Nutrition and pressure ulcers

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Abstract
Pressure ulcers, also known as pressure sores, bed sores or decubitus ulcers, are defined by the National Pressure Ulcer Advisory Panel as an area of localised injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear. 1 Old age, uncontrolled diabetes, sepsis, neurological and vascular disease, spinal cord damage, malnutrition and trauma are also recognised risk factors for pressure ulcer development. Malnutrition and pressure ulcers are major contributors to decreased function, quality of life, increased morbidity and mortality, increased frequency and length of hospital stay and higher healthcare costs. The role of a multidisciplinary care team cannot be underestimated owing to the complex underlying pathology of pressure ulcers. A registered dietitian is part of the team. This article will explore the roles of the registered dietitian in terms of the identification of at-risk patients and the implementation of a comprehensive nutritional plan.

Introduction
Pressure ulcers, also known as pressure sores, bed sores or decubitus ulcers, are defined by the National Pressure Ulcer Advisory Panel (NPUAP) as an area of localised injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear. 1 Old age, uncontrolled diabetes, sepsis, neurological and vascular disease, spinal cord damage, malnutrition and trauma are also recognised risk factors for pressure ulcer development. 2 Malnutrition and pressure ulcers are major contributors to decreased function, quality of life, increased morbidity and mortality, increased frequency and length of hospital stay and higher healthcare costs. 2,3 The role of a multidisciplinary care team cannot be underestimated owing to the complex underlying pathology of pressure ulcers. A registered dietitian is part of the team. This article will explore the roles of the registered dietitian in terms of the identification of at-risk patients and the implementation of a comprehensive nutritional plan.

Case study
Mrs G, a 78-year-old widow and former teacher, was admitted to an orthopaedic ward. Her background medical history included essential hypertension, osteoporosis and urinary incontinence. Mrs G was overweight for most of her adult life and her current body mass index (BMI) of 32 kg/m² had not changed much over the years. Her admission followed a traumatic fall. The physiotherapist advised her on how best to mobilise and position herself in bed so as to alleviate the pressure on a stage 1 bedsore, which appeared on her sacrum on day three post admission. Mrs G reported that she was a resident in a frail care setting and ate at least “one good meal per day”, but described herself as a small eater, and said that she was always the last to finish eating at her table. She had been on a full ward diet while in hospital, but reported having a poor appetite. Her medical aid funds were limited, and she had to be transferred back to frail care. On the day of the transfer, eight days after her admission, a referral was made to the registered dietitian, requesting dietary advice for use at home, as well as an opinion on whether or not the patient should take additional zinc supplementation to promote wound healing.

The above hypothetical scenario may resonate with many readers. Inadequate nutrient intake and low body weight are associated with slow and non-healing wounds. 4 Weight gain helps to improve the skin condition in underweight individuals, increasing its resistance to the effects of pressure, shear force and friction. 5 Weight gain increases soft tissue “padding” over bony prominences, helping to distribute the pressure on underlying tissue over a wider area, thereby reducing the risk of blood flow occlusion. 6

Malnutrition is defined as any nutritional imbalance. 3 Numerous studies have shown the correlation between obesity and abnormal wound healing. 7 Factors associated with obesity, such as metabolic dysfunction, low-grade inflammation and vascular insufficiencies, may lengthen the inflammatory stage of wound healing and leave obese individuals more susceptible to infection. 5 With the high...
incidence and prevalence of noncommunicable diseases, such as hypertension, obesity and diabetes, many patients admitted to healthcare facilities might harbour nutritional deficiencies that are not immediately obvious. The scenario highlights the common practice whereby obese individuals are considered to be well nourished, when in fact they are at risk, and they may benefit clinically from early nutritional support. They are often overlooked or referred too late. It is important to recognise that micronutrient and macronutrient deficiencies exist in obese individuals.5

Evidence-based recommendations for the prevention and treatment of pressure ulcers are available. In 2009, the NPUAP and the European Pressure Ulcer Advisory Panel (EPUAP) published guidelines. These guidelines have since been revised by an international collaboration of the NPUAP, EPUAP and the Pan Pacific Pressure Injury Alliance (PPPIA).1

The prevalence and incidence rates of pressure ulcers vary depending on the population and setting. Most pressure ulcers occur in acute and long-term care facilities, but they also take place in home settings.2

The nutritional care process

The registered dietitian is responsible for the nutritional care process, which encompasses screening and making an assessment, planning and implementing, and evaluating and monitoring nutrition-related outcomes.

