



The prevention of pressure ulcer for elder- literature review

Jie Bai, Dan Wang, Xiaoping Ma

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The background of this thesis is that in today's aging global social conditions, more and more older people need to be taken care of, with insufficient medical staff and facing increasing work pressure. We study and collect experience and related techniques to summarize the relevant knowledge about pressure ulcer prevention, which in turn can help to improve the quality of life of the long-term bedridden elderly people, prevent the occurrence of pressure ulcers, and reduce the subsequent work pressure of medical staff.

The purpose of this thesis is to discuss the problem of pressure ulcers in the old people who are in bed for a long time, and the methods of prevent pressure ulcers. The aim is to increase awareness of the subject, improve the quality of life of chronically of bedridden patients and reduce of pressure ulcers.

The method of this study is a narrative literature review. The goal of the method is to collect and comprehensive medical domain knowledge of pressure ulcers, experience, and technology, thus more conducive of nurse in clinical nursing work, so that in the field of corresponding nursing, especially for long-term care of older people. can be more efficient and proactive care, reducing the generation of pressure sores or delay the development of potential pressure ulcers.

The results of this thesis are that long-term bedridden elderly people have a high risk of developing pressure ulcers, but most pressure ulcers are preventable.

The researchers concluded that the risk factors of pressure ulcers were affected by directional force, limited body position, skin condition, nutrition, age, disease, etc. Medical staff can timely assess the risk of pressure ulcers, actively change the position, use some pressure ulcers prevention equipment, protect the skin, monitor nutritional status and other measures to prevent the occurrence of pressure ulcers.

Keywords: Pressure ulcer, Prevention, Nursing interventions, Elder

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1 Introduction

The article is about how to effectively prevent pressure ulcers in the elderly who are bedridden for a long time. Long-term bedridden elderly, self-care ability decline, life needs to be taken care of, and often accompanied by loneliness, self-esteem affected and needs change, and so on psychological pressure. If in the long-term bedridden life, produced for bedridden patients are prone to pressure ulcers, is undoubtedly more heavy patient pain.

Pressure ulcers, also known as bedsores, have become a high-incidence complication of bed rest (Huang 2017). In today's global aging society, more and more elderly people need to be taken care of. However, due to the shortage of medical staff, medical staff are not only facing increasing work pressure, but also unable to allocate more energy to better take care of the bedridden patient. Therefore, the incidence of pressure ulcers in elderly bedridden patients is increasing year by year. Once the pressure ulcer occurs, patients will face tremendous psychological pressures. Moreover, the occurrence of pressure ulcers will not only increase the patient's suffering, death risk, and readmission rate but also increase the economic burden of medical treatment and the difficulty of clinical care. It also affects the smooth recovery of the disease (Zhang 2017).

Senior nursing experts believe that the occurrence of pressure ulcers is a shame for nursing work. Once a pressure ulcer occurs, it is regarded as a nursing error, and this situation will cause a lot of unnecessary work pressure for the nursing staff. Many family members of patients even think that the occurrence of pressure ulcers is a medical accident, which triggers disputes between doctors and patients. In addition, the cost of prevention and treatment of pressure ulcers varies greatly. Although the cost of providing pressure ulcer prevention for long-term bedridden patients can seriously affect the budget of healthcare services, the cost of treating pressure ulcers is much higher (Demarre et al. 2015).

The objective of this thesis is to summarize the mechanisms and risk factors of pressure ulcers and obtain the prevention and reduction of pressure ulcers. To help improve the quality of life of the long-term bedridden elderly and reduce the follow-up work pressure of medical staff.

This thesis aims to summarize effective nursing interventions for preventing pressure ulcers in long-term bedridden elderly.

2 Definition of pressure ulcers

Pressure ulcers refer to soft tissue damage and necrosis caused by long-term compression of local tissues, blood circulation disorders, persistent local ischemia, hypoxia, and malnutrition.

Early pressure ulcers were called "bedsore" (Decubitus Ulcer) (Kottner et al. 2009; Li et al. 2012). In the 1970s, Pressure Ulcer (PU) was commonly used to refer to pressure ulcers. The American Pressure Ulcer Group renewed defined pressure ulcers in 2007. They believe that pressure ulcers are local damage to the skin and underlying soft tissues, and it is usually in bone protrusions or related to medical or other equipment. The definition of pressure ulcers jointly proposed by the National Pressure Ulcer Advisory Panel (UAP) and European Pressure Ulcer Advisory Panel (EPUAP) in 2009 has been widely recognized. Clay (2008) mentions that pressure sores are pressure, or pressure combined with shear and/or friction, causing local damage to the skin and/or lower tissue, which are usually on bone protrusions. The authors also show that pressure ulcers are also associated with other confounding factors that promote pressure ulcer generation. In 2016, NPUAP proposed that "Pressure Injury" is more exact y than "Pressure Ulcer" and they updated the definition in the official statement. Pressure injury refers to the localized damage that occurs in the skin and subcutaneous tissue. It is usually in the bone protuberance or the part in contact with the medical device, and it can be expressed as intact skin or open ulcers may be accompanied by pain. Intense, long-term pressure or pressure combined with shear force can lead to pressure ulcers. Factors such as microenvironment, nutritional status, tissue perfusion and comorbidities can also affect the degree of force tolerance of the pressure and shear of local tissues. Finally, it affects the occurrence of pressure ulcers (Ahn et al. 2016).

