. The authors perceive the specific analytic procedures to each of the approaches and techniques addressing the reliability. (Shannon & Hsieh 2005.)

The content analysis assisted to invent new hypotheses and interpret the findings. The authors purchased information from abstract, results and the discussion. The analysis process was started through the studies of the obtained materials. This assisted the authors to relate all the information to the research questions. The authors searched the sentence “pressure ulcer risk assessment tool” that assisted to reveal articles that were related to the topic during the data analysis process. The authors used their equipped knowledge from the known topic to distinguish between the irrelevant and relevant material. Therefore, these revealed available materials for analysis. The authors formatted the research questions, analyzed and collected the data and finally, constructing the conclusion of this study.

7.4 Reliability and validity

Reliability is the degree of consistency with which the data-collection instrument produces the same results every time it is implemented in the same situation or used by different investigators. (Polit & Beck 2008). The electronic books used in this study have presented accurate information in this research. The literature review was used in this research as it is compulsory to avoid plagiarism. Quotations from various articles were used and later; rephrased with the authors' own words.

Two authors have been involved in writing this research. Therefore, there is more than one person's review when analyzing the material. The authors of the research will work as nurses in the future and will be able to include this research as part of their career. The authors have been close with the supervising teacher. This research writing has followed the correct writing process by the authors with the supervision of their thesis instructor.

The permission was asked from different databases to be able to use the research material. Implementation of this research required confidentiality. Therefore, names or ideal situations were avoided in this research. The authors planned to have a research based on true findings from these databases. (Polit & Beck 2008).

Fraud was avoided when investigating this research. Fraud in this research means that the author changed the findings of the research to prove that he/she has set the correct hypothesis. (Routio 2007.)

8 RESULTS

8.1 Assessment tools used

There are four different assessment tools used in this research. Braden and Waterlow scales are used in Germany's ICU's to assess the pressure ulcer risks. Kottner and Dassen (2009) have compared Braden and Waterlow scales as to which is most effective to use in ICU settings. In this research, the authors found out that through patients and nurses results, Braden Scale is most reliable of the two in ICU settings than Waterlow scale. The Braden Scale is also researched to be popular because it is mostly used and has numerous existing researched data. Although the Braden Scale is more reliable than Waterlow Scale, neither of these scales is alone recommended to used in the ICU.

In pediatrics, there are several scales used but the best known scales in use are Braden Q, Garvin and Glamorgan scales. Braden Q Scale is adapted from the Braden Scale which is adult-based scale to predict pressure ulcer risks. Braden Scale was chosen because it is reliable and valid. In Braden Scale, the critical areas are tissue tolerance and pressure with extrinsic and intrinsic factors. The Braden Q Scale has all the original subscales from Braden Scale but also there is one extra subscale; the seventh subscale is tissue perfusion/oxygenation. (Noonan et al. 2011.)

The Garvin Scale is not a very well known risk assessment tool. This scale includes four risk factors: perception, mobility, moisture and nutrition. (Willock et al. 2010). The Glamorgan Scale is produced for pediatrics through literature review and from the patient data made, statistical analysis are used to validate the scale. The various factors this scale assesses are; mobility, pressure, nutrition, incontinence, equipment, anemia, pyrexia, perfusion and low albumin. In the scale, the scores are in three groups between 10-20+, being at risk, high risk or very high risk. The scale is recommended to use daily or if the children's situation changes to do it again every time when needed. (Richardson 2008.)

Willock, Anthony and Baharestani (2010) have compared Braden Q, Garvin and Glamorgan Scale. The findings from this research have proved that Glamorgan Scale predicts the pressure ulcer risk better than Braden Q or Garvin Scale.

Galvin and Curley (2012) have developed Braden Q+P Scale to be used in pediatric perioperative situations. This scale assists the operative nurses to assess the pressure ulcer risks in operation theatre. The scale is created from Braden and Braden Q scale. The Braden Q+P scale was created because of the higher risk to develop pressure ulcers in operative settings because the patients are under anesthetics and the position of the patient depends of the surgery. Also, the patient can be in the same position for several hours.

8.2 Risk factors of prevention and grading

Anthony, Papanikolaou, Parboteeah and Saleh (2009) have researched the workability of the pressure ulcer assessment tools. The research explains that Waterlow Scale has only three of the sub-scores in wheelchair patients who had pressure ulcers prediction; skin, gender and mobility. In hospital inpatients, there were five sub-scores predicting pressure ulcers; skin, continence, appetite, surgery and age.

