Nurses' Experiences of Pressure Ulcer Prevention

A Literature Review

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Abstract

Pressure ulcers are known as the localized damage to the skin that usually occurs due to bony prominence or related to medical devices and over the years, there has been an increasingly alarming prevalence of pressure ulcers particularly among elderly patients, that tend to decrease their mobility and causes decline in quality of life and quality of nursing care provided. For nurses especially, the prevention and management of pressure ulcers is a top priority; however, amidst different interventions applied, certain difficulties and challenges are still experienced by nurses as part of pressure ulcer prevention.

The research aimed at assessing the current experiences of nurses towards the prevention of pressure ulcers and understand its challenges and the purpose was to find appropriate interventions or measures in enhancing pressure ulcer prevention among elderly that can lead to positive changes in nurses' attitudes, methodologies, and practices. The method utilized was the literature review analysis. A total of 14 articles were chosen from three different databases: CINAHL, PMC, and Google Scholar. The original data was subjected to content analysis to present the nurses' experiences, challenges, and interventions towards pressure ulcer prevention.

The main categories identified are skin management interventions, nursing management interventions, pain and disease management interventions, and nutrition-related interventions. The findings provided key information on what specific interventions or measures are being applied by nurses that can help ensure to better manage and treat pressure ulcers that will help improve the overall condition and quality of life of their patients, and at the same time, can also help them to improve their attitude and practices towards pressure ulcer prevention and management. It also provided key understanding on what barriers or challenges are hindering nurses in providing effective pressure ulcer prevention for their elderly patients. The research recognizes the limitations of the study, thus, recommending future research on the impacts of specific interventions used for pressure ulcer and on the adequacy and effectiveness of tools and guidelines provided for nurses for pressure ulcer prevention.

Keywords/tags (subjects)

Pressure ulcer, elderly patients, pressure ulcer prevention, intervention, management of pressure ulcers

Miscellaneous (Confidential information)

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Contents

1 Introduction

One of the biggest and most commonly recurring challenges that hospitals face is the presence of 'pressure ulcers' among patients. Even though the development of pressure ulcers may be considered as a key indicator on the quality of nursing care that is provided among patients, there are certain situations wherein its presence or occurrence is simply unavoidable (Dilie & Mengistu, 2015). Pressure ulcers are referred to as the "localized damage to the skin as well as underlying soft tissues, usually occurring over a bony prominence or related to medical devices" (Mervis & Phillips, 2019). Some common risk factors for pressure ulcer development include incontinence, immobility, old age, co-morbidities, malnutrition, immunosuppression and neuro-sensory deficits which all lengthens exposure to shear and pressure (Ebi, Hirko, & Mijena, 2019).

Since pressure ulcers are seen as an indicator of the quality of nursing care administered to patients, it is important that nurses have the knowledge and skills to carry out proper assessment and evaluation of patients' who are susceptible to pressure ulcers (Dilie & Mengistu, 2015). In every healthcare setting, nurses are the first point of contact. Therefore, it is vital that they carry out best quality practices to prevent unnecessary suffering, ensuring that patients' skin integrity is maintained, and complications of pressure ulcers are prevented (Ebi, Hirko, & Mijena, 2019). The authors, Bhattacharya, and Mishra (2015) also added that pressure ulcers primarily develop because of shear and pressure that is common among people who are im-mobile or have been chair bound or bedridden for an exceptionally long time inside the hospital and other healthcare facilities. Unfortunately, the presence of pressure ulcers is often progressive which creates adverse effects on the quality of life of patients, even significantly limiting their social, physical, and financial well-being over time (Etafa, Argaw, Gemechu, & Melese, 2018).

In the United States, there are approximately 1 million patients who develop and suffer from pressure ulcers, with a considerable number experiencing death from its resulting complications (Etafa et al. 2018). In Finland, even though it has been stated that most stages of pressure ulcers are avoidable, they remain persistent. 13% of acute care patients, 16,5% of long-term care patients and 22% of home care patients are reported to suffer from pressure ulcers (Soppi, Livanainen & Korhonen, 2014). By this report, over 60% of pressure ulcers in Finland go unnoticed and the costs incurred by pressure ulcers in Finland have been evaluated to be approximately 2-4% of the annual healthcare costs.

The prevention and management of pressure ulcers among patients is considered a top priority for healthcare professionals, especially for nurses. This is because it is through the nurses´ critical decisions, as well as the way they execute management and prevention strategies, that the successful deterrence of pressure ulcer cases can be achieved. In other words, it is nurses who hold the biggest responsibility when it comes to managing and preventing pressure ulcers, among patients who are at most risk of acquiring it (Etafa et al. 2018). Unfortunately, amid prevalence and the high incidences rates of patients suffering from pressure ulcers, it was observed that most nurses' experiences difficulties and challenges in caring and preventing the occurrence of pressure ulcers among patients (Kim and Lee, 2019).

In addition, it was evident that many nurses possessed very little knowledge and skills regarding the most critical parameters in managing cases of pressure ulcers. Even the existing practices concerning pressure ulcer prevention proved to be uncoordinated and quite unreliable given the absence of logistical strategies and shortage of healthcare staff intended for the deterrence of such cases (Mwebaza et. al 2014). The authors Gupta, Loong and Leong (2012) also added that outdated management and preventive practices on pressure ulcers were very common and the knowledge of nurses on their roles in preventing and managing pressure ulcer were observed to be insufficient. All of these were deemed to have negative impact on the experiences of nurses in pressure ulcer prevention in many hospital and home care settings.

2 Pressure Ulcer

2.1 Definition of Pressure Ulcer

Pressure ulcers pertain to wounds on the skin or the tissue beneath the skin's surface. Alternatively referred to as "bed sores", this medical condition occurs when a person remains in the same position for an extended period of time, such as in a hospital or long-term care facility (Qaseem, Humphrey, Forciea, Starkey, & Denberg, 2015). In most cases, pressure ulcers can be extremely painful, take a long time to heal, and also increases a person's risk of infection. Pressure ulcers frequently occur where the skin meets the bone, such as for instance, on a person's hips, back, tailbone and shoulders. In terms of demographic profile, those who are at most risk of acquiring pressure ulcers are people of older age, either of Hispanic ethnicity or from the black race, those with

low body weight, those with physical or mental disabilities, and those who have diabetes, incontinence, and other progressive health conditions (Qaseem et al., 2015).

The development of pressure ulcer is as a result of reduced blood flow to the affected area which hinders the skin and underlying tissues of oxygen and nutrients. In terms of demographic profile, those who are at most risk of acquiring pressure ulcers are people of older age, either of Hispanic ethnicity or from the black race, those with low body weight, those with physical or mental disabilities, and those who have diabetes, incontinence, and other progressive health conditions that affect blood circulation (Qaseem et al., 2015). Also, individuals who have limited mobility (bedridden or wheelchair bound patients), sensory impaired patients are also susceptible to pressure ulcers.

Pressure ulcers have considerable impacts on patient care outcomes in aspects of patient well-being and health care delivery. Some of these impacts include pain and discomfort (open wounds and damaged tissues are sources of constant pain making it difficult for individual to get a comfortable position), nutritional impacts (pain and discomfort from wounds can reduce patient's appetite and thus body will lack nutrients to foster the healing process), (Saghaleini, Dehghan, Shadvar, Sanaie, Mahmoodpoor, & Ostadi, 2018). Because of the pressure ulcers and the areas that are affected, patients may be advised to limit movement to prevent irritation and more damage to those areas and might lead to muscle atrophy and joint contractures, which generally affects patient's physical functioning (Jaul, Barron, Rosenzweig, & Menczel, 2018).

Furthermore, pressure ulcers can hamper the normal healing process; the reduced blood flow to the affected areas (infection sometimes) usually slows down healing of the ulcer thereby prolonging the recovery time. Additionally, ulcers are open wounds which serve as a gateway for bacteria and other microorganisms to enter the body thereby increasing the risk of infections leading to other complications which will affect overall health, leading to sepsis and other life-threatening conditions (Demarré, Van Lancker, Van Hecke, Verhaeghe, Grypdonck, Lemey, ... & Beeckman, 2015; Roussou, Fasoi, Stavropoulou, Kelesi, Vasilopoulos, Gerogianni, & Alikari, 2023) .

2.2 Significance of Pressure Ulcer

Pressure injuries have garnered worldwide attention due to their adverse health effects and substantial economic impact (De Sousa & Faustino, 2019). A comprehensive analysis of cost estimates conducted in Europe revealed that the expenses associated with pressure injuries prevention care varied between €2.65 and €87.57 per patient, per day, across various healthcare settings and similarly, the cost range for PI treatment across several settings was determined to be €1.71 to €470.49 (Jiang & Lommel, 2020; Malinga & Dlungwane, 2020). The prevalence of pressure ulcers (PUs) in Europe varies from 4.6% to 27.2% in hospital settings, whereas the rate in the United States is reported to be 5.1% (Parisod, Holopainen, Koivunen, Puukka, & Haavisto, 2022). Studies have revealed that the Netherlands has the highest occurrence in the sacrum region and were classified as stage 1 but Finland recorded the lowest occurrence of Pressure ulcer of 4.6% (Moore & Patton, 2019).

In the United States, there are approximately 2.5 million patients per year who develop and suffer from pressure ulcers in acute facilities, with a considerable number experiencing death from its resulting complications and the National Pressure Ulcer Advisory Panel estimates an annual cost to the healthcare system to be $3.6 billion (Siotos, Bonett, Damoulakis, Becerra, Kokosis, Hood & Shenaq, 2022). In other regions such as in Central Latin America and Tropical Latin America, the highest prevalence rates of pressure ulcers have been observed based on a report published in 2019. Many other regions worldwide demonstrated a rising trend in the number of people suffering from pressure ulcers. This includes Southeast Asia whose prevalence rates rose from 59.6% to 71.1%, Southern Latin America which increased from 47.5% to 68.6%, and South Asia which rose from 28.6% to 35.5%, from the year 1990 to 2019 (Zhang, Zhu, Li, Xie, Liu, & Ouyang, 2021).

In Finland, even though it has been stated that most stages of pressure ulcers are avoidable, they remain persistent. 13% of acute care patients, 16,5% of long-term care patients and 22% of home care patients are reported to suffer from pressure ulcers (Soppi, Livanainen & Korhonen, 2014). By this report, over 60% of pressure ulcers in Finland go unnoticed and the costs incurred by pressure ulcers in Finland have been evaluated to be approximately 2-4% of the annual healthcare costs. According to another quantitative research carried out in a hospital in Finland in 2013 showed that there was a prevalence of 8.7%. In this same research, 224 patients were assessed for risk of pressure ulcer development and 1.7% were classified as very high risk, 17% were of high

risk and 26.2% were of moderate risk. Classification of pressure ulcers in Finland is done through HaiPro-incident, which is an anonymous, voluntary reporting system of patient safety incidents and has been created to improve patient safety and nursing staff safety (Nordberg, 2021).

Aside from the increasing costs that was being caused by the prevalence of pressure ulcer, physical health and psychological consequences was also another collateral damage of the said condition. In a study by Kim, Lyon, Weaver, Keenan and Chen (2020) regarding the discussion of psychological distress caused by pressure ulcer, it was revealed that psychological-related impact of the development of pressure ulcer includes the onset of symptoms of depression, characterized by lack of energy, anxiety, as well as insomnia due to sleep disturbance, thus resulting in general decline in the quality of life of patients and developing thoughts of how, aside from their current health condition, the contraction of pressure ulcer had made it more difficult for them to heal and thus rendered them immobile as well. It was also revealed how exhibiting psychological distress over pressure ulcer also showed a relationship on the pain experienced or pain intensity that can be heightened due to the anxiety and depression being felt by the patient. Physical health was also found to be at greater risk due to pressure ulcer or pressure injury, for instance, with elderly patients who are more prone to experiencing postural instability, changes in gait, slower movement, reduced cerebral blood flow, decreased nerve conduction velocity, shorter reaction time, and a decrease in both the size and number of neurons that can help them to react and move (Moraes, de Araujo, Caetano, Lopes and da Silva, 2012).