3 The mechanism of pressure ulcers

At present, the research on the pathogenesis of pressure ulcers is still under exploration. The following three theories have been widely recognized. They are the theory of microcirculation disorders, the theory of cell deformation, and the theory of ischemia-reperfusion injury. The current research point of view is that pressure ulcers are the result of multiple inducements and contributing factors, and mechanical force is the most important factor leading to the occurrence of pressure ulcers. From the perspective of pathophysiology, when the pressure acting on the skin surface or subcutaneous tissue exceeds the minimum pressure that the tissue can withstand, it will cause local tissue ischemia and hypoxia, resulting in pressure sores (Wang 2008). The degree of tissue tolerance to pressure is related to the health of the body, the anatomical location of the tissue, and the type of tissue. Under normal circumstances, the maximum pressure that the capillaries of healthy tissues can withstand is 10-30 mm Hg. (Lyder and Ayello (2008) believe that the blood pressure in normal capillaries ranges from 20 to 40 mmHg, with an average value of 32 mmHg.) When the external pressure exceeds the maximum pressure that the capillaries can withstand, the capillaries will close and shrink, and blood circulation will be blocked. As the compression time increases, Capillaries will undergo a series of changes, such as dermal papillary capillary stages, venule

congestion stages, lymphocyte infiltration stages, thrombosis stages, haemorrhage stage. Then it will develop into subepidermal bullae and epidermal degeneration. Finally, it will become early ulcers (Hu et al. 2011). Animal model experiments show that the length of compression also determines the degree of tissue damage in addition to the force. Prolonged high pressure will inevitably lead to the occurrence of pressure sores. Studies have shown that the compression strength above 9.3 kPa lasts for 2 hours Can cause irreversible damage to the tissue (Defloor 1999). The theory of ischemia-reperfusion injury believes that intermittent or continuous pressure or shear force can cause severe and irreversible ischemic damage to the skin and subcutaneous tissues. Therefore, nutrients and gas cannot be supplied to the damaged area of the skin. Reperfusion can bring cytokines and reactive oxygen species, which makes it easier to cause tissue necrosis repeatedly and pressure sores. After ischemia-reperfusion injury, the massive release of oxygen free radicals and calciumion overload can cause the denaturation of cell proteins and DNA, which can lead to irreversible damage to cells and lead to cascade amplification effects (Li et al. 2015).

This tissue damage is caused by the continuous deformation of tissue caused by pressure acting vertically on the tissue surface and shear stress acting parallel to the tissue, either alone or in combination. The degree of resistance to this deformation varies depending on the type of tissue, and the local environment, tissue blood flow, age, general conditions, comorbidities, and tissue condition can also affect tissue durability (Chan 2005).

4 Related factors of pressure ulcers

Pressure ulcers are the result of a series of influencing factors. At present, there is no single factor that can explain the occurrence of pressure ulcers alone (Coleman et al. 2014; Aljezawi 2014). Comprehensive related research, the researchers in this thesis have roughly divided the pressure ulcer-related factors into three categories: endogenous factors, exogenous factors and treatment-related factors. Exogenous factors refer to the external mechanical forces acting on the skin and subcutaneous tissues, which are the main causes of pressure ulcers, including vertical pressure, shearing force, and frictional force. Endogenous factors are referred to some of the characteristics of the patient's own existence that weaken the ability of the skin and subcutaneous tissue to resist external mechanical forces. It includes physical disturbance, malnutrition, disturbance of consciousness, age, and so on. Treatment-related factors mainly refer to factors that may increase the exposure of patients to exogenous factors and endogenous factors during treatment, such as the use of certain medical devices, the use of sedative drugs or anaesthetics, and so on (Ahn 2016; Bluestein 2008; Jaul 2010; O'Byrne 2016; Gyeonghyeon and Chan 2021).

4.1 Exogenous factors

4.1.1 Pressure

The intensity and duration of pressure are important factors in the development of pressure ulcer, Long-term pressure on the body or repeated low-pressure perfusion in a short period of time can cause pressure ulcers (Clay 2008).

According to the National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) pointed out that when the local pressure is >30-35 mm Hg for 2-4 h, it can cause irreversible ischemic damage to the local tissues. A pressure of 55 mm Hg is applied to the joints of the lower limbs (bone carina) of the mouse. When the compression time is longer than 2 hours, the skin squamous epithelial tissue gradually becomes thinner, the cell structure and layers are gradually unclear, and the subcutaneous oedema becomes more and more obvious as the time passes; After 4 hours, the squamous epithelium and the dermis began to peel off, the vascular congestion and subcutaneous haemorrhage in the dermis became more and more serious, and neutrophils and mast cells swam out and infiltrated (Xu et al. 2015). Bouten et al (2003) conducted a cell culture of mouse skeletal muscle cells in vitro and established a model of tissue damage. They found that pressure-induced muscle cell deformation is an important factor in causing pressure ulcers. Muscle and adipose tissue are the most sensitive parts. When the pressure spreads through the skin from shallow to deep, Muscle and adipose tissue appear degeneration and necrosis first. Because when there is visible damage on the skin surface, the real problem is actually muscle damage. The study found that the highest contact pressure between the bone process and the muscle fascia when pressed. At this time, pressure may cause damage to deep tissue much worse than that seen on the skin surface (Clay 2008).

4.1.2 Friction

Friction refers to the force generated when the skin and the contact surface are displaced relative to each other. Friction can destroy the keratinocytes of the skin, causing hyperemia, edema, hemorrhage, inflammatory cell aggregation and dermal necrosis in the skin tissue (Huang et al. 2014). In addition, friction can cause the temperature of local tissues to increase. For every 1°C increases in temperature, the oxygen consumption of tissue metabolism needs to increase by 10%, which will eventually affect the tissue oxygen supply and accelerate the occurrence of pressure sores (Pan 2014).