According to Kottner and Dassen (2009), the risk assessment should be thought critically because the nurses might have different opinions. This research continues to inform that the pressure ulcer risks are more complex than the risk assessment scale suggests.

When implementing risk assessment scales in the health care settings, the health care professionals should acquire acceptance and support from the staff and administration. The staff should obtain education and the risk assessment should have a documentation system created. For example, Braden Q Scale necessitates a strategic plan that should include feedback and monitoring system as well as system support. On the feedback, reports of patient's risk should be documented as well as the success of the prevention of the pressure ulcer. Furthermore, using the scales in right manner might decrease the variations in the management and prevention of pressure ulcers. (Noonan et al. 2011.)

Pressure ulcer risk factors include immobility status for example, general body weakness, paralysis, recovery time after surgery, coma or use of sedatives. A situation that a patient is not able to sense anything like being in a coma for too long has risks of having an ulcer. Older adults have thinner skins which are susceptible to development of pressure ulcers hence age plays a huge role. If the skin is not moisturized well and an older adult has poor eating habits, the chance of him/her developing pressure ulcers is even higher as mentioned by EPUAP (2009). Smoking is another factors that decreases blood flow therefore the amount of oxygen in the blood is highly reduced. This explains why smoking patients may have chronic wounds because they tend to heal slowly.

8.3 Prevention of pressure ulcers

Preventing the pressure ulcers takes lot of time and needs proper management and especially with the children, nurses need to be on the alert. For example, the pulse oximeter will cause skin damage if not changing the place regularly as well as the name bands. High fever, anemia, incontinence, poor perfusion, low albumin, weight and poor nutrition level are also increasing the risk for developing pressure ulcer if not taken care of. (Richardson, Anthony & Willock 2008.)

Galvin and Curley (2012) have investigated a research of the perioperative pressure ulcer risk and found out that the intensity, tissue tolerance and duration of the pressure are the most critical factors causing pressure ulcers. Skin assessment of the patient should be done early to prevent development of pressure ulcers. Furthermore, the operative settings have reported existence of low systolic blood pressure and low oxygen saturation. Therefore, blood pressure and oxygenation level should be taken care of in operations. The mobility of the patient is also very low in the operation theatre so there are recommendations to use gel positioning and gel overlays.

In the operative settings, it is very vital that the operative team co-operate together and help each other with the positioning and skin assessment as well as to recognize if the IV lines, endotracheal tubes, urine catheters, dispersive pads or

electrocardiogram leads and spectroscopy leads are pressing or scrubbing the skin.

TABLE 5. Process of abstraction to the research results.

Subcategory	Generic category	Main category
Sensory perception, moisture, activity, mobility, nutrition status, friction/shear	Braden Scale	Pressure ulcer assessment tools
Sex, age, build, appetite, nurse's skin assessment, mobility, continence, tissue malnutrition, neurologic deficits, major surgery, medication	Waterlow Scale	
Original six (6) sub-categories and tissue perfusion/oxygenation	Braden Q Scale	
Same sub-categories as in Braden Q and also devices, positioning, post-procedure concern and assessment	Braden Q+P Scale	
Perception, mobility, moisture, nutrition	Garvin Scale	
Mobility, pressure, nutrition, incontinence, equipment, anemia, pyrexia, perfusion, low albumin	Glamorgan Scale	
Surgery, coma, use of sedatives, general body weakness	Immobility status, nutrition	

Positioning, pressure ulcer education and training	Early recognition of pressure ulcers, skin assessment	Pressure ulcer prevention
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9 DISCUSSION

Researches revealed that Braden Scale is the most valid tool in use. Various scales which are able to be used for example, in pediatrics and operative settings have been created. There are various ways of preventing the development of pressure ulcers such as, taking care of the skin, proper diet, mechanical loading and support surfaces and educating the health care personnel on pressure ulcer implementation. All the assessment tools are unique in their variables and how the scoring system is evaluated.