Nutrition screening and assessment

Screening

In order to improve patient care and contain costs, hospitals and healthcare organisations need specific pressure ulcer-focused policies, standards and procedures. These policies need to be properly implemented, monitored and enforced if they are to be effective. Validated and reliable screening tools are available, and offer a rapid and simple process which can be conducted by any member of the healthcare team.3,6 To prevent and treat pressure ulcers, the NPUAP, EPUAP and PPPIA recommend pressure ulcer risk assessment, as well as individualised nutrition screening for each individual at risk of acquiring or with a pressure ulcer on admission to a healthcare setting, or at the first visit in community settings, with each significant change of clinical condition, and/or when progress toward pressure ulcer closure has not been observed.1

Nutrition screening tools are designed to detect protein and energy undernutrition and or to predict whether or not undernutrition is likely to develop or worsen under the present or future conditions of the patient.4 As risk factors for pressure sores are multifactorial, the guidelines emphasise the importance of asserting clinical judgement and not relying on the results of one risk assessment tool alone.7 The screening tool should also be linked to specified protocols for action.4 Factors commonly examined include weight history, hydration, BMI, recent food intake, and physical and mental health. With reference to the case study, the nutrition risk screening (NRS)-2002 is a screening tool that can be used in hospitals. It includes old age as a risk factor. Alternatively, the Mini Nutritional Assessment® could be used, which is a combination of a screening and assessment tool validated for use in the elderly (≥ 65 years).8 It is important to share the results of the screening, assessments and nutrition care plans when the patient is transferred back to the frail care facility to ensure continuity of care.

Making a nutrition assessment

The nutrition assessment is fundamental in identifying existing and potential nutrition-related problems.

A thorough assessment of nutritional status includes:

- Dietary intake and social history.
- The medical history, including a review of the prescribed medications.
- A clinical evaluation and the anthropometric data.

Special population groups: Patients with spinal cord injuries and pressure injuries are a nutritionally at-risk subgroup of the general population with pressure injuries, and should be assessed early in their injury. Assessment of these patients should be the same as that for patients without spinal cord injuries, but the nutrition calculations should be specific to this population group to meet their specific needs.7

Planning and implementing

Dietary and social histories

Individualised nutrition care plans are recommended for individuals with or at risk of pressure ulcers.1 The social history and a detailed diet history are essential when formulating a nutrition care plan. The diet history and a review of the documentation on current food and fluid intake are needed to assess the adequacy of nutrient intake. In assessing our hypothetical patient, Mrs G, and her issues regarding a poor appetite, a review of the previous days’ food and fluid charts, as well as any documentation relating to food intake, would be helpful in determining for how long her appetite had been poor, and whether or not her poor intake had resulted in a significant decrease in oral intake. In preparing dietary advice for her to use at home, factors such as her age, cultural and food preferences, financial situation, housing situation (in her case, she was resident in a frail care which has water, sanitation and electricity), and her ability to eat independently,1 all need to be considered so that any planned intervention remains practical and patient centred.