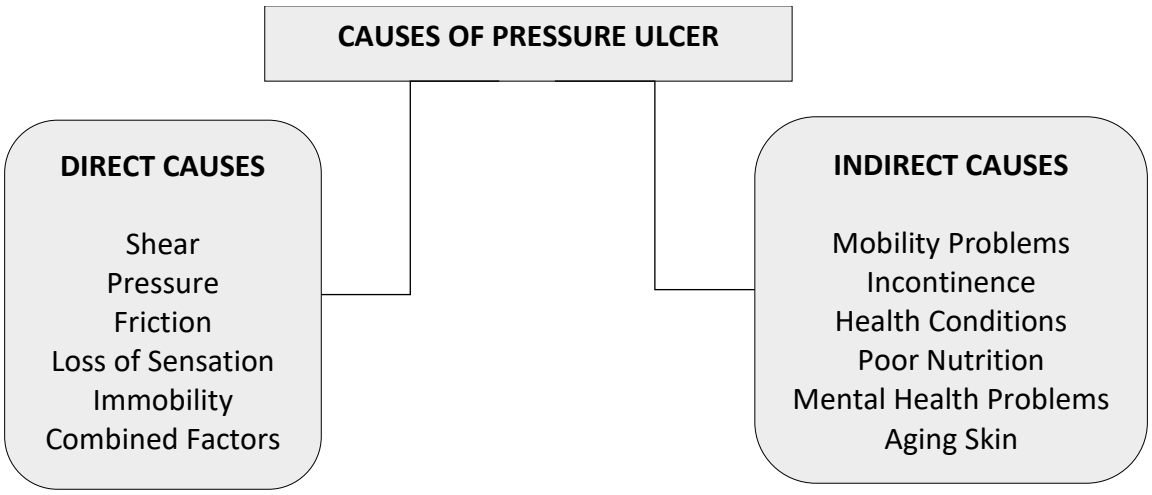
2.3 Causes and Stages of Pressure Ulcer

Causes

Pressure ulcers (PUs) typically occur as a result of a tissue injury that stems from when a specific area of the skin's blood supply is compromised due to pressure. Despite the fact that pressure ulcers are highly preventable, all patients especially those who have long been bed-ridden as well as those who remain in the same position for a long period of time, are at risk of suffering from this condition (Mitchell, 2018). Since the onset of the twentieth century, pressure ulcers have been recognized as one of the most expensive and physically debilitating condition, given its progressive nature and its frequency occurrence among people who are immobile (Bhattacharya & Mishra,

2015). The diagram below summarizes the top direct and indirect causes of pressure ulcers that occur among many patients (Bhattacharya et al., 2015):

Figure 1. Causes of Pressure Ulcer



According to Bhattacharya et al. (2015), the causes of pressure ulcers may be classified into two: direct and indirect causes. Pressure is one of the direct causes of pressure ulcer which entails the distortion of internal soft tissues that lead to skin atrophy. Shear is also another direct cause of this condition which results from putting significant pressure on certain parts of the body, as well as friction which similarly results from pressure, weakened skin and total skin breakdown. Immobility or a person's prolonged inability to move likewise increases pressure on certain body parts which lead to pressure ulcers. Moreover, a person's loss of sensation or the inability to produce the so-called "reactive hyperaemia", as well as combination of two or more of the abovementioned factors increases the risk of suffering from pressure ulcers (McGraw, 2019). On the other hand, mobility problems such as paralysis and insensibility are some of the indirect causes of pressure ulcers. Other indirect causes of this condition include poor nutrition or malnutrition, health conditions (e.g., heart disease, diabetes, etc.), incontinence and aging skin. Having a mental health problem also increases a person's risk of acquiring pressure ulcers due to the lack of self-care and personal hygiene (Black, 2019).

Stages

The National Pressure Ulcer Advisory Panel (NPUAP) revised the stages of pressure ulcer, and this was done to comprise the current understanding of the etiology and anatomical features present or absent in each stage of pressure ulcer (Edsberg et al., 2016). By this same report, revised staging system were said to use the term injury instead of ulcer and indicate stages using Arabic numerals rather than roman numerals. They were classified and described through staging systems which describes the extent of tissue loss and the physical appearance of the injury. Other research reveals that pressure injury staging acts as a base for treatment, comparison of outcomes and reimbursement where applicable.

As revised and reviewed by NPUAP, the staging or grading of pressure injuries includes identifying redness, blanching response, localized heat, oedema and hardness of the skin was classified as follows:

Stage 1 (Non-blanchable erythema): here, the skin is intact but with localized redness which does not change to white when pressure is applied (non-blanchable). Changes in sensation, temperature (warm or cold) and firmness (firm or soft) may lead to visual changes.

Stage 2 (partial-thickness loss of skin): there is partial loss of skin in this stage which affects the epidermis and sometimes the dermis. The wound at this stage looks like an open blister or shallow crater with reddish or pinkish wound bed. At this point, there might be fluid drainage with the surrounding tissues showing signs of inflammation.

Stage 3 (full thickness skin loss): at this point, the ulcer reaches the subcutaneous tissue which creates a deeper wound. Since there is full skin loss, fat is exposed and the wound has a higher risk of infection, but the fascia, bone, tendon, ligament, bone and cartilage are not exposed.

Stage 4 (Full thickness tissue loss): at this point there is an extensive loss of tissue exposing the muscle, bone or tendons, fascia, ligaments and cartilage. The wound is usually deep and has a high risk of infection as well as other complications like osteomyelitis or cellulitis. Depth of the damage tissue varies with anatomical location.

Unstageable (obscured full thickness loss and tissue loss): some pressure injuries are covered by dead tissues (eschar) or by yellowish, greyish, greenish, or brownish tissue (slough) and with this, the full extent of the wound cannot be seen. Until the necrotic tissue is removed, the wound is considered unstageable. If the eschar and slough are removed, the wound might be a stage 3 or 4 pressure injury.

Deep tissue pressure injury: This has been added newly to the staging system and may present as intact or non-intact skin. However, they are characterized by deep purple or maroon discoloration and are often associated with damage to underlying tissues. Pain and temperature often lead to skin color changes and results from intense and prolonged pressure and shear forces at the bone-muscle interface.

2.4 Prevention of Pressure Ulcer

Pressure ulcer prevention, which is considered a crucial part of effective nursing care, has become a primary focus of numerous healthcare facilities around the world (Getie, Baylie, Bante, Geda & Mesfin, 2020). Pressure ulcer prevention is focused on alleviating the risk factors for each patient and is centered on minimizing the episodes of prolonged skin pressure among patients, either through using appropriate padding at key pressure points or through the frequent repositioning of patients (Boyko, Longaker, & Yang, 2018). It is important to take note that urine, sweat and stool all lead to the softening of the skin. Thus, if the skin is overlying a specific pressure point, it may eventually lead to skin breakdown which may trigger pressure ulcers. For this reason, it is necessary to keep a patient's skin dry and clean and it must be considered as a focal point in preventing pressure ulcers especially for patients who are at high risk of acquiring it. Moreover, making routine positional changes, along with the provision of adequate padding for patients are also crucial in the prevention of pressure ulcer among immobile patients (Boyko et al., 2018).

In the UK, the SSKIN bundle was introduced as a set of healthcare interventions intended for preventing pressure ulcers. To successfully facilitate prevention of pressure ulcers, patients with a high risk of developing pressure ulcers are placed or subjected to the pressure ulcer preventive care bundle (Whitlock, 2013). Essentially, the SSKIN bundle is comprised of a five-point pressure ulcer prevention strategy which includes the following (Mitchell, 2018): (1) surface, (2) skin inspection, (3) keep moving, (4) moisture and incontinence, and (5) hydration and nutrition.

In the prevention of pressure ulcers using the SSKIN bundle, one of the priorities is the use of support or equipment surfaces intended for relieving pressure and pre-venting skin damage. Another priority is skin inspection or assessment which is crucial in preventing any form of skin damage, managing existing pressure ulcers, and preventing the further breakdown of skin (Loikkanen, & Tammi, 2016). Maintaining skin hygiene, which includes cleaning the skin and protecting the most vulnerable areas of the skin with devices that help redistribute or relieve pressure, also forms a vital part of the pressure ulcer prevention strategy (Sving, Fredriksson, Gunningberg, & Mamhidir, 207). Moreover, it is essential for high-risk pressure ulcer patients to keep moving or to be repositioned frequently. In fact, it is recommended for them to keep moving every 4 to 6 hours and that ideally, it must be the patients who must do it themselves. In repositioning patients, nurses and other healthcare staff must prioritize patient safety; as such, they must handle and assist patients when moving and their pain or discomfort must be evaluated, documented, and addressed (Mitchell, 2018).

The next important step in pressure ulcer prevention based on the SSKIN bundle is moisture and incontinence. Extrinsic moisture leads to skin breakdown, so, to successfully prevent pressure ulcer, any issues related to continence among patients must be addressed and healthcare workers must prioritize proper skin care management among patients (Beeckman, Van Lancker, Van Hecke, and Verhaeghe, 2014). Finally, hydration and nutrition must also be prioritized in preventing pressure ulcers as these are essential in facilitating the tissue repair process. Thus, it is the responsibility of nurses and other healthcare staff to properly assess the nutritional and hydration status of patients (Mitchell, 2018).

2.5 Management and Treatment of Pressure Ulcer

The detrimental impact of pressure ulcers on the quality of life of patients such as pain, discomfort, reduced mobility, risk of infection, psychological impacts, social isolation, long hospital stay, long-term complications and sleep disturbance highlights the importance of proper management and treatment of this costly and debilitating medical condition. As emphasized by Nuru, Zewdu, Amsalu, & Mehretie (2015), pain from pressure ulcer along with the discomfort from the patients' prolonged disease and extended time of rehabilitation, may all contribute to death and permanent disability. For this reason, it is only important to manage and treat this condition to avoid fatalities. The management and treatment of pressure ulcers involves a multidisciplinary approach

which aims at promoting wound healing, preventing complications and improving the overall well-being of the patient. It is worth noting that the individual treatment plan may vary depending on the stage of the pressure ulcer and patient's needs (Boyko, Longaker, & Yang, 2018).

Among the most common treatment options for pressure ulcers include basic wound management (e.g., dressing and cleaning the wound), active joint physiotherapy for improved circulation, proper nutrition (e.g., Vitamin C, iron, protein, zinc, etc.) and use of antibiotics to facilitate better wound healing, negative pressure wound therapy, hyperbaric oxygen therapy, and in some extreme cases, reconstructive surgery (Bhattacharya et al., 2015). Nevertheless, prior to performing any form of treatment for pressure ulcers, medical experts emphasize the importance of first identifying its causative factors, which may vary from patient to patient.

Key components for the treatment and management of pressure ulcer include pressure relief (repositioning, use of specialized support tools), wound cleaning (debridement), moisture control, infection control (if infected, appropriate antibiotics be prescribed, close monitoring of the wound for signs of infection), nutritional support (vitamins, minerals proper diet). Furthermore, pain should be managed as much as possible with analgesics and other pain management strategies. Rehabilitation and physical therapy are one of those management strategies which involves therapeutic exercises, range of motion exercises and other interventions to promote independence thereby improving mobility and preventing complications (Mervis & Phillips, 2019).

It is worth noting that management of pressure ulcer consists of all elements of pressure ulcer prevention including the use pressure reducing support surfaces, repositioning, and adequate nutrition. However, management also involves cleansing and debridement of wound, and other surgical management (Posthauer, Banks, Dorner, & Schols, 2015). Therefore, it is important to constantly monitor and reassess the pressure ulcer throughout the treatment process and to involve all health professionals like nurses, dieticians, physicians, and other health professionals.

2.6 Roles and Responsibilities of Nurses in Pressure Ulcer Prevention

The identification of pressure injuries is a patient safety action initiated by nurses that heavily relies on visual examination and clinical judgement (Mather, Jacques, & Prior, 2022). In fact, according to the study conducted by Tan, Cheng, Hassan, N. B., He & Wang (2020) as well as that of Jiang

et al. (2020) indicated that nurses bear the obligation of mitigating pressure injuries and assume a significant role in its prevention. Parisod et al. (2021) stated that in the majority of instances, pressure ulcers can be prevented, with the knowledge possessed by nursing personnel playing a pivotal role in the effective prevention of such injuries. Such prevention was also said to be effective especially when nurses possess advanced levels of education or specialized in the field of pressure ulcers or wound care nurses have superior knowledge and skills compared to their counterparts with lesser levels of education or those who do not practice in clinical settings. In addition, there also appears to be a positive correlation between the number of years of experience in the field of nursing and the attitudes exhibited by nurses in wound care and prevention. Sousa & Faustino (2019) stated that nurses play a crucial role within the multi-professional health team, serving as leaders of the nursing team and care managers. They are responsible for making decisions that facilitate the selection of optimal care procedures for hospitalized patients, with the goal of ensuring high-quality care. In order to ensure the provision of high-quality care, it is imperative to possess a comprehensive understanding of pressure ulcer that is grounded in scientific knowledge and supported by empirical evidence.

Malinga & Dlungwane (2020) also reiterated that nurses must have a strong foundation of knowledge, a positive mindset, and a commitment to employing evidence-based strategies particularly in dealing with pressure ulcer prevention. Nurses play a major role in pressure ulcer prevention (PUP) within healthcare settings. Nevertheless, patients also have the opportunity to contribute to this process by actively participating in their own care. Research has indicated that patient engagement in care has the potential to enhance patient safety, hence emphasizing the importance of patient involvement in pressure ulcer prevention and care (Roberts, McInnes, Wallis, Bucknall, Banks, & Chaboyer, 2016)

The fundamental responsibility of a nurse within a team is to evaluate persons who are at risk, implement interventions to remove variables that contribute to the development of pressure ulcers, and facilitate the healing process of these ulcers. The practices associated with Pressure Ulcer Prevention (PUP) involve the risk assessment for pressure ulcers, assessment of the skin condition, and provision of appropriate care. Additionally, activity management, nutrition management, moisture/incontinence management, support surface management, training, and registration are important aspects of PUP (Yilmazer, TÜZER, & ERCİYAS, 2019). A 2008 study cited by Carisson &

Gunningberg (2017) had examined the decision-making process of nurses regarding pressure ulcer prevention in the last 48 hours of a patient's life and was revealed that the nurses' primary objective was to ensure a positive end-of-life experience for the patient. However, this intention, along with the emotions of the nurses and the patient's relatives, as well as the prevailing culture within the ward, created a conflict between prioritizing pressure ulcer prevention while also providing comfort care.