Nurse's knowledge of the pressure ulcer risk assessment is vital so that early interventions are carried out. The choice of assessment tools highly depends on the nurse's capability to assess a patient's pressure ulcer state. This opportunity presents the nurse's viewpoint, values, knowledge and competence to care for the patients' pressure ulcers. Nurses ought to recognize the many chances of patients acquiring pressure ulcers when admitted and therefore, the goal of preventing them should be a priority. Knowledge of how a pressure ulcer starts, its stages, risk factors involved and challenges in addressing this problem with the patients should be kept into consideration. Moreover, if a patient is able to communicate, he/she should be offered an opportunity to discuss the changes of the skin. This calls for participation from the patient because it is highly likely a patient knows more about their own changes by providing nurses the best accurate way of assessing the pressure ulcers.

Most researches discuss how vital knowledge plays in assessment of pressure ulcers. Nurses need to be educated on regular basis on how to interpret the readings on all the scales because all scales can be used in various health care settings. Education involves keeping the skin healthy and self-assessment of the skin to rule out any areas of the skin that seem unhealthy. Use of these assessment tools requires accuracy to avoid underrating or overrating patients; this leads to compromising patients' health.

Clinical judgement of the nurse is required to help analyze who is at risk. Patients who have malnutrition symptoms are bed or chair bound, dehydrated or mobility impairment are at risk of developing pressure ulcers. A nurse who has knowledge

of this topic and has experience in treating such patients will realize early in advance. When the risk is detected early, early interventions are applied in order to prevent any further damage. The ability of a nurse to possess good clinical decisions in detecting pressure ulcer risk depends on the exposure with patients who have pressure ulcers and the quality of that exposure.

The knowledge and skills of a nurse might not be useful in a situation like a huge workload at the ward and minimum amount of nurses. Minimum amount of nurses on the ward everyday means that pressure ulcer prevention might not be a priority. Hence, regular assessment of developing pressure ulcers might be missed out.

This study consumed more efforts and time than was predicted at the beginning. The process of the review exposed the importance of balancing time and teamwork for all the steps of the research. The review process assisted in development of professional skills of carrying out a research. Moreover, the authors became aware when accessing the data for future research. The literature review was more beneficial because the authors wanted to provide wider perspective from the research and the assessment tools for pressure ulcers were not well known in Finland.

In this study, the authors recognized several challenges and ideas for further research. Some of the sub-scales seem to be unreliable when assessing pressure ulcers risk. Also, the reliability and validity of the scales are revealed not very well known.

REFERENCES

- Anthony, D. 2009. Do risk assessment scales for pressure ulcers work. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0965206X09000588?np=y>. Accessed 15 January 2014.
- Apostolopoulou, E. Tselebis, A. Terzis, K. Kamarinou, E. Lambropoulos I. and Kalliakmanis, A. 2014; 8 (3) Pressure ulcer incidence and risk factors in ventilated intensive care patients. Available: <http://www.hsj.gr/volume8/issue3/833.pdf>. Accessed 1 August 2014.
- Augustyn, B. 2007. Ventilator associated pneumonia assessment and prevention. *Crit Care Nurs.* ;27:32-39. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0020748913000473?np=y>. Accessed 10 August 2014.
- Aveyard, H. 2010. *Doing a Literature Review in Health and Social Care: A Practical Guide* (2nd Edition). Berkshire, GBR: McGraw-Hill Education. Available: <http://site.ebrary.com.ezproxy.centria.fi/lib/cop/reader.action?docID=10413319>. Accessed 25 September 2014.
- Balzer, K. 2011. Designing trials for pressure ulcer risk assessment research: Methodological challenges. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0020748913000473?np=y>. Accessed 20 September 2014.
- Balzer, K., Pohl, C. Dassen, T. and Halfens, R. The Norton, Waterlow, Braden, and Care Dependency Scales. 2007. Comparing their validity when identifying patients' pressure sore risk. *J Wound Ostomy Continence Nurs.* Jul-Aug 34(4):389-98. <http://www.ncbi.nlm.nih.gov/pubmed/17667085> Accessed 15 January 2014.
- Baharestani, M., Ratliff, C. and the National Pressure Ulcer Advisory Panel, Neonatal and pediatric pressure ulcers: an NPUAP white paper. *Adv Skin Wound Care.* 2007. Available: <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-ulcer-prevention-points>. Accessed 15 January 2014.
- Borlawsky, T. and Hripcsak, G. 2007. Evaluation of an Automated Pressure Ulcer Risk Assessment Model. Available: <http://hhc.sagepub.com.ezproxy.centria.fi/content/19/4/272.full.pdf+html>. Accessed 15 January 2014.
- Cooper, K. 2013. Evidence-Based Prevention of Pressure Ulcers in the Intensive Care unit *Critical Care Nurse*;33[6]:57-67 <http://web.b.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=3&sid=1d687247-7379-4053-8457-d2d7a93c5ba9%40sessionmgr112&hid=123>. Accessed 5 August 2014.