4.1.3 Shear force

Shear force is generated when the relative displacement between the adjacent surfaces of two layers of tissue occurs, and it is generated by the superposition of pressure and friction in

opposite directions. Shear force is closely related to body position (Amir et al. 2017). It often acts on the deep layers of the skin. It can cause relative displacement of tissues, block the blood supply of deep tissues, and accelerate the process of skin damage, so it is more harmful. Shear forces can cause blood vessels to twist and cut off the blood supply to a larger area. Under an optical microscope, comparing the shearing force and the pressure, Liang et al (2012) found that the shearing force caused muscle fibre oedema, striated ruptures and interstitial widening. If the shearing force lasted longer than 30 minutes, it could cause irreversible tissue damage. At the same pressure and shear force, the shear force is more likely to cause deep tissue damage. Goldstein et al (1998) applied the same vertical pressure and shear force to the greater trochanter and bilateral iliac ridges of pigs, and they found that the shear force damages the skin earlier than the vertical pressure. Therefore, the harm of shear force is far greater than the pressure in the vertical direction.

4.2 Endogenous factors

4.2.1 Restrictions on movement and behavior

Movement and behavior limitation refers to the limitation of the patient's ability to change the body position autonomously, which causes the patient's local tissue to be compressed. It is a necessary condition for the occurrence of pressure ulcers (Allman et al. 1995). Restriction of movement affects multiple systems such as bones, muscles, circulation, digestion, breathing, and skin. Therefore, bedridden patients such as spinal cord injury, aging, postoperative immobilization. are extremely high-risk groups of pressure ulcers (Ham et al. 2017; Coleman et al. 2014; Gelis et al. 2009).

4.2.2 Sensory disorders

Sensory disturbance refers to the limited ability of the patient to feel the painful stimulation caused by the compression of the limbs, which affects the patient's main position change. It may cause in continuous compression of the body part, which increasing the risk of pressure ulcers. So paraplegia, Coma and the elderly are at higher risk of pressure ulcers. (Amir et al. 2017; Coleman et al. 2014; Aljezawi et al. 2014).

4.2.3 Poor tissue perfusion

Decreased tissue blood perfusion affects tissue oxygenation, resulting in weakened tissue tolerance. When blood flow is insufficient, the body compensatively shunts blood from the skin and other secondary organs to important organs, so the skin tissue is in a state of hypoperfusion. Ischemia and hypoxia accelerate Pressure ulcers occurred in the skin tissues (Aljezawl et al. 2014; Gelis et al. 2009; Sanada et al. 2008). Yang et al (2007) conducted experiments on rats and they found that ischemia-reperfusion can aggravate oxygen free

radicals, tissue cells and vascular endothelial damage. Oxygen free radicals play an important role, and the degree of damage aggravates with time. There is the most obvious damage in 4 hours. This conclusion is consistent with the conclusions of Sundin et al (2000) and Liang et al (2016). Ischemia-reperfusion injury is closely related to the inflammatory response mediated by neutrophils, which can also aggravate cell tissue damage (Zhang et al. 2011).

4.2.4 Malnutrition

Many scholars (Amir et al. 2017; Roberts et al. 2015, Brito et al. 2013) believe that malnutrition is closely related to the occurrence of pressure ulcers. When the body is undernourished, it can happen in several situations. Such as (1) the catabolism of the body is increased; (2) muscle of the body occurs atrophy; (3) immune function is impaired; (4) it is easy to appear negative nitrogen balance; (5) subcutaneous fat has loss; (6) muscle strength is declined. Blood circulation disorders are more likely to occur when tissues are compressed, which increases the risk of pressure ulcers. Serum albumin, food intake, BMI, arm circumference and other indicators can reflect nutritional status (Roberts et al. 2015; Anthony et al. 2011). Studies (Hu et al. 2011; Coleman et al. 2014; Gelis et al. 2009) show that serum albumin lower than 30-35/L is an important laboratory test index for predicting the occurrence of pressure ulcers. Wang et al (2011) analyzed the nutritional indicators of 221 patients with pressure ulcers over 60 years old in the gastroenterology department, and they found that calf and leg circumference is under 30 cm, loss of appetite, lack of targeted nutritional support and changes in dietary types are important influencing factors in the occurrence of pressure ulcers. Duan et al (2012) found that APTT, albumin, and hemoglobin abnormalities increase the risk of pressure ulcers in patients to varying degrees compared with normal levels. Efteli et al (2013) also confirmed that albumin is related to the occurrence of pressure ulcers. Patients with pressure ulcers should pay attention to nutrition while doing basic care.

4.2.5 Age

Age is closely related to pressure ulcers. Studies have shown that the incidence of pressure ulcers is positively correlated with age (Feuchtinger et al. 2005; Coleman et al. 2014). The elderly skin is loose, dry, and lacking in elasticity. The subcutaneous tissue is atrophy and thinning. The secretion function of sebaceous glands is degraded, and the skin is easily damaged. These characteristics increase the risk of pressure sores (Song 2007). In elderly patients, the function of the heart and blood vessels is decreased, the elasticity of capillaries is weakened, and the function of peripheral circulation is decreased. After local compression, the skin and subcutaneous tissue are more prone to hypoxia and ischemia. Elderly patients have low motor and nerve activity, poor control of the body, and sensory function decline. They cannot take timely actions to protect the skin. The metabolism of aging skin and soft

tissues are low. These characteristics cause the elderly to easily develop pressure sores. In addition, the elderly is prone to chronic diseases such as malnutrition, which greatly increases the risk of pressure ulcers (Pan 2014). Qian et al (2012) showed that age is an independent risk factor for pressure ulcers. Lupe et al (2013) believe that when the age increases, the risk of pressure ulcers also increases.