2.7 Attitudes and Experiences of Nurses Towards Pressure Ulcer Prevention

Nurses generally play a vital role in preventing pressure ulcers, because often, they assess the patients' risks, implement prevention strategies, and provide care. Therefore, the attitudes and experiences of nurses towards pressure ulcer prevention have great impacts on the effectiveness of the efforts. According to Avsar, Patton, O'Connor, & Moore, (2019), attitude is learned and is affected by knowledge, behavioral intent and the amount of affection for or against an object. By this, attitude is used to express either positive or negative feelings towards a person. Implying that if a person holds a positive attitude towards someone, then there is an increase possibility of performance and vice versa.

Interestingly, although countless number of studies have already been conducted on the occurrence of pressure ulcer among patients, especially the elderly, healthcare professionals such as nurses still demonstrate negative attitudes as well as poor compliance on the clinical guidelines intended for the prevention of pressure ulcers (Dilie & Mengistu, 2015). With varying prevention strategies put in place, nurses have different experiences with implementing these strategies (repositioning, pressure redistribution devices and skin care) and their attitudes towards these strategies tend to influence the consistency in applying them (Dilie & Mengistu, 2015).

Research has shown that nurses are aware of the significance of preventing and managing pressure ulcers but find it challenging to offer high-quality treatment owing to competing objectives and obstacles at both the organizational and patient levels. Nurses intend to incorporate preventive methods and deliver optimal pressure ulcer care, but the complications of working in a hospital or other institutional settings makes this difficult (Barakat-Johnson, Lai, Wand and White, 2019). Also, nurses play a vital role in patient education about PU prevention. Their experiences in

communicating with patients can affect patient compliance with prevention strategies (Kang & Kim, 2021).

Though little research has been done to assess the experiences of nurses on pressure ulcer prevention, few studies revealed that nurses feel that all patients are at risk of developing pressure ulcer, and they think that treating PU is a lesser priority than its prevention. Also, nurses believed that PU could be avoided and not time consuming if there is continuous assessment of patients to identify patients at risk of PU (Etafa, Argaw, Gemechu, & Melese, 2018). Since nurses are responsible for assessing patients' risk for PU, their experiences in conducting assessments can impact the accuracy of risk stratification and the subsequent prevention measures (Kang, & Kim, 2021). This same study revealed that nurses' experiences with interprofessional collaboration can influence PU prevention outcomes because effective PU prevention often requires collaboration with other healthcare professionals such as physicians, physical therapists, and wound care specialists.

Etafa et. Al (2018), further suggests that nurses may have different levels of experiences and attitudes toward documentation which affects the quality of record, because proper documentation is required to track PU prevention efforts and outcomes. Moreover, nurses may experience emotional and ethical challenges when caring for the patients with PU, so they feel guilty or frustrated when ulcers develop despite their efforts, and this can affect their attitudes and job satisfaction.

Other studies reveal that nurses often demonstrate a positive attitude towards pressure ulcer prevention; but prevention practices are negatively affected by the lack of time and staff and by these barriers, the nurses' positive attitudes are prevented from being reflected into effective clinical practice (Tubaishat, Aljezawi, & Al Qadire, 2013). Furthermore, nurse's knowledge towards pressure ulcer prevention has been reviewed to be inadequate (Ebi, Hirko, & Mijena, 2019; Qaddumi & Khawaldeh,2014; Charalambous, Koulouri, Roupa, Vasilopoulos, Kyriakou, & Vasiliou, 2019). These studies have shown that nurses are confronted with certain challenges (heavy workload, time constraints, staffing shortage, limited resources) that affect their knowledge and the quality of care rendered to their patients.

2.8 Barriers that Nurses faces in Pressure Ulcer Prevention

Several factors serve as barriers towards the effective practice of strategies to prevent pressure ulcers among patients. These challenges can vary depending on the healthcare setting, patient population, and the resources available. These factors include the lack of staff, heavy workload, inadequate training as well as the lack of resources or medical equipment in many healthcare facilities, risk assessment, patient mobility, patient complexity, patient cooperation, communication, cultural and language barriers (Etafa et al. 2018). Barriers can be sub-divided into institutional, nurses and patient barriers.

Institutional Barriers

Research has shown that poor knowledge of nurses in PU prevention has resulted from lack of regular training of the nurses, lack of review on the prevention strategies and guidelines and lack of self-development. Among these factors formal regular training of the nurses is essential in updating the knowledge of the nurses on PU prevention (Ebi et al., 2019). Same study also revealed that majority of the nurses do not receive training on PU guidelines and risk assessment tools which results to inadequate knowledge. According to Qaddumi & Khawaldeh, 2014, training nurses on the recognition and prevention of PU helps prevent them and improve recovery.

Lack of PU relieving tools and resources

Resources such as PU beds and mattresses and manuals for their use are good for use in preventing PU (Hommel, Gunningberg, Idvall, & Bååth, 2017). This research showed that it is difficult to access PU prevention equipment and if accessed are always insufficient thereby making it difficult for nurses to familiarize with their uses. Therefore, inaccessibility, inadequacy, insufficiency, and lack of training on tools results in poor knowledge of nurses in prevention of PU.

For instance, in the study of Ebi, Hirko & Mijena (2019), it was discussed that in Ethiopia, the lack of pressure relieving devices was also pointed out as one of the common barriers for effective pressure ulcer prevention and treatment. The study found that a lack of pressure relieving equipment or device is the most commonly reported obstacle for nurses to engage in pressure ulcer prevention. Ethiopia is classified as a developing nation, yet there is still a shortage of medical

equipment provided to healthcare facilities. Implementing suitable equipment, utilizing turning charts, or upgrading mattresses can all serve as preventive measures; however, the absence of sufficient pressure relieving devices can impede the effectiveness of these preventive measures for combating pressure ulcers. Moreover, aside from the inadequate supply of pressure relieving devices, in the study of Mwebaza, Katende, Groves & Nankumbi (2014) it was also found that although there had been some pressure relieving devices that were found or available in medical wards, most of it are not being used and some are mostly use in neurology and thus signifying how little knowledge of some nurses or limited awareness of the availability of such pressure reliving devices had led in having only a few nurses to use pressure relieving devices on their wards

Nurses' Barriers

Lack of Motivation

Studies have shown that as a result of staffing shortages, heavy workload and poor salary, nurses had inadequate knowledge towards PU prevention which therefore hindered them from having time to carry out proper PU assessments and prevention on patients resulting from their inadequate knowledge and skills (Ebi et al., 2019). Other studies also revealed that nurses got demotivated to acquire more knowledge or training because of burnout, lack of support and other negative attitudes towards PU prevention. Kim & Lee, 2018 reviewed that the nurses with a positive attitude had a better knowledge of PU prevention than the ones with negative attitudes. On the other hand, developing nurses' knowledge through educational and training programs influenced nurses' attitude towards PU prevention (Charalambous et al., 2019).

Lack of Knowledge

Most nurses have also been proven to lack proper knowledge and understanding of how to effectively care for and prevent cases of pressure ulcers. For instance, in the study conducted by Kim & Lee (2019), it was observed that although nurses conducted regular assessment on the patients' risk factors for pressure ulcer, they failed to produce a proper preventive plan as part of their nursing care strategies. They also did not consider the patients' condition when making necessary changes on their nursing plans, thus, proper awareness and knowledge on the most effective pressure ulcer prevention practices are crucial in successfully addressing this problem, along with an open communication and a willful participation both nurses and patients in the clinical process.

In a study conducted in a Ugandan teaching hospital, assessment tools for PU were not used, pressure relieving devices were available in the wards but were not used because of lack of training (Mwebaza, Katende, Groves & Nankumbi, 2014). They knew the PU preventive measures but had little knowledge on risk assessment, clarification and observation and were dependent on the experts' opinions and other traditional ways than the scientific methods.

Nurses' grades and year of clinical experience

Years of clinical experience also contribute to the factors influencing PU prevention in several settings. As nurses develop throughout the years, they improve in their leadership and knowledge as well. From studies, nurses with little work experience demonstrated little knowledge of PU prevention while those with longer working experience demonstrated high level of knowledge (Mwebaza, Katende, Groves & Nankumbi, 2014).

Moreover, the research conducted by Alshahrani, Middleton, Rolls & Sim (2023) also revealed that as the number of years of experience increases, so does the level of expertise in preventing pressure injury and thus also plays a significant role in ensuring effective pressure injury prevention and treatment. Further, in the study of Köse, Yesil, Oztunc & Eskimez (2016) their findings also showed that there was in fact a significant difference between the nurses who had less than two years of experience and those who had more than seven years of clinical work experience. The preventive treatments for pressure ulcer scores of nurses with more than 7 years of experience were considerably higher compared to those with less than 2 years of experience and thus, it was concluded that the degree of knowledge among nurses in preventing and treating pressure injury will generally rise as their years of experience increase.

Patient Barrier

Critically ill patients

Same study carried out in the Ugandan teaching hospital revealed that patients were not cooperative, and others were aggressive making it difficult for the nurses to carry out effective PU risk assessment, repositioning thereby resulting in poor knowledge in PU prevention for the nurses. On

the other hand, the presence of other comorbidities like stroke, obesity, malnourishment, incontinence, old age, are some of the factors hindering effective PU assessment because most of the patients are bound to the bed (Mwebaza, Katende, Groves & Nankumbi, 2014).

Limited mobility, communication barrier, environmental factors and financial constraints

Patients with limited mobility may find it challenging to change positions regularly which is a high-risk factor for pressure ulcer development including bedridden and wheelchair bound patients. Patients who face language barriers, hearing disability or have difficulty in expressing their needs may have challenges informing about discomfort and understanding preventive schemes. Some patients in crowded or understaffed healthcare settings may experience delay in receiving assistance with repositioning or wound care. Those with limited financial resources may struggle to afford specialized support surfaces, cushions or nutritional supplements that can help in pressure ulcer prevention. This could also limit the patient's access to healthcare services and resources (Tubaishat, Aljezawi, & Al Qadire, 2013).

3 Aim and Purpose

The aim of this study is to assess the current experiences of nurses towards the prevention of pressure ulcers and understand challenges and difficulties that they face in pressure ulcer prevention. In relation to this research aim, the main purpose of this literature review is to find appropriate interventions or measures in enhancing the prevention of pressure ulcers among the elderly that lead to positive changes in the nurses' attitudes, work methodologies, and management practice. Given this information, the research question that this study intends to answer is: What interventions or measures have been shown to improve pressure ulcer prevention among the elderly and have made a positive impact on the nurses' attitudes, work techniques, and management?

4 Research methodology

4.1 Literature review

By definition, a literature review refers to a comprehensive method of collecting and synthesizing prior research that was conducted in a systematic manner. This research method establishes a

foundation in advancing knowledge as well as in promoting theory development through an integration of diverse and wide empirical findings intended to address or answer relevant research questions (Snyder, 2019). The authors Winchester and Salji (2016) also described literature review as that which constitutes a thorough and evidence-based examination of a specific subject, discipline, or body of knowledge. It involves a critical evaluation of the existing collective knowledge concerning a particular topic. In addition, Kraus, Breier, Lim, Dabic, Kumar, Kanbach, & Ferreira, J. (2022) asserted that when independently examined, literature reviews offer researchers the opportunity to deepen their comprehension of past contributions within their field, facilitating the identification of gaps that exist in the current body of literature, as well as setting potential directions for future research. Nevertheless, it should not be considered a mere exhaustive compilation of published works, as literature reviews must be presented as a personal yet impartial summary of relevant information about a certain topic (Winchester & Salji, 2016).

According to Maggio, Sewell, & Artino, (2016), a literature review is considered a critical component in research within the medical and nursing education field. The significance of literature reviews in the nursing context lies in its ability to answer research questions that provide practical healthcare guidance to patients, present the most reliable research evidence that impact their health decisions, shape and influence policy decisions, and pinpoint areas that may be improved in future research studies (Smith & Noble, 2016). A well-conducted and systematic literature review is characterized with a clear rationale for undertaking the review, emphasizing its significance in achieving effective patient care and health service delivery (Smith & Noble, 2016; Winchester & Salji, 2016). Additionally, Snyder (2019) asserts that a high-quality literature review involves a predefined search strategy and appropriate exclusion and inclusion criteria. These elements ensure a targeted and focused literature review process that utilizes only the sources that are most relevant to the given research question or topic.

In this research study, the primary objective is to attain an evidence-based understanding of previous research on the nurses' experiences with pressure ulcer prevention. The aim is to identify and understand the challenges and difficulties that nurses experience about the prevention of pressure ulcers among elderly patients, and at the same time, identify interventions or measures to

enhance the nurses' attitudes, work techniques, and overall management of pressure ulcer prevention in general nursing care. In alignment with these goals, a literature review is considered a suitable methodological approach to address the research aim and purpose in this study.