European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel: Prevention and treatment of pressure ulcers: quick reference guide. Washington DC: National Pressure Ulcer Advisory Panel; 2009, 24 p. Accessed 13 August 2014.

Fosco, C. 2012. What is Braden Scale. Available: <http://www.woundrounds.com/wound-care-technologies/what-is-the-braden-scale>. Accessed 5 January 2014.

Galvin, P. and Curley, M. 2012. The Braden QDP: A Pediatric Perioperative Pressure Ulcer Risk Assessment and Intervention Tool. Available: <http://web.b.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=1&sid=75e0863c-bacc-4c4a-81a4-d37abcb696a3%40sessionmgr110&hid=114>. Accessed 15 January 2014.

Garcia-Fernandez, F. Pancorbo-Hidalgo, P. Agreda, J. and Torres, M. 2013. Risk assessment scales for pressure ulcers in intensive care units: A systematic review with meta-analysis. EWMA journal, volume 13, no 2 http://ewma.org/fileadmin/user_upload/EWMA/pdf/journals/Scientific_articles/Articles_Oct_2013/Risk_assessment_GarciaFernandez.pdf. Accessed 6 June 2014.

Guy, H. 2012. Pressure ulcer risk assessment. *Nursing Times*; 108: 4, 16-20. Available: <http://www.nursingtimes.net/nursing-practice/clinical-zones/wound-care/pressure-ulcer-risk-assessment/5040368.article>. Accessed 15 January 2014.

Healthcare Improvement Scotland. 2009. Braden Risk Assessment tool. Available: http://www.healthcareimprovementscotland.org/our_work/patient_safety/tissue_viability_resources/braden_risk_assessment_tool.aspx. Accessed 28 May 2014.

Healthcare Improvement Scotland. 2011. Waterlow Risk Assessment tool. Available: http://www.healthcareimprovementscotland.org/our_work/patient_safety/tissue_viability_resources/waterlow_risk_assessment_chart.aspx. Accessed 28 May 2014.

Kelly, J. 2005. Inter-rater reliability and Waterlow's pressure ulcer risk assessment tool. *Nursing Standard*. 19,32,86-92. Available: <http://web.a.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=3&sid=71cac41a-83be-4dbc-8791-440082f417e9%40sessionmgr4001&hid=4107>. Accessed 5 June 2014.

Kottner, J. and Balzer, K. 2010 Do pressure ulcer risk assessment scales improve clinical practice? *Journal of Multidisciplinary Healthcare*. 3,103-111. Available: <http://web.a.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=3&sid=71cac41a-83be-4dbc-8791-440082f417e9%40sessionmgr4001&hid=4107>. Accessed 15 January 2014.

Kottner, J. Dassen, T. and Halfens, R. 2009. An interrater reliability study of the assessment of pressure ulcer risk using the Braden scale and the classification of pressure ulcers in a home care setting. Available:

[http://www.journalofnursingstudies.com/article/S0020-7489\(09\)00125-4/abstract](http://www.journalofnursingstudies.com/article/S0020-7489(09)00125-4/abstract). Accessed 15 January 2014.

Kottner, J. and Dassen, T. 2009. Pressure ulcer risk assessment in critical care: Interrater reliability and validity studies of the Braden and Waterlow scales and subjective ratings in two intensive care units. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0020748909003617?np=y>. Accessed 15 January 2014.

Kottner, J. 2011. Validation and clinical impact of paediatric pressure ulcer risk assessment scales: A systematic review. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0020748911002185?np=y>. Accessed 15 January 2014.

Low, L. Vasanwala, F. and Tay, A. 2014 Pressure ulcer risk assessment and prevention for the family physician. Proceedings of Singapore healthcare Volume 23; Number 2, http://www.singhealthacademy.edu.sg/Documents/Publications/ProceedingsVol23No22014/08%20RA_003-0114_Low%20Lian%20Leng.pdf. Accessed 15 January 2014.