Medical history, including a review of the prescribed medications

Mrs G was 78 years old, had essential hypertension, osteoporosis and urinary incontinence. Therefore, as part of the medical history, a review of any prescribed medications would be necessary to identify any drug nutrient interactions. Drug nutrient interactions are broadly divided into two categories:

- Drugs that adversely affect nutritional status by impairing the intake of food, and/or the absorption, metabolism and excretion of
the nutrients: With reference to the case study, antihypertensive
drugs, such as captopril, enalapril and lisinopril; and analgesics,
such as codeine and tramadol, are associated with a dry mouth. A
dry mouth would make chewing and swallowing difficult. These
side-effects could be addressed in hospital, and practical steps,
such as amending the menu from a full ward to a soft, moist diet,
could help to improve appetite and oral intake. If maintained on a
full ward diet, sauces or gravy could be added to the food. It would
also be helpful to encourage the patient to try to suck on ice chips
or sip on water flavoured with fresh lemon or lime.
• Impaired absorption, and the efficacy of drugs as a consequence
of an individual’s poor nutritional status: People who are at higher
risk of such adverse effects include the elderly, patients on multiple
and prolonged drug therapy, individuals with recent weight loss or
dehydration, and those who are nutritionally compromised due to
chronic disease or impaired gastrointestinal or renal function.

Evaluating and monitoring nutrition-related outcomes

A clinical evaluation and anthropometry

Significant findings on the physical examination include temporal
wasting, proximal muscle weakness, sarcopenia and tongue
atrophy. The hair, skin and mouth are susceptible to nutritional
decreases because of the rapid cell turnover of the epithelial tissue.
However, signs of nutritional deficiency may or may not be apparent
on physical examination. The appearance of the skin should be
noted for wounds, quality of wound healing, bruising, oedema and
hydration status. It is important to recognise that the warning signs
and symptoms of dehydration can be deceptive and atypical in the
unwell and the elderly.

Anthropometric measurements are an integral part of clinician
assessment when determining nutritional status. Unintentional
weight loss is a well validated indicator of malnutrition. The regular
weighing of patients is recommended. Individuals should be
weighed in light clothing, without shoes, using a reliable, calibrated
scale. When reviewing the weight history weight loss, > 5% in
30 days, or > 10% weight loss in six months is considered to be
significant. (BMI classification applies to adults aged 18-65 years,
and is a measure of how ideal the weight is in relation to the height).

Table I classifies adult underweight, normal weight, overweight
and obesity, according to BMI.

Body composition assessments, such as tricep skinfold thickness,
mid-arm circumference and mid-calf circumference may also
be used to gain a more accurate impression of nutritional status,
especially in older people. A practical measure, such as hand grip
strength using a hand grip dynamometer, can be used to determine
muscle loss. The research indicates that decreased hand grip
strength is linked to premature mortality, declining nutrition status
and increased disability.

Biochemical data

Research and expert opinion suggest that biochemical tests may be
performed on patients with pressure injuries to assist in nutritional
assessment. Biochemical tests may include serum sodium, total
protein, albumin, C-reactive protein, transferrin, cholesterol,
haemoglobin (Hb), vitamin B12, red cell folate and iron profile, fasting
blood sugar and HbA1c. Acute phase proteins do not consistently or
predictably change with weight loss, calorie restriction or nitrogen
balance, and appear to better reflect the severity of the inflammatory
response.

An aetiology-based approach to the diagnosis of adult malnutrition,
I.e. starvation-related, chronic disease-related or injury-related
malnutrition, is recommended by both the American Society for
Parenteral and Enteral Nutrition and the European Society for
Parenteral and Enteral Nutrition (ESPEN) in the clinical setting. With
the nutrition assessment complete, the severity of the malnutrition,
and whether or not the patient, in our case Mrs G, had chronic
disease-related or injury-related malnutrition, would need to be
considered when formulating the nutrition care plan.

Nutrition care plan

Nutritional support is associated with an improvement in nutritional
intake and nutritional status. Adequate calories, protein, fluid, and
vitamins and minerals are required by the body to maintain tissue
integrity and prevent tissue breakdown. The optimal nutrient intake
to promote the healing of pressure ulcers is unknown.