4.2 Literature search

Conducting a literature search is vital in the nursing field as this provides nurses with the opportunity to conduct critical analysis and understanding of health conditions and emphasizes the essentiality of providing evidence-based patient care that can allow them to adapt effectively to an increasingly complex and changing healthcare environment (McCabe and Timmins, 2005).

The literature search for this study was carried out based on a well-defined research question and a specific protocol that identifies the search terms and the established inclusion and exclusion criteria for this research. The researchers who are also the authors of this study, conducted the literature search along with the selection process for the relevant studies and journal articles. To minimize research bias, the researcher focused on answering the research question and strictly followed the protocol for the search strategy and the criteria laid out for the inclusion and exclusion of articles.

During the initial stage of the literature search, the researchers eliminated all duplicate entries and proceeded to choose articles based mostly on the relevancy of their titles and abstracts. Following this, the researchers thoroughly scrutinized and evaluated each article to determine whether or not they satisfied the established inclusion criteria. Before initiating the database search, the researchers took necessary measures to set an appropriate inclusion criterion, aiming to minimize the occurrence of bias and error that can affect the literature search process. Aside from this, according to Cook and West (2012) the proper selection of available electronic tools is also needed to be taken in consideration to obtain and analyse eligible studies across multiple databases.

Search Parameters

For this study, the researchers established the standard search protocol and parameters to ensure the precision of the methods employed as well as the conclusions drawn from it. Table 1 below

outlines the PICOS criteria applied in this study, along with the key search words utilized by the researchers presented in Table 2, the set inclusion criteria in Table 3, and the Prisma Flow Chart in Figure 2.

PICOS

The journal articles used in this study were obtained from three (3) key databases which includes the CINAHL (Cumulative Index of Nursing and Allied Health Literature), PMC (PubMed Central) and Google Scholar. Majority of the articles were primarily sourced out from PMC (PubMed Central) which provided access to full-text copies of the articles, as compared to those articles that were either inaccessible and/or required a certain cost to be accessed in full within the CINAHL and Google Scholar databases. The researchers utilized each database through the use of specific criteria which were labelled and identified in detail in Table 1.

In the PICOS (Population, Intervention, Comparison, Outcomes and Study) criteria table, the given research question in this study which is ``What interventions or measures have been shown to improve pressure ulcer prevention among the elderly and have made a positive impact on the nurses' attitudes, work techniques, and management?" has been deconstructed to meet the specific elements of the PICOS. The population under consideration include all nurses, nursing practitioners, or nursing staff of any age, nationality, gender and with a minimum level of work experience. The intervention for this study includes the specific nursing measures or healthcare interventions intended to prevent or manage pressure ulcers among patients in the elderly care settings. For this study, the alternative to the identified interventions has not been specified. The outcome focuses on the significant reduction in cases of pressure ulcers among elderly patients. And lastly, the criteria set for the selected articles for this study include those that were published from 2013 to 2023. These articles must also be freely accessible in full-text for all JAMK students, with available abstract, are peer-reviewed, and are considered as original studies in English language.

Table 1. Inclusion Criteria

Inclusion Criteria
Original articles published in English language
Full-text and Peer reviewed articles
Articles that answer research question
Articles published between the year 2013 to 2023
Articles accessed free for students at Jyväskylä University of Applied Sciences (JAMK)
Articles on pressure ulcer carried out in hospitals and elderly care setting

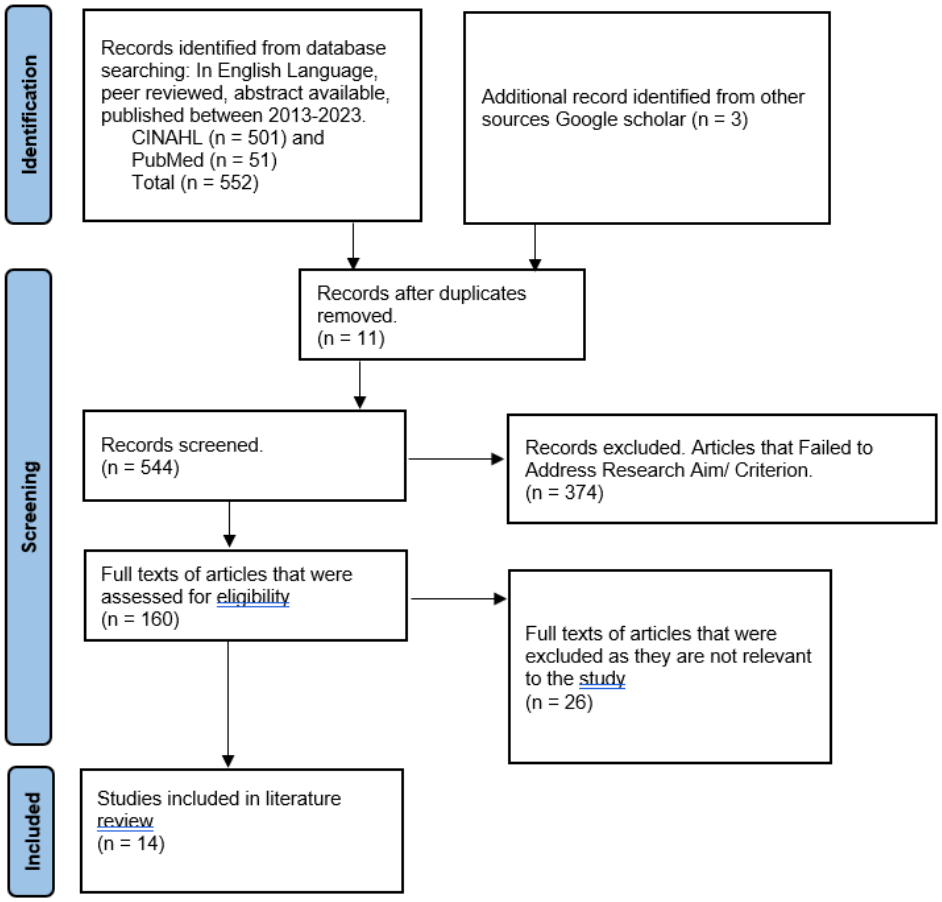
Table 2. PICOS Criterion

PICOS	**Criterion**
Population	All nurses, nursing practitioners, or nursing staff of any age, nationality, gender and with minimum level of work experience
Intervention	Nursing measure or healthcare interventions intended to prevent or manage pressure ulcers among patients in the elderly care settings
Comparison	Not specified
Outcome	Significant reduction in cases of pressure ulcers among elderly patients
Studies	Articles published from 2013-2023, peer-reviewed, original studies, English Language, abstract available, free text for JAMK students, and priority articles are those set in Finland, Sweden and other Nordic countries

Table 3. Key search words

Inclusion Criteria
Nurse OR Nurses OR Nursing
Pressure injuries, OR Pressure ulcers, OR Pressure sores, OR Bedsores, OR Decubitus
Prevention OR Intervention OR Treatment OR Program
Prevention OR Reduction OR Minimize
Elderly or Aged or Older or elder or Geriatric or Elderly People or Old People or Old People or Senior
Residential care OR Nursing home OR Long-term care OR Care home

Figure 2. Article Selection Process (PRISMA Chart)



For the literature review process, the researchers utilized three primary databases, namely CINAHL, PMC (PubMed), and Google Scholar, to search relevant papers and studies. The databases were selected based on the keywords provided in Table 2. A total of 555 research publications were initially identified in the study. Nevertheless, after eliminating the duplicates and doing a thorough examination of the title and abstract of each article, a total of 103 articles were deemed suitable for a comprehensive analysis. The preliminary screening and selection process were undertaken independently by the researchers in order to establish a consensus on the final number of publications that satisfied the criteria for this study.

Following a comprehensive screening process, the researchers selected a total of fourteen (14) journal articles for analysis in this study. The remaining publications were discarded due to their inability to effectively answer the research issue or fulfil the predetermined criteria. Figure 1 depicts the comprehensive screening procedure for the articles, as presented in a Prisma Flow chart.

The fourteen (14) chosen articles for this literature analysis were published in the following years: 2015 (2), 2018 (1), 2019 (4), 2020 (2), 2021 (2), 2022 (2), and 2023 (1). These journal articles were published in different countries such as the United States (4), New Zealand (1), Qatar (1), United Kingdom (1), Austria (1), Finland (3), Germany (1), Korea (1), and India (1). The chosen articles comprised of a combination of qualitative and quantitative data collection methods that included retrospective longitudinal study (1), cross-sectional study (1), case study design (1), cross-sectional multicentred study (2) quasi-experimental intervention study (1), randomized control trial study (1), pre-test and post-test design (1), literature review (5), and a theoretically driven development process (1).

4.3 Data Analysis

Data analysis, as defined by Taherdoost (2020), is a process that entails transforming collected data into meaningful information. It utilizes various techniques and modeling to identify predominant themes, data trends, and draw conclusions from a given set of acquired data or information. According to Bhatia (2017), the primary objective of data analysis is to convert complex data into a format that is easily comprehensible, readable, conclusive, and supportive of necessary decision-making processes. Typically, the data analysis process begins with initially determining what needs

to be measured which offers researchers a clear meaning and understanding of the main goal that the analysis aims to address (Bhatia, 2017). Content analysis pertains to the process of categorizing qualitative data through summary, classification, and tabulation of data. This type of analysis can be classified into three: (1) descriptive which specifically focuses on the data itself, (2) interpretive which seeks to understand the meaning behind the data, and (3) narrative which involves reformulating stories provided by respondents, taking into consideration the diverse experiences of the participants (Alem, 2020).

In the context of this study, the thematic analysis approach, which is one form of content analysis, was employed by the researchers to methodically organize and analyze intricate sets of data. It entails the systematic exploration of themes capable of encapsulating the narratives found within the provided data sets. This method also involves identifying these themes by means of thorough reading, re-reading, and analysis of the given data (Dawadi, 2020).

During the data collection preparation phase, the researchers conducted the standard search process and the in-depth screening of the articles. Subsequently, the researcher selected articles by reviewing and analyzing all the data collected, marking the specific texts that are deemed suitable and relevant for the study. This meticulous data extraction process is crucial to ensure that all important information that addresses the research questions is not over-looked (refer to Appendix 1 for the table of articles reviewed).

The analysis then followed a three-step process of open-coding, creation of categories, and abstraction as outlined by Elo, Kääriäinen, Kanste, Pölkki, Utriainen, & Kyngäs, (2014). First, the interventions or measures that have been shown to improve pressure ulcer prevention among the elderly and have made a positive impact on the nurses' attitudes, work techniques, and management were initially identified and recorded in a separate excel sheet. The primary aim was to derive evidence-based information that addresses the research question. Afterwards, the codes underwent proper sorting and all those that have similar content were placed into descriptive subcategories. Using the three-step data analysis process, the specific categories were abstracted for this study, with each category labeled based on its content. All the results were reported using actual narratives obtained from the articles selected as summarized in Table 4 below:

Table 4. The Three-Step Data Analysis Process

Category	**Subcategory**	**Themes identified from the research articles**
Skin management interventions	Skin inspection and care for the prevention of pressure ulcer injuries	• Daily skin assessment • The use of barrier creams • Management of incontinence associated dermatitis • Hydration and moisture management • The use of pressure redistributing devices • Routine repositioning and the use of support surfaces for pressure redistribution • Minimizing linen layers
Nursing management interventions	Proper nursing knowledge & practice in pressure ulcer management/ prevention	• Proper training for nursing staff • Accurate monitoring and documentation • Risk assessment
Pain and disease management related interventions	Managing various elderly diseases to prevent pressure ulcer injuries	• Pain management • Diabetes management • Continence care • Anemia correction
Nutrition-related Intervention	Adequate nutrition support	• Supporting patients during mealtimes to ensure • adequate nutritional intake • Conducting malnutrition screening • High protein diet supplementation • Use of oral nutritional supplements and protein or energy-enriched snacks

**The raw data include verbatim texts directly lifted from the selected journal articles*

5 Results and Findings

The findings for this study which are focused on the interventions and measures for improving pressure ulcer prevention among the elderly are presented into four (4) main categories: (1) skin management interventions, (2) nursing management interventions, (3) pain and disease management related interventions, and (4) nutrition-related interventions. Table 5 below presents a sum-

mary of the descriptive sub- categories and main themes derived from the data analysis. The succeeding sections present more detailed explanations of the data findings for this study, as supported by the information obtained from the selected journal articles.