McInnes, E. Jammali-Blasi, A. Bell-Syer, S. Dumville, J. and Cullum, N. 2011. Support surfaces for pressure ulcer prevention. Cochrane Database Syst Rev;(4): CD001735 doi: 10.1002/14651858.CD001735.pub4. Accessed 19 August 2014.

Moore, Z. and Cowman, S. 2008. Risk assessment tools for the prevention of pressure ulcers. Available: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006471.pub2/abstract>. Accessed 15 January 2014.

National Pressure Ulcer Advisory Panel (NPUAP), 2007. *Pressure ulcer definition and stages*. Available: <http://www.npuap.org>. Accessed 4 February 2014

Noonan, C. Quigley, B. and Curley, P. 2011. Using the Braden Q Scale to Predict Pressure Ulcer Risk in Pediatric Patients. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0882596310002319?np=y>. Accessed 15 January 2014.

Page, K. 2010. Development and validation of a pressure ulcer risk assessment tool for acute hospital patients. Available:

<http://web.b.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=3&sid=1c381b72-0ccd-4e9a-ac22-ce1bcdee6229%40sessionmgr198&hid=114>. Accessed 15 January 2014.

Papanikalou, P. Lyne, P. and Anthony, P. 2006. Risk assessment scales for pressure ulcers: A methodological International Journal of Nursing 44 (2007) 285-296

<http://course.sdu.edu.cn/G2S/eWebEditor/uploadfile/20140403113427410.pdf>. Accessed 18 July 2014.

Polit, D. and Beck, C. 2008. *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. 8th Edition. Philadelphia: Lippincott William and Wilkins.

Richardson, J. 2008. Inter-rater reliability of Glamorgan Paediatric Pressure Ulcer Risk Assessment Scale. Available: <http://web.b.ebscohost.com.ezproxy.centria.fi/ehost/detail/detail?vid=2&sid=75e0863c-bacc-4c4a-81a4-d37abcb696a3%40sessionmgr110&hid=114&bdata=JnNpdGU9ZWWhvc3QtbGl2ZQ%3d%3d#db=c8h&AN=2010084844>. Accessed 15 January 2014.

Routio, P. 2007. Tutkimuksen etiikka. Www- dokumentti. Available: <http://www2.uiah.fi/projects/metodi/051.htm>. Accessed 16 August 2014.

Rolstad, B. and Ovington, L. 2007. *Principles of wound management*. In R. A. Bryant, & D. A. Nix (Eds.), *Acute & chronic wounds: Current management concepts* (3rd ed., pp. 391-426). St. Louis, MO: Mosby.

Schlüer, A. Cignacco, E. Müller, M. and Halfens, R. 2009. The prevalence of pressure ulcers in four pediatric institutions. *Journal of Clinical Nursing*, **18**(23), 3244–3252. doi:10.1111/j.1365-2702.2009.02951.x. Available: <http://onlinelibrary.wiley.com/doi/10.1111/jspn.12055/full>. Accessed 20 August 2014.

Shannon, S. and Hsieh, F. 2005. Three Approaches to Qualitative Content Analysis. Available: <http://qhr.sagepub.com/content/15/9/1277.short>. Accessed 15 January 2014.

Tannen, A. 2009. Diagnostic accuracy of two pressure ulcer risk scales and a generic nursing assessment tool. A psychometric comparison. Available:

<http://web.b.ebscohost.com.ezproxy.centria.fi/ehost/pdfviewer/pdfviewer?vid=4&sid=1c381b72-0ccd-4e9a-ac22-ce1bcdee6229%40sessionmgr198&hid=114>. Accessed 15 January 2014.

U.S. National Library of Medicine. 2012. Braden Scale Source Information. Available: http://www.nlm.nih.gov/research/umls/sourcereleasedocs/current/LNC_BRADEN. Accessed 6 February 2014.

Willcock, J. 2010. A comparison of Braden Q, Garvin and Glamorgan risk assessment scales in paediatrics. Available: <http://www.sciencedirect.com.ezproxy.centria.fi/science/article/pii/S0965206X10000343?np=y>. Accessed 15 January 2014.