4.2.6 Skin status

Skin oedema, excessive dryness and other abnormal conditions can lead to weakened local skin's tolerance to external mechanical forces. For example, the elderly and malnourished patients are prone to skin dryness and oedema, which can increase the risk of individual pressure ulcers (Ham et al. 2017). Moisture is an important physical and chemical factor that causes pressure ulcers. Continuous exposure to a humid environment can soften the skin and reduce resistance. Then it weakens the skin's barrier function (Shen 2009) and increase the chance of pressure ulcers. When the skin is impregnated with urine, faeces, sweat, the pH of the skin changes and the protective oils are lost. It causes excessive infiltration of connective tissues, reduces skin elasticity, and skin more susceptible to friction and pressure damage, which increases the risk of pressure sores (Kfillman et al. 2014). Williams (2000) believes that various causes of skin dampness, such as sweating, incontinence, blood oozing, and fluid from the wound, can all lead to pressure ulcers. Studies have shown that excessive moisture or excessive dryness can contribute to the occurrence of pressure ulcers, but the incidence of pressure ulcers on wet skin is 5 times higher than that on dry skin (Wang and Wu, 2007). when faecal incontinence contains more bacteria and toxins than urine, it is more likely to induce infection than urinary incontinence, which makes the situation worse. Therefore, when nursing patients with pressure ulcers, the local skin should be kept clean and dry to reduce the risk of pressure ulcers. Increased local skin temperature will affect the occurrence of pressure sores. Every 1°C increase in skin temperature increases tissue metabolic oxygen consumption by 10%. When continuous pressure causes tissue ischemia, any increase in temperature will increase the tissue's susceptibility to pressure ulcers. When the body temperature is too low, peripheral blood vessels Contraction reduces blood circulation, resulting in reduced blood supply in the compressed area, and pressure ulcers are prone to occur (Li et al. 2014). Hypothermia during and after surgery can increase the risk of pressure ulcers (Zhang et al. 2015). Duan et al (2012) showed that patients with patients with body temperature higher than 37.5°C and body temperature lower than 35°C had a 3.438 and 3.343 times higher risk of pressure ulcers than patients with normal body temperature.

4.2.7 Mental and psychological factors

The body is regulated by the nervous, endocrine, and immune systems. When mental depression and emotional shock can cause the body's stress response. It can lead to the

accumulation of anaerobic metabolites and induce tissue damage. Patients with depression are prone to pressure sores due to neglect of skin care (Wang 2014). Zhang et al (1996) believe that mental depression and psychological trauma can lead to reduced immune response, endocrine disorders. It can cause lymphatic obstruction, increase the accumulation of anaerobic metabolites, and induce tissue damage.

4.2.8 Smoking

Some researchers (Gelis et al. 2009) proposed that smoking can increase the risk of pressure ulcers. The nicotine in tobacco can cause peripheral vasospasm and reduce the ability of haemoglobin to transport oxygen, thereby affecting the blood circulation of the skin, leading to an increased risk of pressure ulcers and affecting the healing of pressure ulcers. Multivariate analysis showed that smoking was positively correlated with the incidence and severity of pressure ulcers. Stop smoking, the risk of pressure ulcers is significantly reduced (Zhang et al. 2007). Cakmak et al (2009) have shown that people with pressure ulcers have smoking.

4.2.9 Own disease

Relevant studies have shown that if patients suffer from cardiovascular diseases (Amir et al. 2011; Shahin et al, 2008), diabetes (Coleman et al. 2014) deep vein thrombosis (Ham et al. 2017), respiratory diseases (Fogelberg et al. 2009), lower limb fractures (Ham et al. 2017), spinal cord injury (Barrois et al. 2008), infections Individuals sexual diseases (Amir et al. 2011), Cerebrovascular disease (Amir et al. 2011; Vanderwee et al. 2009) are more susceptible to pressure ulcers. Relevant studies have shown that changes in systemic oxygenation caused by abnormal respiratory system function may be related to the occurrence of pressure ulcers, and the more serious the disease, the more likely pressure ulcers occur (Tu et al. 2011; Bry et al. 2012). Takahashi et al (2011) studied 12650 patients and the results showed that diabetes, falls, cataracts, renal dysfunction, peripheral vascular disease and pressure ulcers are related. At present, the relationship between organ failure and pressure ulcers is often overlooked. Accompanied by sepsis (Gomes et al.2010) and infection (Yepes et al. 2009) are independent risk factors for pressure ulcers. Senturan et al (2009) surveyed 30 mechanically ventilated patients and the results showed that the incidence of mechanically ventilated patients was 16.7%. The serum pH and glucose levels of patients with pressure ulcers were significantly higher than those without pressure ulcers. Man et al (2013) observed 259 patients older than 65 years old who were hospitalized for more than 5 days, and the results showed that systolic blood pressure lower than or equal to 90mmHg is a risk factor for pressure ulcers (odds ratio=6.71, $P \leq 0.01$). Bi et al (2010) conducted pressure ulcer risk assessment on 89 patients, and the result showed that 50 cases

had hypotension, and 4 cases of pressure ulcers occurred when patients had hypotension, which is a high-risk factor for pressure ulcers.

4.2.10 Other factors

Different researchers have different opinions on the impact of gender on the occurrence of pressure ulcers. Gelis et al (2009) pointed out that men have a higher risk of pressure ulcers. But Sving et al (2014) showed that women have a higher risk of pressure ulcers. Efteli (2013) believes that the incidence of pressure ulcers in women is higher than that of men. Takahashi et al (2011) hold the completely opposite view and believe that men are more likely to have pressure ulcers. Another study suggests that there is a certain relationship between the level of education and the occurrence of pressure ulcers (Gelis et al. 2009). The history of pressure ulcers will affect the recurrence of pressure ulcers (Morita et al. 2015). Many researchers use pressure ulcer risk assessment scores and the scores of each item as factors predicting the occurrence of pressure ulcers.

4.3 Therapeutic factors

4.3.1 Application of certain types of drugs

The application of steroid hormones (Waterlow et al. 1985; Nijs et al. 2009), cytotoxic drugs (Waterlow et al. 1985), sedative drugs (Keller et al. 2002; Vanderwee et al. 2009), vasoactive drugs (Shahin et al. 2008; Karayurt et al. 2016) can affect the metabolism of skin tissue and keratinocyte function, individual mobility and limbs Sensing ability, skin tissue blood perfusion. It increases the risk of pressure ulcers.