Table 5. The Descriptive Sub-Categories and Main Themes Derived from the Data Analysis

Main Themes	**Descriptive Sub-Categories**
Skin management interventions	• Conducting daily skin assessment/ inspection in pressure ulcer prevention among elderly patients • Practicing routine repositioning as a preventive measure for pressure ulcers • The use of support surfaces for pressure redistribution and pressure redistributing devices as a pressure ulcer intervention strategy
Nursing management interventions	• Providing proper training for nursing staff on pressure ulcer prevention • Practicing accurate monitoring and documentation to prevent pressure ulcer injuries among elderly patients • Risk assessment practices among nurses for pressure ulcer prevention
Pain and Disease Management Interventions	• Pain management for pressure ulcer prevention among elderly patients • Practicing continence care for pressure ulcer management among the elderly • Comorbidity management for pressure ulcer prevention among elderly patients
Nutrition-related interventions	• Supporting adequate nutritional intake as a pressure ulcer intervention • Conducting regular malnutrition screening for pressure ulcer management among elderly patients

5.1 Skin Management Interventions

5.1.1 Conducting daily skin assessment

The practice of conducting daily skin assessment among elderly patients is one of the most important and effective interventions for the prevention of pressure ulcer occurrence among elderly

patients (Lavallée, Gray, Dumville, & Cullum, 2019). Maki-Turja-Rosted, Leino-Kilpi, Korhonen, Vahlberg, & Haavisto, (2020) emphasized the importance of nurses consistently assessing patients' skin, documenting observations, and using appropriate creams to address any skin problems present in the patients. Consequently, conducting a skin assessment is considered as a crucial practice that is advised as an integral part of any pressure ulcer risk assessment and it is advisable to perform this examination promptly upon admission and, upon repositioning, to briefly examine the pressure sites in a patient's body. Daily skin assessment was also essential in maintaining the cleanliness and dryness of patients' skin, as well as evaluating the presence of heat and edema in the skin and it is particularly crucial to pay attention to these aspects in patients with darker skin tones, but these practices are not commonly implemented as part of pressure ulcer prevention (Haavisto, Stolt, Puukka, Korhonen, & Kielo-Viljamaa (2021) and Volzer, El Genedy-Kalyoncu, Fastner, Tomova-Simitchieva, Neumann, Hillman, Blume-Peytavi, Hahnel, Sill, Balzer, & Kottner, (2023).

James and Abraham (2020) also underscored the importance of the nurses' early identification of signs of skin deterioration among their patients by means of conducting regular and timely interventions such as cleansing, moisturization, routines for pressure relief, and skin barrier protection. The use of barrier creams or any other type of cream is also deemed particularly useful as they can aid in preventing the further breakdown of the patients' skin (Lavallée, et al., 2019; Maki-Turja-Rostedt, et al., 2020).

Moreover, to minimize the instances of fecal-related skin contamination, it is crucial for nurses to implement effective incontinence management practices, which include proper toilet training for patients, ensuring the dryness and cleanliness of linens, and keeping the patients' skin folds dry and clean (James & Abraham, 2020). Furthermore, Eglseer, & Lohrmann (2019) and Floyd (2018) reported the significance of moisture management in pressure ulcer prevention as hydration plays a crucial role in the preservation of the patients' skin as well as the viability of their skin tissues and reduce skin damage and pain. In fact, it is important for the nursing staff to maintain and monitor their patients' hydration status ideally every two (2) hours (James & Abraham, 2020).

5.1.2 Practicing routine repositioning

Numerous literatures also emphasize the importance of implementing strategies and interventions specifically targeted to address the patients' decreased mobility which increases their risk for suffering from pressure ulcer injuries. This particularly highlights the significance of routine repositioning and the use of support surfaces for pressure redistribution (Maki-Turja-Rostedt, et al., 2020; Nadukkandiyil, et al., 2020; and Floyd, 2018). In fact, according to Maki-Turja-Rostedt, et al. (2020), it is important for nurses to be properly trained when it comes to repositioning procedures for their patients, which ideally must be in coordination with the patients' mealtimes. According to Nadukkandiyil, Syamala, Saleh, Sathian, Zadeh, Valappil, Al Hamad, (2020) and Bai, Wang & Ma (2021) and James and Abraham (2015), the ideal nursing practice entails strict compliance with the repositioning standard of as frequent as every 2 hours for every patient and recommended to utilize a pressure redistribution mattress, which should be used at regular intervals of every 4 hours. Another best practice according to Maki-Turja-Rostedt, et al., (2020) involves intentionally moving the patients' bodies to various positions that help relieve the pressures on their skin.

Haavisto et al. (2021) added that in terms of the specific practices in repositioning includes the practice of avoiding direct placement of the patient on tubes and drainages, and it was noted that the repositioning schedule and procedures should be adapted according to the patient's skin condition, with the least frequency of implementation. Bai et al. (2021) in their study, relayed that ensuring appropriate placement of the elderly and facilitating regular repositioning are critical strategies for the prevention of pressure ulcers and in alleviating pressure at the site of pressure and to a certain degree, it serves as a means of counteracting the body's physiological imbalances in reflexive functions. When facilitating repositioning for elderly individuals, nursing staff employ a technique involving the placement of their hands behind the shoulders and hips of the elderly patient, subsequently lifting them to effect a change in their position. In order to mitigate the risk of further skin damage among the elderly, it is advisable to refrain from engaging in activities such as lifting and pulling.

5.1.3 Use of support surfaces and pressure redistributing devices

Floyd (2018) in her study reiterated the importance of the usage of support surfaces as an intervention for pressure ulcer. In relation to this, according to Bhattacharya and Mishra (2015) the use

of pressure-release devices such as cushions and mattresses are helpful. It is recommended to maintain cleanliness and dryness of the skin and prompt removal of any pressure exerted on the skin or tissue is imperative to prevent any injury. The mitigation of external pressure on susceptible portions of the body's limbs can be achieved by the utilization of specialized mattresses, cushions, and various protective devices. These specifically engineered protective devices can provide significant assistance to patients who are deemed to be at risk of developing pressure ulcers, or who already have Grade 1 or 2 pressure ulcers. Moreover, patients who engage in prolonged periods of sitting are advised to utilize protective cushioning or constructed air mattresses to safeguard their bony prominence. Regularly altering body positions and relieve pressure on specific areas by engaging inside bending, front bending, and utilizing upper body muscles to push themselves off the chair can also be supplemental in the use of support devices to prevent pressure ulcers particularly among elderly patients. James and Abraham (2020) underscored the importance of nurses ensuring that all the linens used by their patients are always dry and clean.

5.2 Nursing Management Interventions

5.2.1 Providing proper training for nursing staff on pressure ulcer prevention

The authors Maki-Turja-Rostedt et al. (2020) emphasized the importance of providing proper training to all nursing staff, ideally at least once a year, to ensure that they are well-adept and knowledgeable on the most effective practices for the early detection and prevention of pressure ulcers among the elderly. As James and Abraham (2020) have argued, most immobile and bed-ridden patients are automatically at high risk for acquiring and developing various medical complications such as pressure ulcer injuries. As such, it is essential for nurses and caregivers to receive the proper and formal training for them to effectively prevent such conditions from occurring (Jacob, 2019).

Maki-Turja-Rostedt et al. (2020) also noted how educational sessions on pressure ulcer prevention subjects or protocol compliance have been implemented as a supplementary framework for its intervention and the most often cited supportive structure for facilitating the implementation of pressure ulcer prevention measures in long-term older people care (LOPC) facilities was the education and continuous training of nursing staff. Adequate training and education for care profession-

als are vital to ensure their proficiency in the prevention of pressure ulcers. The provision of pressure ulcer prevention training to care workers is anticipated to enhance their comprehension of the significance of pressure ulcer prevention and consequently, it was also through undergoing in these trainings, that their attitudes towards pressure ulcer prevention will become more favorable (Lee and Lee, 2022).

5.2.2 Practicing accurate monitoring and documentation

Accurate monitoring and documentation were also highlighted as one of the many strategies for pressure ulcer injuries particularly among elderly patients as this was deemed to be helpful in tracking closely the changes in the wound and how effective or not are the other applied interventions (Jacob, 2019). Lavallee et al. (2019) also discussed that the provision and monitoring of clinical interventions of this nature are considered fundamental aspects of care and should not be encompassed within a dedicated pressure injury prevention bundle, and rather becoming instead a basis of any changes or improvements that needed to be done by nurses. Regular and comprehensive documentation of skin assessment is needed to ensure that pressure ulcer injuries are being treated properly and that any adverse changes can be addressed immediately, and that appropriate alternative intervention will then be applied instead (Bai et al. 2021 and Haavisto et al. 2021).

5.2.3 Risk assessment practices among nurses

The initial stage in the prevention of pressure injuries involves conducting a risk assessment (Jacob, 2019), which begins prior to the patient's arrival and involves the exchange of information between nurses. This process typically entails the utilization of assessment tools in conjunction with clinical expertise, enabling healthcare providers to promptly address any alterations in the patient's health status and wherein the condition of the skin and assessment of moisture is also being conducted (Grinlinton, Merrick, Napier, & Neville, 2022). In doing so, different pressure ulcer risk assessment instruments are also being used to capture accurate observations (Maki-Turja-Rostedt et al. 2020).

It is imperative to underscore that with each instance of risk assessment, a thorough examination of the skin must be undertaken. In clinical practice, it is widely recommended to implement proac-

tive preventative interventions just for individuals who possess a heightened susceptibility to pressure ulcers. The Pressure Ulcer Risk Assessment Scale (RAS) is commonly employed as early as the 1960s for the purpose of assessing the risk of pressure ulcers. In fact, there are four established scales that are widely utilized for the assessment of hospitalized bedridden patients and the elderly. These scales include the Braden score sheet, the Norton score sheet, the Waterlow risk factor assessment sheet, and the Anderson risk index marking method and these scales are recognized for their maturity and practicality in evaluating the condition and risks associated with these patient populations (Bai et al. 2021).

5.3 Pain and Disease Management Interventions

5.3.1 Pain management

The onset of diabetes was cited by many previous studies to contribute to the prevalence and even in the slow healing of pressure ulcers. Patients, particularly elderly ones diagnosed with diabetes exhibit a heightened susceptibility to delayed wound healing, augmented phagocytic activity, heightened reactivity to pressure, and enhanced dermal blood perfusion and thus strict or close diabetes control and monitoring such as monitoring of glucose levels are needed (Jones, 2019 and Floyd, 2018).

On the other hand, another comorbidity is known to contribute to the increased prevalence of pressure ulcers. According to Nadukkandiyil et al. (2020) anemia is a prevalent hematological condition that affects the elderly and is often characterized by a multitude of contributing factors and since it causes a reduction in the delivery of oxygen to bodily tissues, this disease prevents the timely healing of pressure ulcers, even encompassing over six months of non-healing. The use of blood transfusion could potentially serve as a significant therapeutic intervention for individuals with low hemoglobin levels who are afflicted with pressure ulcers. In the treatment of pressure ulcer patients with anemia of chronic disease, medical interventions such as erythropoietin administration and intravenous iron supplementation, in cases of concurrent iron deficiency are commonly employed. Additionally, the use of supplementary measures, including the provision of vitamin B12 or folate supplements, in cases of concurrent deficiencies, may also be considered. Floyd (2018) also added that daily caloric intake is also being used as an intervention for this aspect to increase iron absorption and reduce further inflammation.

5.3.2 Comorbidity management

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5.3.3 Practicing continence care for pressure ulcer management

Incontinence-associated dermatitis is a type of skin inflammation that arises as a result of prolonged contact with urine or liquid stool and commonly occurs in patients who are bedridden. Continence care was highlighted by James and Abraham (2015) as an important intervention which involves the use of appropriate incontinence management strategies which encompass toilet training, the administration of moisture barrier ointment, the maintenance of clean and dry linens, as well as the upkeep of clean and dry skin folds. Volzer et al. (2023) added that this also involves regularly replacing incontinence materials used.

In the context of older patients experiencing incontinence, it is vital for healthcare professionals to prioritize the meticulous management of perineal skin care, and this is crucial in order to mitigate the adverse effects of excessive moisture on the local skin, hence preventing potential skin damage. In the management of urinary incontinence, patients have the option to utilize either diapers or urine pads. When cleansing the skin of senior individuals, it is advisable to utilize warm water and neutral soap, while incorporating milk-based preparations to mitigate the risk of severe skin dryness in this population. Moreover, skin protectants are also employed in the management of incontinence among patients to mitigate the risk of moisture exposure, hence decreasing the occurrence of pressure ulcers (Bai et al. 2021).

5.4 Nutrition - Related Interventions

5.4.1 Supporting adequate nutritional intake

The process of conducting a nutritional screening involves the utilization of a malnutrition screening method that has been deemed valid and reliable. The clinical guidelines pertaining to pressure injuries advocate for the implementation of malnutrition screening in all patients who are deemed to be at risk of suffering pressure injuries (Floyd, 2018). An increased level of knowledge among healthcare professionals on dietary issues in patients is associated with a reduction in the likelihood of pressure injury development. The utilization of a malnutrition screening tool enhances the nutritional practices of healthcare workers, resulting in increased referrals to dietitians and so demonstrating the enhancement of nutritional treatment quality. As such, they are tasked with conducting further nutritional assessments, devising personalized nutritional care plans, and overseeing the administration of nutritional therapy. Additionally, the involvement of all healthcare professionals within the multidisciplinary team is necessary to facilitate the execution of these interventions (Egsleer et al. 2019).

Weight monitoring is also another aspect of malnutrition screening (Maki-Turja-Rostedt et al. 2020). The practice of careful weight monitoring is commonly accompanied by the optimization of oxygen and blood supply, the preservation of mobility and muscle strength, the minimization of bedrest, the prevention of strokes, the cautious administration of antibiotics, and the careful consideration of pharmaceutical side effects of medications (Nadukkandiyil et al. 2020).