The specific recommendations provided herein are applicable to
adults at risk of or with a pressure ulcer, who are assessed as being
at risk of malnutrition.
• Protein and energy: Total energy intake is an important aspect
in the prevention of malnutrition and tissue breakdown. The
ESPEN recommends an exogenous energy supply of 20-35 kcal/kg
bodyweight/day during the acute and initial phases of critical
illness, which should be increased to 25-30 kcal/kg bodyweight/
day during recovery. However, patients with pressure ulcers
have a significantly higher resting energy expenditure than
those without pressure ulcers, and higher energy requirements
in the range 30-35 kcal/kg bodyweight/day are recommended. Adults
who are underweight or who have experienced significant
unintentional weight loss may need additional energy intake. It is
equally important to meet requirements and preserve muscle mass
in the obese patient. Using the actual weight when calculating
the energy needs for wound healing can significantly overestimate
requirements in such a patient. A 50% adjusted body weight can
be used to calculate the energy requirements for patients with a
BMI > 30kg/m2 (Table II).
and development, it is considered essential in times of metabolic nitrogen balance. While arginine is not essential for normal growth tissue cell growth, replication and repair, and promotes a positive
Arginine is an amino acid which regulates the pathways required for

• In the case of Mrs G, using the adjusted bodyweight equation [(87-68 kg) x 0.5 + 68 kg = 77.5 kg adjusted bodyweight (30-35 kcal/77.5 kg) = 2 325 kcal – 2 712 kcal], would provide approximately 300 kcal less than that calculated for using §30-35 kcal/87 kg actual bodyweight = 2 610 kcal – 3 045 kcal.

• Protein is required for all stages of the wound healing process. There appears to be a tendency for increased protein intake to improve the healing rate of pressure ulcers. Protein requirements, providing 16-20% of total energy intake, are calculated based on 1.25-1.5 g protein/kg/day.1 Renal function should be assessed to ensure that high levels of protein are appropriate for the individual.1

• Arginine, and vitamin and mineral supplementation: Individuals identified as being at risk of pressure ulcers should be encouraged to consume a balanced varied diet that includes a good source of vitamins and minerals.1 If dietary intake is poor or deficiencies are confirmed or suspected, vitamin and or mineral supplementation should be provided.1 Vitamins A, C, E, B6, selenium, copper, iron and zinc are some of the key nutrients in tissue viability and wound healing.8 Zinc and vitamin C are two of the most commonly used nutrients in dietary interventions and pressure ulcer wound healing. There is some clinical evidence to support the use of vitamin C supplementation in patients with pressure ulcers.2,12 Vitamin C supplementation may be of greater benefit to those who are deficient at baseline, but as vitamin C assays are not routinely performed, and considering that the supplement presents little risk to patients, doses of up to 500 mg/day can be recommended for most patients.2 While dietary sources of zinc should be encouraged by including foods such as red meat, beef liver, fish, milk, egg, dried beans and wholegrains,8 there is little evidence of the benefit of zinc supplementation on its own in patients with pressure ulcers.2 Zinc deficiency is more common in individuals with pancreatic insufficiency, chronic diarrhoea, short bowel syndrome or a high-output gastrointestinal fistula.13 When supplementing patients with suspected zinc deficiency, doses > 40 mg/day are not recommended as this may result in adverse gastrointestinal side-effects, a decrease in high-density lipoprotein cholesterol, and impairment of the copper status, which are all negatively associated with wound healing.12 With reference to our own case, zinc supplementation would not be recommended.

Arginine is an amino acid which regulates the pathways required for tissue cell growth, replication and repair, and promotes a positive nitrogen balance. While arginine is not essential for normal growth and development, it is considered essential in times of metabolic stress and poor oral intake.7 Research seems to indicate that there is potential benefit in using arginine-containing nutritional supplements, combined with vitamin C and zinc, in patients where there is a stage 2 or higher pressure injury.1 Given the possible association of increased mortality in patients with severe sepsis, the ESPEN concludes that these should not be used in patients with severe sepsis, and that further research that specifically examines the use of arginine-containing nutritional supplements with respect to benefits, potential harm, cost and resource issues, is needed.11 With reference to our own case, arginine-enriched supplements should not be recommended.