4.3.2 Use of medical devices

Patients need to rely on medical devices to maintain their lives due to their condition. Long-term compression and stimulation of medical devices can cause edema, peripheral circulatory disturbances, changes in metabolic state, nutritional disorders, sensory disturbances, inflammatory reactions, and so on. The risk of device-induced pressure ulcers was increased (Brito et al. 2013). Medical device-related pressure ulcers have gradually received attention in recent years, and they are one of the important factors leading to pressure ulcers. Studies (Keller et al. 2002; Karayurt et al. 2016; Apold et al. 2012; Ham et al. 2017) have proposed that patients are prone to pressure ulcers when using medical devices such as endotracheal intubation and its fixed stent, oxygen mask, nasal feeding tube, and bone and joint orthopedic appliances. When using the above medical devices, the patient's limb movement is limited. The skin is prone to moisture. The skin in contact with the medical device and the surrounding areas are more susceptible to pressure and friction. The risk of pressure sores was increased. When using plaster fixed traction, the patient's body or limb activities are

restricted. It is likely to cause pressure sores if the orthopedic device is fixed too tightly. The plaster is not flat, debris and improper placement of the liner in the splint are likely to cause pressure sores, too.

4.3.3 Surgical treatment

During the operation, the local skin of the patient is continuously compressed. The anesthetic drug causes the perception ability and the blood flow to slow down, which increases the risk of pressure ulcers to a certain extent (Amir et al. 2011; Shahin et al. 2008; Xie 2005). Amir et al (2011) and Lumbley et al (2014) discussed the relationship between the length of surgery and the occurrence of pressure ulcers. As the duration of pressure increases, the risk of pressure ulcers increases.

5 Prevention of pressure ulcers

When managing the problem of pressure sores, prevention is the first, clinical prevention of pressure ulcers, patients first to conduct risk assessment to determine risk factors, and then reduce and prevent some factors causing pressure ulcers, such as pressure, friction, shear force, water, and other personal risk factors (Clay 2008).

5.1 Assess the risk factors and risks of pressure ulcers in the elderly

Once a pressure ulcer occurs, it will have an adverse impact on the patient, his families and the society, so the prevention of pressure ulcers is particularly important. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) proposes to conduct a structured risk assessment as soon as possible (no more than 8 hours after admission) to identify patients at risk of pressure ulcers. It also proposes that repeat the risk assessment as much as possible according to their sensitivity, especially when the condition has changed significantly. At the same time, it is emphasized that every time a risk assessment is conducted, a comprehensive skin examination must be carried out. All risk assessments should be recorded. Preventive measures should be formulated and implemented for patients at risk of pressure ulcers. We cannot not only rely on the total score of the risk assessment tool, but also, we need to check the risk Assessment tool scores and other risk factors to guide the development of risk-based prevention plans. It is impossible to prevent pressure ulcers indiscriminately for all patients from manpower or material resources. In clinical practice, it is only advocated to take active preventive measures for patients at high risk of pressure ulcers. It usually uses the Pressure Ulcer Risk Assessment Scale (RAS) for pressure ulcer risk assessment. RAS first appeared in the 1960s. There are currently 4 more mature and practical scales, namely the Braden score sheet, the Norton score sheet, the Waterlow risk factor assessment sheet and the Anderson risk index

marking method, which are mainly used to assess hospitalization Bedridden patients and the elderly (Wang and Wu, 2008), The Norton and Braden scale scores are higher, and the risk of pressure ulcers are lower. The Waterlow and Anderson scales scores are higher, and the risk of pressure ulcers are greater. Jalali R et al (2005) concluded that there were not much different between the sensitivity of Norton, Braden and Waterlow scale. Wang et al (2008) pointed out that the factor classification of the Norton table is consistent with the theoretical framework. The Braden table has factor classification deviation, and the factor classification of the Waterlow table is consistent with the source classification of pressure ulcer factors. The predictive validity of the three scales is relatively ideal. The Waterlow scale has the highest predictive validity. The Braden scale is widely used in China due to its convenient operation. Braden and Bergstrom were formulated in 1987 by two doctors in the United States. It includes 6 evaluation criteria. They were patients' sensory and perceptual activity, horizontal mobility, nutritional status, and skin response to moisture, friction, and shear force. Its reliability and effectiveness in the prevention of pressure ulcers in bedridden patients in orthopedics and neurology have been obtained Confirmed (Xu et al. 2011).

5.2 Timely change of body position

Pressure is one of the important causes of pressure ulcers in the human body. Therefore, reasonable positioning of the elderly and assisting the elderly to change their positions on a regular basis are necessary measures to prevent pressure ulcers. A certain frequency of turning over for the elderly in time can reduce the exposure to the elderly. The most effective measure to prevent pressure ulcers is to turn over the pressure at the pressure site. To a certain extent, it compensates for the body's imbalance in physiological reflex activities. The body position follows the lateral position at a 30-degree angle. Turn over every 2 hours and turn over every hour if necessary. The order of turning over is left side-right side-supine (Liu et al. 2015). When turning over for the elderly, the nursing staff should put their hands under the shoulders and hips of the elderly, lift the elderly to move their positions. They should avoid lifting and pulling on the elderly to prevent the skin of the elderly damaged again. Shao et al (2008) believed that the method of turning the body in the supine position by tilting the body to the left or right by 20°-30° alternately with the supine position is simple and easy to operate and effective in preventing pressure sores.