The implementation of interventions aimed at addressing malnutrition has the potential to mitigate the likelihood of developing pressure ulcers (Bai et al. 2021). Different nutritional disorders, including malnutrition, hypoproteinemia, and anemia, have been found to have a substantial impact on the healing process of wounds and can expedite the development of pressure ulcers. Nutrition assumes a crucial role in facilitating the wound healing process, particularly in the context of pressure ulcers. This is further compounded by factors such as advanced age, diabetes, and several other medical disorders that impede the attainment of sufficient nutritional intake and there is even a direct correlation between protein energy deficiency and the incidence and recovery of pressure ulcers (Bhattacharya and Mishra, 2015).

6 Discussion

6.1 Discussion of the main findings

Several pressure ulcer interventions were determined over the course of analysis of different related studies and articles pertaining to the use and effectiveness of pressure ulcer interventions particularly for elderly patients or in the elderly care setting. First, in terms of skin management interventions, the practice of daily skin assessment can be considered as the cornerstone for proper prevention and assessment of pressure ulcers. Skin assessment plays a pivotal role in terms of documenting any skin-related problems and identifying interventions that are applicable to used (Maki-Turja-Rostedt et al. 2020). As such, skin assessment also contributes to ensuring the cleanliness of skin, and early and proper identification of signs of skin deterioration that can further contribute to pressure ulcer (Haavisto et al. 2021; Volzer, 2023 and James and Abraham, 2015). The use of barrier creams and proper moisture management is also part of skin assessment and is also deemed essential to not just maintain but also monitor the hydration level and the onset of pressure ulcer in the skin of the patient (Egsleer et al. 2019 and Floyd, 2018; James and Abraham, 2015). Routine positioning was also another approach for skin management intervention, highly focusing on strategic repositioning particularly during mealtime with the use of pressure redistribution mattresses and regular hourly intervals that can help to effectively relieve their skin from pressure due to staying in the same relative position for a long period of time. The nurses also play a significant role in the repositioning of patients, and their knowledge of where they will place their hands for support are contributing factors for the effectiveness of such inter-

vention (Maki-Turja-Rostedt et al. 2020, Bai et al. 2021; Floyd, 2018). Support surfaces are also incorporated in the interventions, with the use of lines, cushions, mattresses and other available support devices, are helpful as a form of assistance for patients when moving or sitting and can also assist them in repositioning (Bhattacharya and Mishra, 2015 and Floyd, 2018).

Following this, there is also the nursing management interventions which involves the integration of adequate training for nurses to continuously improve their knowledge regarding pressure ulcer, what strategies can be used for its prevention and how important these interventions are needed to be applied, especially for elderly care patients. Training and educational programs are deemed essential in not just broadening the knowledge and skills of nurses but also to help them better understand the importance of the application of pressure ulcer interventions and improve their attitudes towards it as well (Lee and Lee, 2022; Jacob, 2019; Maki-Turja-Rostedt et al. 2020). The improvement of skills and proficiency of nurses in handling pressure ulcer can also be related on expecting improvements in the practice of accurate monitoring and documentation which is necessary in order to ensure that proper intervention is provided and that changes in the pressure ulcer condition of a patient will be keep in track and adverse effects will be addressed properly and immediately especially since the onset of pressure ulcer can greatly affect the quality of life of elderly patients (Haavisto et al. 2021; Lavallee et al. 2019; Jacob, 2019; Bai et al. 2021). Ensuring that proper intervention will be provided also encompasses the application of effective risk assessment practices by nurses. Further, the use of different available pressure ulcer risk assessment tools or instruments are considered a supplemental approach that can provide clinical nurses with a more accurate depiction of the pressure ulcer condition of the patient and can also allow them to further integrate other interventions or approaches that can specifically target or address identified risks that contribute in slow-healing of pressure ulcer (Maki-Turja-Rostedt et al. 2020; Grilinton et al. 2022; Bai et al., 2021; Jacob, 2019).

Another significant intervention for pressure ulcer is pain and disease management interventions. Since it is known that elderly patients have pre-existing health conditions or comorbidities, this makes them more susceptible to acquiring pressure ulcer. Comorbidity management specifically for diabetes and anemia are needed in order to ensure that glucose levels are at normal and so does their iron absorption. Anemia correction through blood transfusion, iron supplementation and the likes are also deemed necessary to ensure that the presence of diabetes and anemia will

not hinder proper and immediate healing of pressure ulcer while also causing immune deficiency among elderly patients (Jones, 2019; Floyd, 2018; Nadukkandiyil et al. 2020). On the other hand, there is also the pain management of pressure ulcers through the integration of having a pain management plan and the use of hyperbaric oxygen therapy that was recognized for alleviating pain felt by patients due to the onset of pressure ulcers aside from daily wound dressing, surgical debridement, and consumption of antibiotics (Bhattacharya and Mishra, 2015 and Jones, 2019). Continence care was also another significant intervention for pressure ulcer. The prolonged exposure of a part of the skin of a patient to stool or urine can lead to the development of incontinence-associated dermatitis; however, with the implementation of continence care such as toilet training, use of clean and dry linens, application of moisture barrier ointments was deemed effective part of the care. The use of warm water for cleaning, resorting to the use of urine pads or diapers and use of organic or neutral-based soaps were also considered to be part of an effective continence care for pressure ulcer management for elderly patients.

Several examined studies also mentioned the need for the integration of nutrition-relevant intervention that can also contribute for the effective management and prevention of pressure ulcer. The providing of support, promotion of an intake of a well-balanced diet usually high in protein and calories, intake of necessary supplements. Monitoring of hydration or water levels are all part of nutrition-related interventions. High-protein diets are especially recommended in order to improve the health of patients and reduce their tendency of accumulating pressure ulcer or can allow them to have enough bodily nutrients to speed-up their recovery against pressure ulcers. The combined effort and open communication between family members or relatives and healthcare professionals such as dietitians plays a significant role in supporting adequate nutritional intake for pressure ulcer prevention (Haavisto et al. 2021; Egsleer et al. 2019; Bai et al. 2021; Maki-Turja-Rostedt et al. 2020; James and Abraham, 2015). Aside from nutritional intake, conducting a regular malnutrition and weight monitoring was also deemed necessary for improved pressure ulcer management. According to some of the analyzed studies, regular health screening was found to be effective in the reduction of the onset of pressure ulcer and also in mitigating malnutrition that can trigger pressure ulcer development (Maki-Turja-Rostedt et al. 2020; Bai et al. 2021; Egsleer et al. 2019).

The clinical guidelines pertaining to pressure injuries advocate for the implementation of malnutrition screening in all patients who are at risk of suffering pressure injuries (Floyd, 2018). An increased level of knowledge among healthcare professionals on dietary issues in patients is associated with a reduction in the likelihood of pressure injury development. As such, they are tasked with conducting further nutritional assessments, devising personalized nutritional care plans, and overseeing the administration of nutritional therapy. Additionally, the involvement of all healthcare professionals within the multidisciplinary team is necessary to facilitate the execution of these interventions (Egsleer et al. 2019). It was also revealed that for nurses to prevent pressure ulcer development effectively, there must be availability of pressure ulcer relieving tools and risk assessment devices. Thus, it is important to include every item to prevent pressure ulcer development thereby promoting the health of the patients and improving their quality of life.

6.2 Validity and reliability

The ministry of Education, science and culture for Finland, appointed a board (Finnish Advisory Board) on research ethics (Räsänen & Moore, 2016) who has drawn up guidelines by which researchers use to encourage good conduct and conformity to scientific practices including procedures on how to deal with fraud and research malpractices. Therefore, it is the responsibility of the researchers to ensure that conclusions drawn from their research are based on valid findings. It is on this basis that the researchers retrieved their data from recommended evidence-based articles which were accessible to the students of JAMK, university of applied sciences.

According to the Finnish Advisory Board, the researchers must comply with the ethical guidelines and principles. By this, reliability is defined as the degree of consistency and dependency of the research and its findings. This is particularly important because it reflects the extent to which the study's findings are stable, consistent, replicated, and trusted (Elo, Kääriäinen, Kanste, Pölkki, Utriainen, & Kyngäs, 2014). On the other hand, validity refers to the extent to which the study measures what it intends to measure or accurately reflects the concept it claims to as-sess. It ensures that the study's findings and conclusions are meaningful and trustworthy (Heale, & Twycross, 2015).

For this study, there were two independent researchers who reviewed and analyzed original articles to cancel any bias that may arise from the findings (Honorene, 2017). Also, reporting the process of conducting the research step-by-step will allow for easy reproducibility enabling the readers to arrive at same or similar conclusions following the same procedures (Diaba-nuhoho & Amponsah-Offeh, 2021). The reliability of this study was enhanced because the search criteria were strictly followed (articles published from 2013-2023, peer-reviewed, in English, accessible to JAMK students). Also, the researchers have had many professional practices in different health settings (hospitals, elderly care, home care) having experiences about pressure ulcer and its prevention. This research and the knowledge acquired will help them in their future career as nurses in the prevention of pressure ulcer.

6.3 Ethical considerations and study limitations

Conducting research involves codes of conduct or guidelines that guide and direct the process of data collection and its analysis. These are published by ethics committees of institutions or organizations thereby ensuring that approvals and consents are obtained where required. Therefore, the researchers must ensure and proof that the research was conducted in an ethical manner supporting the findings. According to Taquette & Borges da Matta Souza, 2022, protecting the rights of the participants is a paramount ethical consideration. In literature review methodology, protecting human rights do not apply because it is secondary research but general ethical codes of conduct for research are still applicable. According to the Finnish national board on research integrity (2019), ethical considerations must be maintained through the process of the research. Therefore, the researchers are responsible for conducting the research in an honest, transparent and unbiased way, also giving credit to the works of other researchers. Lots of research has been carried out on the prevention of pressure ulcer prevention but there is limited research on the experiences of nurses and how the interventions have affected the nursing care in the various health care settings.

6.4 Critical appraisal

This is a step-to-step process of analyzing a research article carefully to deduce its trustworthiness, value and relevance to a specific context before making decisions for other research (Burls, 2014). It is important to critically appraise research studies because it allows researchers to use evidence

that are reliable, valid and relevant for the study also excluding those that are irrelevant (Burls, 2014). For this study, critical appraisal was used to enable the researchers develop necessary skills to analyze and make sense from the research articles and appraise their validity, reliability, and relevance to the study.

Research shows that studies are usually subjected to bias, but it is good for researchers to ensure that it is minimized as much as possible (Burls, 2014). By this, the study employed a literature review methodology to collect data, appraise them combining evidence relevant to the study while minimizing bias. In this study, 14 articles were used ensuring that their relevance to this study was trustworthy and evidence based.

Hawker et al., 2002, developed a quality assessment tool which is used to present critical appraisal review with parameters like the abstract, introduction, aims, sampling method, data analysis, ethical considerations, results and findings, transferability and usefulness reviewed. All these were used to review the articles for this study, analyzed and scored independently and then results were discussed and agreed upon by the authors of the study. The criteria for scoring included values like 4= Good, 3=Fair, 2= Poor and 1= Very poor. The appraised articles (n=14) for this study resulted in 2 articles scoring 31, 4 articles scoring 33, 3 articles scoring 34, 4 articles scoring 35 and 1 article scoring 36. Out of the 14 articles, the highest score obtained was 36 and a minimal score of 31. The maximum achievable score is 36. The mean score of the articles is 34, indicating the articles' good quality in relation to addressing the research issue and articles used for this study were reliable and relevant. A comprehensive examination of each article can be found in Appendix 2: Quality of Articles.

6.5 Conclusion and recommendations for further studies

Conclusively, if the nurses and other health care professionals undergo proper training on pressure ulcer prevention with all other challenges met (nurse motivation, pressure relieving tools, communication, proper documentation, less workload, enough staff, encouraging salaries), there will be a positive attitude in the nurses to carry out their nursing interventions effectively. Therefore, the key factors to promote pressure ulcer prevention are adequate level of nurses' knowledge, motivation, and communication in the various health care settings. From the research question, it follows that nurses have a large responsibility regarding pressure ulcer prevention but

are unable to effectively carry out the tasks due to the challenges that have been listed. However, if these challenges are met and the barriers broken, then the nurses' attitudes and skills will be improved, and quality of care will improve.

Organizing staff training sessions at least once a year is a necessity which will improve their knowledge and skills, guide them on the use of tools and devices for appropriate assessment and use for the prevention of pressure ulcer and its development. One of the barriers discussed was the educational level of nurses that affects the level of knowledge in pressure ulcer prevention. To address this, it will be good to carry out continuous assessment of nurses' knowledge for future studies on pressure ulcer prevention. Another factor affecting the prevention of pressure ulcer is environmental factors and this could be settled by hospital institutions and its leadership providing a favorable working environment which stimulates and motivates the nurses allowing them to deliver optimal nursing care to the patients. This could be done by employing enough staff which in turn will reduce the workload, increase the salary which will motivate them work more and better, provide tools that will enhance their work and free them from mental and physical breakdown.