Hydration: Dehydration is an independent risk factor for pressure ulcer development. Dehydration can reduce tissue perfusion at the wound site by reducing the blood volume, and limiting the supply of nutrients and oxygen. Extra fluid consumed as a result of nutritional support may reduce the incidence of dehydration.2 Baseline fluid requirements are calculated according to age and weight. Lower fluid requirements are required in elderly patients, i.e. > 75 years (25 ml/ kg/day), compared to the average adult aged 25-55 years (35 ml/kg/day). Fluid requirements may need to be adjusted depending on the clinical conditions, for example fluid restriction due to renal failure versus increased fluid needs for a patient with pyrexia vomiting, profuse sweating, diarrhoea or heavily exuding wounds.1

Implementing the guidelines in practice

Ideally, the required high calorie and protein needs should be achieved through fortification of the existing oral diet. In the case of Mrs G, smaller, more frequent meals of her favourite foods, would help to improve her poor appetite. Evidence shows that nutrition support, usually in the form of enteral nutrition, should be considered if the dietary intake remains inadequate, despite the modification thereof and the use of oral nutritional supplements.11 Based on a systematic review and meta-analysis, enteral nutrition support, particularly high-protein oral nutrition supplements, can significantly reduce the risk of pressure ulcers developing by 25%.13 More research is required to suggest oral nutrition supplements. Enteral tube feeding may improve the healing process with respect to pressure ulcers.13 Many oral nutrition supplements, as well as specialised supplements enriched with arginine, are available in South Africa. They contain vitamins and minerals, are available in a variety of flavours, in either ready-mixed or powder options, and offer a convenient way of supplementing the diet. Oral nutrition supplements are recommended by dietitians in both the public and private sector in South Africa. These supplements may be obtained without prescription in the private sector. However, medical aid societies do not always cover the cost of these products, and their use often depends on the individual’s own financial resources.

Based on the diet history and food records, the dietitian may recommend a change in consistency to the diet to encourage independent feeding. The patient and in the case of Mrs G, the caterers at the frail care centre/her caregivers, should be provided with dietary counselling on a suitable high-protein, high-energy diet. Suitable recipes for high-protein, high-calorie drinks or shakes may be recommended. The diet should include a variety of food. Protein is found in foods such a milk, milk powder, cheese, yoghurt, custard,
chicken, meat, peanut butter, legumes and whey protein powder. Additional calories or energy are derived from both fat and sugar sources, e.g. cream, avocado pears, butter, sugar, honey, fruit juice and fresh or tinned fruit. These foods, together with a variety of vegetables and fruit, and also sufficient fluid, would form the basis of the diet.

Conclusion

Malnutrition and pressure ulcers are major contributors to decreased function, quality of life, increased morbidity and mortality, increased frequency and length of hospital stay and higher healthcare costs.2,3 Nutrition therapy is an area that offers promise in the prevention and treatment of pressure ulcers. The application of the NPUAP, EPUAP and PPPIA 2014 guidelines to our hypothetical case would consolidate key messages with regard to nutrition and pressure ulcers, namely that:

- Nutritional status should be screened and assessed at admission.
- Individuals at risk of nutritional problems should be referred for early assessment and intervention.
- An individualised nutrition care plan with sufficient protein (1.25-1.5 g protein/kg ideal weight) should be provided to obtain a positive nitrogen balance and calories (30-35 kcal/adjusted bodyweight if BMI > 30 kg/m²).
- Supplementation with a high-protein, high-calorie oral nutrition supplement is an appropriate nutritional strategy.
- The consumption of a balanced diet that includes good sources of vitamins and mineral should be encouraged. Supplementation with additional 500 mg of vitamin C could be recommended.
- Appropriate fluids for hydration must be provided and encouraged.
- Referral to a community dietitian post discharge is mandated to ensure continuity of care.

References