5.3 Use decompression equipment

The most important way to prevent pressure ulcers is to relieve the patient's long-term pressure on the local tissues. The pressure relief tool can increase the contact area between the support surface and the skin. It also can change the contact position between the support surface and the skin or shorten the contact duration. So, it can reduce the pressure on the local skin. Many studies (Li 2015; Jiang 2013; Zhao and Gong, 2008) have proved the

effectiveness of decompression equipment. So, the use of decompression equipment are more and more common, and it gradually become the routine of clinical pressure ulcer care. Decompression tools include systemic decompression tools such as alternate inflatable pressure mattresses and high-specification elastic foam mattresses, and local decompression tools such as soft pillows, turning pillows, and sponge cushions. In the pressure ulcer prevention and treatment guidelines, it is mentioned that appropriate use of decompression tools should be used to relieve skin pressure for all patients who are assessed to be at risk of pressure ulcers (Zhang et al. 2015). NPUAP (2009) in the clinical practice guidelines pointed out that the decision to change position frequency should be based on the patient's own situation, such as individual tissue tolerance, patient's mobility, patient's comfort, and medical institution conditions such as whether to use a mattress that assists in decompression. Studies have shown that giving patients a pressure relief pad, air bed or sponge cushion can help prevent pressure ulcers from alleviating. Jiang et al (2009) believe that the use of a pressure-reducing mattress can reduce the pressure between the skin and bones. It also can prevent the local blood circulation of the patient from being blocked and keep the bed dry and greatly increase the comfort of the patient in the hospital. Pham et al (2011) used multi-layer foam mattresses to study 238 elderly patients, and the incidence of pressure ulcers decreased from 1.90% to 1.48%. The air bed can effectively reduce the average pressure and area of the compressed area (Ye and Liao, 2007). Sun et al (2015) conducted Meta analysis on the effect of air bed in preventing and curing pressure ulcers and believed that air bed can effectively prevent the occurrence of pressure ulcers, improve patient satisfaction, and relieve the damp skin of patients.

5.4 Reduce friction and shear

Raise the head of the bed no more than 30°. Use lumbar pillows and footrest pillows for the elderly to minimize shearing forces. When caregiver turns and moves the elderly, they need to lift the elderly first, and then move them. They must ensure actions gentle and coherent to reduce skin damage to the elderly. In the specific operation, caregiver can apply talcum powder or petroleum jelly and other skin protective agents on the skin surface of the elderly to achieve the goal of reducing shear and friction (Shao 2008). The elevation of the head of a bedridden patient by less than 30° can prevent the shear force formed by the sacrococcygeal skin and bony marks when the body slides down (Lahmann et al. 2005).

5.5 Massage

Studies have reported that massage can increase skin temperature, leading to a 10% increase in the metabolism of tissue cells and oxygen demand, which in turn causes cell ischemia or ischemia to worsen. So, massage the stressed parts should be avoided. (Bush et al. 1999). Absolutely bedridden patients cannot turn over. Massage is the only way to relieve stress and

promote local blood circulation. Therefore, correct massage is the key to preventing pressure ulcers. The method is that use one hand to press down on the foam pad to make a certain gap between the body and the mattress, and the other hand gently extend to the patient's compressed skin to assess whether there is tenderness. Then, check the surrounding area of the compressed skin or massage around the tender spots to promote blood circulation at the end of the skin (Bi et al. 2010).

5.6 Strengthen nutritional attention

There is a strong correlation between malnutrition and pressure ulcers (Jaul 2010; Chen et al. 2010). Treatment of malnutrition can reduce the risk of pressure ulcers (Miyazaki et al. 210). For patients who cannot eat by mouth, take nutrition by tube feeding as soon as possible according to the condition, correct their negative nitrogen balance, and give a high-protein and high-vitamin diet according to the condition. National Pressure Ulcer Advisory Panel (2009) pointed out that, in addition to their daily diet, supplement oral or tube feed high-protein diets for patients who are at risk of malnutrition or pressure ulcers due to acute or chronic diseases or after surgery. Dehydration can also cause the skin to gradually lose its original vitality and elasticity. Due to the decrease in intracellular fluid volume, the reduction in exercise and the slowing down of the desire to drink, the elderly hospitalized patients need to add some soups to their dietary arrangements to increase their water intake.

5.7 Protect the skin

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) pointed out that keeping the skin intact is an important part of preventing pressure ulcers. Epidemiological studies have found that changes in skin condition (including dry skin and the presence of pressure ulcers) is unanimously recognized as a risk factor for new pressure ulcers. Therefore, preventive skin care should be taken. Preventive skin care includes avoiding as much as possible for the patient to place pressure on the erythema area, using a pH-balanced skin cleanser to keep the skin clean and dry, and not massaging or scrubbing the skin that is at risk of pressure sores. Implement an individualized incontinence management plan, use isolation products to avoid exposure to excessive moisture, and consider using emollients to keep dry skin moist to reduce the risk of pressure sores. Skin management regulations include the use of shower gel and the application of skin protectants around the perineum and belly of incontinent patients, which significantly reduces the incidence of pressure ulcers (Jaul 2010). Keep the skin clean and dry, which can enhance the anti-friction force of the skin. For elderly patients with incontinence, the medical staff should pay special attention to the skin care of the perineum to prevent the local skin of the patient from being too wet and soaking the skin. For patients with urinary incontinence, diapers or urine pads can be used. When scrubbing the skin of the elderly,

warm water and neutral soap should be used, and milk preparations should be used to prevent excessive dryness of the skin of the elderly. Commonly used clinical skin protection measures are that paste some auxiliary materials on the bony protruding parts of the patient that are easy to be compressed. It can add a protective barrier to the skin of the compressed part, which can relieve local pressure and prevent infiltration of the humid environment. Ma (2012) applied a transparent applicator to the skin of the patient's compressed area, which can effectively prevent the occurrence of pressure ulcers. For patients with incontinence, skin protectants can be used to prevent the skin from being exposed to a humid environment, reducing the incidence of pressure ulcers. He et al (2013) showed that the use of Saifurun liquid dressing to rub the compressed parts and bony processes in patients with a high risk of pressure ulcers can alleviate and improve the blood circulation obstacles in the soft tissues of the compressed parts. It can avoid or reduce local tissue degeneration and damage caused by hypoxia and nutrient metabolism disorders. Finally, it can effectively prevent the occurrence of pressure sores in critically ill patients. Ohura et al (2008) showed that the use of hydrophilic foam dressings, film dressings and hydrocolloid dressings can reduce the shear force of subcutaneous tissues by about 31%-45%. The study suggests that film dressings, hydrocolloid dressings, Foam dressings help prevent pressure ulcers in clinical work.