While doing this review, some gaps in the research were identified which could be considered in other research. The need to ascertain that the interventions used to eliminate pressure ulcer and its development have yielded the impacts it intended to. Also, to confirm that the tools and guidelines laid down for nurses to use in the prevention of pressure ulcer are adequate and helpful.

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Appendices

Appendix 1. Table of Selected Articles

Authors, (Year),Country	**Title of the Study**	**Study Objectives**	**Methodology (Data collection method, research design and data analysis employed)**	**Main results**	**Critical appraisal (Hawker et. al 2002)**
Grinlinton, A. et al., 2022 (New Zealand)	Pressure injury prevention in Aotearoa New Zealand aged care facilities: A case study	This study aimed to investigate the factors that influence the prevention of pressure injuries in aged residential care settings.	Individual interviews were obtained and was analyzed using triangulation and pattern matching to identify and present themes.	The findings revealed that strong dedication to the prevention of pressure injuries, especially in aged residential care settings are still considered; however certain factors such as staff shortage and role demarcation proves gaps in the application of pressure injury prevention practices.	35
Nadukkandiyil, N. et al. 2020 (Qatar)	Implementation of pressure ulcer prevention and management in elderly patients: A retrospective study in tertiary care hospital in Qatar	The primary objective of this study is to examine the demographics profile, the clinical characteristics, as well as the risk factors among elderly patients, distinguishing between those with and with-out pressure ulcers.	The researchers carried out a retrospective longitudinal study among elderly patients (aged 65 and above) in a Qatar-based hospital	Based on the study's key findings, an early intervention that involves anaemia correction, a diet supplementation of high protein as well as repositioning the patient every 2 hours represents the optimal approach for pressure ulcer management. Consequently, these best practices are recommended for preventing pressure ulcers among the	33

				elderly. The integration of all available interventions to prevent pressure ulcers is considered beneficial for geriatric patients.	
James, J. & Abraham, R., 2015 (United States)	Effect of Education Interventions on Knowledge and Practice on SSKIN Care Bundle Pressure Ulcer Prevention	The objective of this study is to assess the impact of the structured teaching pro-gramme (STP) focused on the prevention of pressure ulcers among the caregivers of the elderly patients.	The study employed a specific research design involving one-group of participants subjected for both pre-test and post-test. This included a sample size of 30 participants gathered through the purposive sampling technique.	The structured teaching program (STP) proved effective in enhancing the subjects' understanding of the prevention of pressure ulcers through the SSKIN care bundle. This effectiveness was evident in the results of the subjects' post-test knowledge scores and practice, indicating that the structured teaching program is a valuable and well-received method for transmitting information.	33
Lavallée, J. et al. 2019 (United Kingdom)	Preventing pressure injury in nursing homes: developing a care bundle using the Behavior Change Wheel	To create a pressure injury prevention care bundle tailored for nursing home environments, incorporating input from nurse specialists and care staff, based on both theory and evidence.	The researchers applied a theoretically guided development process, initially identifying evidence-based practices for preventing pressure injuries. These practices constituted a preliminary list of potential behaviors for inclusion in the care bundle. Through a 4-hour workshop and additional email consultations involving 13 healthcare workers, they collectively determined the	The nursing home care bundle incorporated three fundamental aspects of pressure injury prevention, consistently found in care bundles. This included skin assessment, repositioning and the utilization of support surfaces. The researchers also recognized that the pressure injury prevention behaviors of nursing home care staff were influenced by opportunity, capability, and reflective motivation.	34

			primary target behaviors for the care bundle. They further examined with the staff the obstacles and facilitators to prevention efforts, defining intervention functions and behavior change strategies using the Behavior Change Wheel.		
Eglseer, D. et al., 2019 (Austria)	Nutritional management of older hospitalised patients with pressure injuries	The primary goal of this study was to depict the nutritional interventions administered to hospitalized Austrian patients aged 70 or older who either had or were at risk of developing pressure injuries.	Using a cross-sectional and multicentre study as its research design, the researchers also employed a standardized questionnaire in gathering demographic information and data with regard to the nutritional interventions, risk for malnutrition, care dependency and pressure injury risk of the participants. The data analysis involved the use of chi-square, descriptive statistics and independent t-tests.	The findings of this study indicate that the nutritional care provided to older patients at risk of developing pressure injuries is not optimal. While the evidence-based guidelines clearly outline recommended interventions, only a minority of patients in clinical practice were able to receive the said interventions, which included screening on malnutrition, dietitian referral and the provision of snacks or food that are enriched with protein and energy.	35

Haavisto, E. et al., 2021 (Finland)	Consistent practices in pressure ulcer prevention based on international care guidelines: a cross-sectional study	The goal of the study was to determine the validity and reliability of pressure ulcer practices prevention for patient safety and ensure quality of care provided.	The study utilized the pressure ulcer prevention practice (PUPrep) instrument that can help assess the perceptions of the respondents on the frequencies of their application of pressure ulcer prevention practices in the scale of: never, sometimes, often, always.	The results of the study revealed that the prevention practice that was most employed was repositioning, while the practice that was least commonly utilized was nutrition and these practices were often followed on a moderate levely by nurses and that the PuPreP instrument was also found to be valid and reliable for its gathered results.	35
Maki-Turja-Rostedt, S., et al. 2020 (Finland)	Consistent practice for pressure ulcer prevention in long-term older people care: A quasi-experimental intervention study	To create, implement, and assess the effects of a revitalized and consistent practice for preventing pressure ulcers in long-term care for older individuals.	The researchers implemented a quasi-experimental intervention study. Data were gathered at both the initial stage and post-intervention in January 2016 and January 2017, respectively, employing a structured questionnaire. The Pressure Ulcer Prevention Practice (PUPreP) instrument, formulated for this study in accordance with international pressure ulcer prevention guidelines, was utilized.	In the facility where the intervention was implemented, there was an improvement in reference to the international guidelines with regard to the frequency of pressure ulcer prevention practices related to nutrition, risk assessment, documentation and the pressure-relieving devices. In addition, significant improvement was observed across all 6 areas of agreement on practices in the intervention facility.	36

Volzer, B. et al. 2023 (Germany)	Enhancing skin health and safety in aged care (SKINCARE trial): a cluster-randomized pragmatic trial	The aim of the study was to determine and analyze the effects of the implementation of skincare and prevention package for pressure ulcer prevention.	Utilized a two-arm cluster-randomized controlled trial wherein an evidence-based structured skincare and prevention program was tested for six months in nursing homes selected for the study.	With the application of the skincare and prevention program, it was found that skin tears, intertrigo and pressure ulcers declined and showed lower mean skin dryness as well as the effect of itch, pain etc.	35
Lee, S.B and Lee, H.Y. 2022 (Korea)	Impact of pressure ulcer prevention knowledge and attitude on the care performance of long-term care facility care workers: a cross-sectional multicenter study	The objective of this study was to examine the impact of knowledge and attitude pertaining to pressure ulcer prevention on care performance.	Structured survey questionnaire was used to assess the attitude, knowledge and care performance as it was related to pressure ulcer prevention for elderly persons or patients.	The results revealed that knowledge, attitude, work experience and number of trainings received have a positive imapct on the care performance on pressure ulcer prevention.	34
Bai, Jie et al. 2021 (Finland)	The prevention of pressure ulcer for elder-literature review	The objective of the study is to examine the issue of pressure ulcers among elderly individuals who remain in bed for extended periods of time. Additionally, this study aims to explore preventive measures for pressure ulcers, raise awareness about the topic, enhance the quality of life for chronically bedridden patients, and ultimately decrease the occurrence of	Literature review was used to collect and analyzed relevant studies regarding pressure ulcers, technology, experience and can help result in having a more proactive care for pressure ulcer prevention.	The findings of this study indicate that older individuals who are bedridden for extended periods face a significant likelihood of acquiring pressure ulcers. However, it is worth noting that the majority of pressure ulcers can be effectively prevented. The medical personnel are capable of promptly evaluating the risk of pressure ulcers, actively adjusting the patient's position, employing specialized equipment for pressure ulcer prevention, safeguarding the integrity of the skin,	33

		pressure ulcers.		monitoring the individual's nutritional status, and implementing other interventions aimed at averting the development of pressure ulcers.	
Jacob, Yanick. 2019 (United States)	Nursing knowledge on pressure injury prevention in the intensive care unit	The objective of this study was to implement an educational intervention targeting intensive care nurses, with the aim of enhancing their knowledge on pressure injury prevention. Additionally, the study sought to assess the impact of this educational program by comparing pre- and posttest responses among elderly patients in the intensive care unit, as a measure of increased nursing knowledge.	Literature review together with the utilization of the Pressure Ulcer Knowledge Test or also known as the Pieper test to determine the knowledge of nurses in terms of PI prevention and address PI concern in the application of pressure injury prevention for elderly patients.	The findings revealed that high pressure knowledge resulted in 85% improvement on injury prevention: 76% for wound description and 62% in Branden scale. Moreover, according to the pre- and posttest answers of the participants, involvement increased the nurses' knowledge.	33
Jones, Druscilla Willis. 2019 (United States)	Hospital-acquired pressure ulcer prevention	The purpose of the study was to determine whether an education program would improve the nurses' understanding of HAPU (hospital-acquired pressure ulcer) prevention, early detection, symptoms, and treatment for staff nurses working in an acute care	The literature search and review were applied as methods of the study for analysis of EBP guidelines for the HAPUs assessment, prevention and also with its treatment. In addition, for the pre- and post-test, fifteen nurses and five medical	Based on the results of the study, it showed that the NetCE score results showed that medical assistants' scores increased from 35 to 65, while nursing staff members' scores improved from 65 on the pretest to 100 on the posttest indicating understanding of the assessment, prevention and treatment of hospital-acquired pressure ulcers.	31

		perioperative department with a high HAPU incidence among elderly patients.	assistants took a standardized pretest from NetCE.		
Bhattacharya and Mishra, 2015 (India)	Pressure ulcers: current understanding and newer modalities of treatment	The objective of this study was to evaluate the mechanisms, symptoms, causes, severity, diagnosis, prevention, and recommendations pertaining to both surgery and non-surgical approaches for managing pressure ulcers.	Literature search and review was conducted in order to gather and review related studies regarding the different approaches towards managing pressure ulcer or pressure injuries epseically in eldery patients.	The current treatment options encompass a range of strategies for wound cleansing, debridement, utilization of optimized dressings, the administration of antibiotics, and the consideration of reconstructive surgery. Moreover, the more recent therapeutic modalities, including negative pressure wound therapy, hyperbaric oxygen therapy, and cell therapy, have been the subject of discussion.	31
Floyd, N.A. 2018 (United States)	Effectiveness of pressure ulcer protocols with the Braden scale for elderly patients in the intensive care unit: a systematic review	The objective of this research was to assess the utilization of the Braden Scale within a comprehensive pressure ulcer intervention strategy, commonly referred to as a care bundle, in order to identify elderly patients admitted to the intensive care unit (ICU) who were susceptible to developing pressure ulcers.	The study was conducted using the guidelines outlined in the Cochrane protocol. The results were presented in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis statement. A comprehensive search technique was employed across six electronic databases, resulting in the identification and review of 409 studies. From this pool, a subset	Ulcer prevention programs employ various strategies to mitigate the risk of pressure ulcers, including risk assessment, daily reassessment of risk, regular skin inspections, moisture removal techniques, nutritional support and hydration, as well as offloading pressure. In the intensive care unit (ICU) setting, the Braden Scale has demonstrated effectiveness in identifying individuals at risk of developing pressure ulcers. Furthermore, the implementation of evidence-based care bundles has proven effective in preventing the occurrence of pressure ulcers and reduce healthcare costs.	34

			of 11 studies was selected for analysis, and their data was incorporated into a literature review matrix to facilitate synthesis.		