5.8 Psychological care

Medical staff should adopt a variety of communication skills to communicate with the elderly. Improve their psychological endurance through patiently comfort, actively guide, so that elderly patients can cooperate with treatment with a good attitude every day. Before the occurrence of pressure ulcers, nursing staff should promptly inform the elderly and their families so that the elderly and their families understand the potential risk factors of pressure ulcers. Through understand the various protective measures given by nursing staff, they can know how to cooperate with the prevention and care of pressure ulcers work. Inform the elderly about the impact of pressure ulcers on the disease process and prognosis (Tian et al. 2010). Involving the elderly and their families actively is critical to preventing and reducing the occurrence of pressure ulcers.

6 Purpose, aim and Research problems

The purpose of this paper is to find out the main causes of pressure ulcers by comparing relevant references and find out effective prevention measures for these reasons, so as to reduce the occurrence of pressure ulcers in the elderly.

The aim of this thesis is to describe the nursing intervention method for pressure ulcer prevention for long-term bedridden elderly.

In this thesis, the researchers raise three research questions.

The first question is what are the pathogenesis and risk factors of pressure ulcers? Although this issue focuses on pressure ulcers, preventive measures are formulated around the pathogenesis and risk factors.

The second question is why the elderly are susceptible to pressure ulcers? In the context of global aging, the elderly is susceptible to pressure ulcers due to their special physiological conditions and primary diseases.

The third question is how to prevent pressure ulcers? This is the subject of our thesis here.

7 Research methods

7.1 Narrative literature review

This article is a literature review on the prevention of pressure ulcers, so the research method is a narrative literature review. Narrative literature reviews can help readers who do not have the time or resources but want to understand a topic to quickly understand the topic and save the process of finding and reading scattered articles. This kind of literature review is the authors studying the knowledge status of selected topics, leading to a useful overview and integration of this field, but it does not focus on providing novel ideas, new explanations, or very comprehensive conclusions. (Baumeister and Leary 1997)

This thesis is a means of pooling some known information about pressure ulcer prevention in chronic bedridden elderly people, and it may be used as a resource for their peers in the medical field. The researchers of this thesis have conclusions on defined and conceptualized advantages from published articles in the database (Baumeister and Leary 1997). This study is based on an objective perspective, but each person's understanding and perspective are different. The researchers rank several conclusions in the article according to their own clinical experience, which will present different research results.

In writing this narrative literary review, we took the following steps, first forming a team and second, we chose topics on pressure ulcer prevention. We then used relevant keywords for literature searches within various databases to efficiently read some of the selected literature, while marking excellent passages that can help in writing this paper. In revising and reorganizing the first draft, we refined the objectives of the paper and identified the study population as long-term bedridden elderly. Objectivity lists the main achievements of pressure ulcer prevention. Before this manuscript was uploaded to Laurea's website, peer

review and feedback on our manuscript, which helped us to refine this narrative literature review (Pautasso 2019) .

7.2 Data analysis

First, researchers in this paper selected keywords for extensive search across various receipt libraries, e. g: Pressure ulcer, Bedsore, Decubitus ulcer, Pressure sore, Pressure injury, Pressure damage, Prevention, Reduction, Minimize, Nursing interventions, Elder.

We subsequently selected several databases for the search, including Laurea Finna, EBSCOhost, Ebook central, PubMed, ProQuest, SAGE, Google Scholar. We searched with keywords and then selected the life range and literature type, excluding unwanted options such as news, business reviews, interviews, and more. We finished the paper at home because of the Covid-19 impact, so we all chose online articles and e-books for reference. Because of the limitation of language ability, we chose English articles for our reading. Since our native language is Chinese and we have experience in nursing work in China, we also took some published Chinese literature for reference.

After each database used keyword retrieval, we first selected some of the most related articles from the article title, and then read these articles efficiently, excluding the articles that cannot be used for reference or are not highly associated with our paper objectives. At the same time, we also marked the useful information. Finally, we saved and classified the marked articles to facilitate the next writing. Next is the data table where we performed the material analysis.

Database	Keyword	Results	Preliminary accepted	Finally accepted
EBSCOhost	pressure ulcer or bedsore or decubitus ulcer or pressure sore or pressure injury or pressure damage or ulcer and prevention	111	18	3

	<p>or reduction or minimize and nursing interventions.</p> <p>Limit to full text.</p> <p>Published date 2016-2021.</p>			
Ebook central	<p>pressure ulcer or bedsore or decubitus ulcer or pressure sore or pressure injury or pressure damage or ulcer and prevention or reduction or minimize and nursing interventions and elder</p> <p>Limit to full text</p> <p>Published date: no limit</p>	16	2	0
PubMed	<p>Pressure ulcer prevention.</p> <p>Limit to full text and books and documents.</p>	8	6	2

	Publication date: 5 years			
ProQuest	pressure ulcer OR bedsore OR decubitus ulcer OR pressure sore OR pressure injury OR pressure damage OR ulcer AND prevention OR reduction OR minimize AND nursing interventions AND elder Limit to feature or article and older people Published date 2016-2021	22237	24	10
SAGE	pressure ulcer or bedsore or decubitus ulcer or pressure sore or pressure injury or pressure damage or ulcer	237	5	1

	and prevention or reduction or minimize and nursing interventions and elder			
	Published date 2011-2021			

Table 1: Research data table

We chose these articles on the reason that the articles in these databases are authoritative first, and the research content is related to our paper objectives, for example, we learned that the risk factors for pressure ulcers during the preview of the article also included malnutrition, after which we also retained the articles related to the nutritional status of older people for further screening.

8 Result

After a comprehensive analysis of many materials, combined with the perspective of pressure ulcer prevention, the researchers summarized several key methods on how to prevent pressure ulcers in long-term bed elderly. They include: 1) Positioning: It is recommended to change the position at least every 2 hours. Use the 30° rule every time to change the position, indicating that the head of the bed should not raise more than 30°, otherwise attention should be paid to limit the time of the head of the bed. When changing the position to one side, also tilt sideways for 30° to prevent pressure on the femoral rotor and sacrum. 2) Expand the support surface: use decompression equipment such as decompression cushion, mattress, pressure ulcer prevention special bed. These products can increase the area of the body and the support surface, thus reducing the force of the body tissue. 3) Avoid moisture: According to the one mentioned above, wet skin is more likely than pressure sores when dry, so avoid too damp between the skin and the support surface. For the incontinence of the elderly, to clean up the excrement in time, so as not to avoid further damage to the skin. 4) Nutrition assessment: timely carry out nutrition assessment, respect the eating habits of the elderly while adjusting the diet structure, to prevent malnutrition. 5) Psychological care: Assess the psychological situation related to pressure ulcers, communicate with the elderly, educate the elderly and their families about pressure ulcers, and encourage them to actively cooperate with the prevention of pressure ulcers (Clay 2008). It is recommended to conduct

pressure ulcer risk assessment on the first admission for early prevention. However, the pathophysiology of pressure ulcers is complex, and no risk assessment scale can be fully reliable, so the results derived from the assessment scale should always be evaluated in combination with a comprehensive clinical condition (Soppi 2020).

9 Conclusion and discussion

The prevention of pressure ulcers has long been an important problem in the nursing community, one of the highest incidences of inpatients, pressure ulcers are a common complication of elderly bedridden patients. (Lyder and Ayello 2008). This thesis summarizes and analyzes the prevention methods of pressure ulcers, hoping to provide a certain theoretical basis for preventing pressure ulcers in elderly patients.

The prevention of pressure ulcers plays an important role in the quality of patients' quality of life. Once the pressure sores occur, not only the patient suffers a great physical and mental pain, the care of pressure ulcers will also consume a lot of financial resources. However, the prevention cost of pressure ulcers only accounts for about 10% of the respective treatment costs (Soppi 2020; Baumgarten et al, 2006).

Study evidence shows that the body develops pressure sores after just a few hours no moving. The incidence of pressure ulcers is also significantly associated with increased age, men, dry skin, urinary incontinence, stool incontinence, difficulty in bed turning, and malnutrition (Baumgarten et al, 2006). So, the long-term bed-the elderly have a great risk of bedsores.

Pressure ulcers are caused by a synergy of many other factors. This can be summarized as three main factors. The first potential risk factor is the aging process of the patient's skin. The second risk factor is the damage and destruction of skin tissue structure caused by some related diseases. The third factor is malnutrition, which can lead to loss of muscle mass, thinning of skin and weakened immunity. In fact, the most important risk factors are those affected by diseases such as mobility problems, incontinence, and cognitive impairment. These injuries, especially immobility, increase the skin's vulnerability to stress, shear, friction, and moisture (Jaul 2010).

According to the in-depth understanding of considerable literature and professional information, for the prevention of pressure ulcers in the elderly can be made some summary and induction. According to the pressure ulcers easy to form reasons and different parts, The following preventive measures can be taken to prevent the causes:1. Reposition at least every two hours. 2. Protect at-risk areas with extra cushioning. 3. Perform regular (at least

daily) skin checks of at-risk areas. 4. Keep skin lubricated and free of excess moisture.5. Provide nutritious meals that include protein, vitamins, and minerals (Carol 2021).

The researchers in this paper summarize many studies concluded that positioning is important for the prevention of pressure ulcers, that is, the need to often change the patient position. As mentioned above, the formation of pressure ulcers is related to the pressure strength and pressure duration (Clay 2008). Changing the position does not reduce the intensity of the pressure, but it will shorten the duration, so timely changing the position is a critical step. But the aging population, nursing shortage and the rising incidence of pressure ulcers (Lyder and Ayello 2008). The problem of pressure ulcers in the long bedridden elderly deserves more attention, but the bedridden elderly often accompanies incontinence care, nursing staff do position care (that is, change the patient's position of the patient at less than 2 hours) but also assist in morning and evening care, dietary care, shower and activities and other care. This is a great challenge for the time and workload of caregivers, not to mention that it is difficult to relocate patients well in the case of insufficient staffing or unreasonable staff allocation (Clay 2008). Therefore, how to improve the efficiency of repositioning, how managers can reasonably allocate the work content of nursing staff, and how to deal with the continuous shortage of caregivers, these issues are worth our continuous study and thinking.

The researchers in this paper have also realized that not all pressure ulcers can be prevented. If the patient refuses to participate in exercise, repositioning, physical therapy on pressure ulcer prevention, the researcher does encounter such patients in the clinical work, then in this case, despite the caregivers constantly educating patients. In another case, such as a patient in end-of-life care, care planning is targeted at comfort, pain may limit position change, manual feeding may also be banned, so the lack of repositioning and malnutrition will increase the risk of pressure ulcers (Clay 2008). Therefore, the prevention and development of pressure sores need the joint efforts and coordination between various disciplines. It is a complex work. At the same time, nursing work occupies a very important part in the prevention of pressure ulcers. Our nursing colleagues should also constantly improve and update their professional knowledge in the work, and timely find and prevent pressure sores. Treat each patient responsibly.

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Tables

Table 1: Research data table	24
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