Appendix 2. Critical Appraisal

Author	Abstract and Title	Introduction and aims	Method and data	Sampling	Data Analysis	Ethics and bias	Results	Transferability and Generalizability	Implication and usefulness	Total Points
Grinlinton, A. et al., 2022 (New Zealand)	4 Adequate information was provided on the abstract and also where the study was conducted.	4 Provided a clear depiction of PIs in aged residential care specifically in New Zealand and the background of the aged residential care in Aotearoa in New Zealand.	4 Individual interviews were conducted in order to obtain a well-rounded response from the participants.	4 Good thing to include staffs of two aged care facilities for unbiased obtaining of data and to be able to see differences or similarities in their responses despite from being in different aged care facilities in the same town.	4 Data analysis and steps are provided and explained thoroughly.	4 Ethical considerations were provided to ensure the anonymity of the participants from the two selected aged care facilities.	3 Identified themes were not categorized if a factor or an intervention but have sufficient explanation of results.	4 The results can be useful and also be generalized or transferable to other aged care facilities in other countries.	4 The findings can be helpful in making improvements in improving staff level and the knowledge and skills of nurses for improvement PI prevention as applied in aged care facilities.	35

Nadukkandiyil, N. et al. 2020 (Qatar)	4 The tile is clear and indicated the setting of the study. The abstract is also clear in providing an overview of what the study is all about.	4 Though a little bit short, the introduction was concise in explaining pressure ulcer and also laid out clearly the aim of the study.	4 Utilized a retrospective longitudinal study for a specific period of time.	3 The sampling of respondents was only taken in a single facility setting in a selected hospital in Qatar.	4 Statistical analysis section provided a brief yet concise discussion on how the data will be analyzed.	3 Ethical approval was sought but no further detailed discussion on how the privacy and identification of the respondents will be assured.	4 The results provided numerical and non-numerical findings and was all supported by different studies or articles.	3 The generalizability of the study is limited as it only included as small sample size and is conducted in a single facility setting thus also limiting further analysis as affected by other variables or factors.	4 Been able to highlight other practices or interventions that can be used and be further improved as part of pressure ulcer prevention.	33
James, J. & Abraham, R., 2015 (United States)	4 Title and abstract are both concise and clearly depicted the study and its findings.	4 Provided useful information to provide overview of the prevalence of pressure ulcer in various countries.	4 Use pre- and post-test design to compare results after educational intervention was applied or tested.	3 Sampling was determined using convenient sampling.	4 Detailed explanation of the different tools used for analyzing the data and scores for the pre- and post-test.	3 Ethical clearance was sought but again, no detailed information on assuring the privacy of respondents and their personal information	3 Graphical presentation of findings was present but lacking further discussion of findings.	4 Transferability is high as this can also be applied in other elderly care facilities in other countries.	4 The findings are helpful in emphasizing the importance of developing a more structured teaching program for improved PU prevention of caregivers in the elderly care setting.	33

						and identity.				
Lavallée, J. et al. 2019 (United Kingdom)	4 Title was concise and abstract is divided clearly in parts that makes it easier to read and understand.	4 Background provided key information about pressure injuries, its prevention and the importance of care bundles.	4 The method utilized are properly and concisely laid out in the journal.	4 Used the purposive sampling to ensure that the participants are those who already have experience in nursing home setting.	4 Data analysis process was also concise, with graphs and stages.	2 No ethical considerations and approval were discussed or stated.	4 The results were able to address the objective of the study and provide a care bundle for PU prevention.	4 Transferability and generalizability are high as care bundle can be applied for elderly patients both in hospital and nursing home setting.	4 The findings can be applied for continuous improvement of application of PU prevention care bundle in nursing home setting.	34
Eglseer, D. et al., 2019 (Austria)	4 Key information about the study was clearly provided in the Title and Abstract of the study.	4 Background mainly focused on not just pressure injuries but also in the vital role of nutritional interventions for its improved prevention.	4 The applied method was also detailed and provided.	4 A large sample of respondents was included in the study for better variation and representation of responses.	4 Different statistical tools and its uses was also detailed in the study.	3 Abided by the Code of Ethics by the World Medical Association and sought approval of local ethics committee for the conduct of the study.	4 The findings were able to answer the research questions and presented the common nutritional interventions for pressure injuries.	4 Transferability and generalizability are high due to the large sample used.	4 The findings were able to highlight the equally important role of nutritional interventions for pressure injuries prevention.	35

Haavisto, E. et al., 2021 (Finland)	4 Abstract and title is concise and easy-to-read or follow.	3 Introduction is brief but clearly explained the prevalence of PUs and care guidelines for PU prevention. The aims or objectives are also clearly stated.	4 The method utilized is concise and also applicable for the intended objectives of the study.	4 A relatively large sample was used and two hospitals and featured two types of care provided – primary and specialized care.	4 Clearly stated the statistical tools used in the study.	4 Ethical considerations and detailed process was provided.	4 The results are concisely presented and easy to follow or understand.	4 Transferability and generalizability are high due to the large sample used and can be applied in two different types of care.	4 The findings were able to add to increasing knowledge with PU prevention.	35
Maki-Turja-Rostedt, S., et al. 2020 (Finland)	4 The title and abstract of the study were brief yet informative.	4 The goals were clearly stated and enough information was provided as background for the study.	4 A quasi-experimental approach was used to compare results of the application of an intervention.	4 Large sample was obtained to effectively compare two older people care facilities.	4 Well-detailed data analysis process and tools discussed.	4 Permissions were gathered from the target respondents and ethical consideration was practiced or applied.	4 The findings are well-presented and answered the questions of the research.	4 Generalizability is high due to the large sample used.	4 The results contributed in aiming to have a more systematic development of PU prevention practices.	36
Volzer, B. et al. 2023 (Germany)	4 Title and abstract	4 Background is complete and the	4 The methods and tools used	4 Numerous randomly selected nursing	4	3 The approval of the ethical	4 The findings are presented	4 Generalizability is high due to	4 Emphasized more the importance of a	35

	are complete in details	overall aim of the study was also stated plainly.	was also presented in detail and is applicable for the aims of the study.	homes were selected for a variety of responses for effective comparison.	The process of data analysis is also provided.	committee was sought but lacks further detail.	well and have supporting studies.	variety of nursing homes selected for the study.	structured skincare program for effective PU prevention.	
Lee, S.B and Lee, H.Y. 2022 (Korea)	4 The abstract is divided in several parts and is easy-to-read and follow.	4 The background and aims is focused on Korea and provided an overview of the prevalence of pressure ulcer in Korean elderly persons.	4 The methods encompassed the needed variables to be explored in the study.	3 The sample is vast but too focused on Korea.	4 Rigorous data analysis and its processes are provided in the study.	4 Ethical considerations are provided and details on how to ensure the privacy of respondents are also stated.	4 The results are well-presented and are aligned in the research objectives of the study.	3 The generalizability of the study is limited as it only focused on Korea.	4 Can be helpful in standardizing better the clinical guidelines being used in pressure ulcer prevention for elderly persons or patients.	34
Bai, Jie et al. 2021 (Finland)	4 The main purpose of the study was clearly indicated in the abstract and its target	4 The background is brief yet concise.	4 The selection of methods for data gathering process is applicable with the	3 The sampling is focused on the elderly care setting	4 Well-detailed data analysis process was also provided in the paper.	2 No ethical considerations or process was provided in the study.	4 The results are well-organized and is in detail and thus being connected with differ-	4 The transferability and generalizability of obtained knowledge and findings can be applied not only for elderly patients but	4 The findings are useful in contributing in knowledge regarding risk factors and practices for pressure ulcer prevention.	33

	recipients in the title .		aim of the study.				ent supporting studies. s	also for other patients and in other type of healthcare.		
Jacob, Yanick. 2019 (United States)	3 Title is short yet concise. Abstract is quite short but somehow still informative.	4 Introduction provided key details and objectives and purposes of the study was also outlined.	4 Instrumentation used was also explained in detail.	3 Not enough information or explanation was provided for the used sampling.	4 Date analysis process was explained in detail.	3 Sought approval and adherence to ethical and federal regulations.	4 Results were presented well and able to answer the research questions and purposes stated at the beginning of the study.	4 Transferability is expected as this is deemed to bring positive change in PI prevention practices.	4 The findings can be useful in increasing awareness and improved handling of pressure injuries and can bring positive change to patients' quality of life and health.	33
Jones, Druscilla Willis. 2019 (United States)	3 Title is also short and abstract part was detailed but quite difficult to determine specific parts	4 Key details are provided in the background or introduction and so did the purposes of the study are also provided.	4 Research instruments or methods are also explained or discussed in detail for easier understanding and its	3 Insufficient information on the sample or sampling of the study.	4 Key processes involved in the data analysis stage are also detailed in the paper.	2 No ethical consideration or approval was sought.	4 The findings were presented well and aligned with the research questions and purpose of the study.	3 Transferability and generalizability are quite expected as this can also be applied in other nursing care or clinical setting.	4 Results were able to show continuous improvement of practice guidelines for HAPUs assessment, prevention and treatment are needed to also increase	31

	of the paper itself in the abstract.		specific purposes and even provided a brief background of those tools.						knowledge of it by nurses, particularly those taking care of elderly patients.	
Bhattacharya and Mishra, 2015 (India)	4 Title and abstract are labelled and key details about the study is present.	4 Adequate information regarding the definition and the factors associated with pressure ulcer was provide and also the aim of the study. s	3 Methodology used was not thoroughly explained in the paper.	3 Insufficient detail regarding the sample included in the study.	3 Same with the methodology, no explicit information about the data analysis process was provided.	2 No ethical consideration or approval was stated.	4 The findings, on the other hand is presented thoroughly, supplied with supporting studies and other relevant data.	4 Transferability is expected as pressure ulcer strategies can also be used in healthcare and elderly care setting.	4 The results can be expected to add to the existing body of knowledge especially with regards to the new or modern strategies for pressure ulcer prevention or interventions.	31
Floyd, N.A. 2018 (United States)	4 The title is concise and the abstract is easy-to-read and also contains	4 Introduction was brief but have relevant details for understanding	4 Methodology and used instruments are discussed properly.	4 Adequate information was provided for the samples used.	4 Thorough discussion of the processes of data analysis was also provided in the study.	2 No ethical consideration or approval was stated.	4 The findings are complete in thought, engaging and providing new knowledge.	4 Transferability is high pressure ulcer methods can also be applicable in other healthcare settings.	4 Positive and continuous change in the pressure ulcer prevention and treatment can be expected.	34

	signifi-cant find-ings of the study.	pressure ul-cer and its prevention.								

Appendix 3. Categorization Table

Source	**Themes identified from the research**	**Subcategory**	**Category**
Floyd, N.A. 2018 (United States) Lavallée, J. et al. 2019 (United Kingdom) Maki-Turja-Rostedt, S., et al. 2020 (Finland) Haavisto, E. et al., 2021 (Finland) Volzer, B. et al. 2023 (Germany)	Daily skin assessment	Skin inspection and care for the prevention of pressure ulcer injuries	Skin management interventions
Floyd, N.A. 2018 (United States) Eglseer, D. et al., 2019 (Austria)	Hydration and moisture management		
Lavallée, J. et al. 2019 (United Kingdom) Maki-Turja-Rostedt, S., et al. 2020 (Finland)	The use of barrier creams		

James, J. & Abraham, R., 2015 (United States)	Management of incontinence associated dermatitis		
Floyd, N.A. 2018 (United States) Bhattacharya and Mishra, 2015 (India)	The use of pressure redistributing devices		
Floyd, N.A. 2018 (United States) Maki-Turja-Rostedt, S., et al. 2020 (Finland) Nadukkandiyil, N. et al. 2020 (Qatar) James, J. & Abraham, R., 2015 (United States) Bai, Jie et al. 2021 (Finland) Haavisto, E. et al., 2021 (Finland)	Routine repositioning and the use of support surfaces for pressure redistribution		
Maki-Turja-Rostedt, S., et al. 2020 (Finland)	Minimizing linen layers		
Maki-Turja-Rostedt, S., et al. 2020 (Finland)	Proper training for nursing staff	Proper nursing knowledge & practice in pressure ulcer management/ prevention	Nursing management interventions

James, J. & Abraham, R., 2015 (United States) Lee, S.B and Lee, H.Y. 2022 (Korea)			
Jacob, Yanick. 2019 (United States) Lavallée, J. et al. 2019 (United Kingdom) Bai, Jie et al. 2021 (Finland) Haavisto, E. et al., 2021 (Finland)	Accurate monitoring and documentation		
Jacob, Yanick. 2019 (United States) Maki-Turja-Rostedt, S., et al. 2020 (Finland) Grinlinton, A. et al., 2022 (New Zealand) Bai, Jie et al. 2021 (Finland)	Risk assessment		
Lavallée, J. et al. 2019 (United Kingdom) Jones, Druscilla Willis. 2019 (United States)	Pain management	Managing various elderly diseases to prevent pressure ulcer injuries	Pain/ Disease-management related interventions

Bhattacharya and Mishra, 2015 (India)			
Jones, Druscilla Willis. 2019 (United States) Floyd, N.A. 2018 (United States)	Diabetes management		
James, J. & Abraham, R., 2015 (United States) Volzer, B. et al. 2023 (Germany) Bai, Jie et al. 2021 (Finland)	Continence care		
Nadukkandiyil, N. et al. 2020 (Qatar) Floyd, N.A. 2018 (United States)	Anemia correction		
James, J. & Abraham, R., 2015 (United States) Haavisto, E. et al., 2021 (Finland) Floyd, N.A. 2018 (United States) Nadukkandiyil, N. et al. 2020 (Qatar)	Supporting patients during mealtimes to ensure adequate nutritional intake	Adequate nutrition support	Nutrition-related Intervention

Eglseer, D. et al., 2019 (Austria)			
Floyd, N.A. 2018 (United States) Eglseer, D. et al., 2019 (Austria) Nadukkandiyil, N. et al. 2020 (Qatar) Maki-Turja-Rostedt, S., et al. 2020 (Finland) Bai, Jie et al. 2021 (Finland) Bhattacharya and Mishra, 2015 (India)	Conducting malnutrition screening		
Maki-Turja-Rostedt, S., et al. 2020 (Finland)	High protein diet supplementation		
Maki-Turja-Rostedt, S., et al. 2020 (Finland) Bai, Jie et al. 2021 (Finland)	Use of oral nutritional supplements and protein or energy-enriched snacks		