Understanding the link between wound care and nutrition

Catherine Rabess

Wound care and nutrition are two interlinked areas that will have a serious impact on the caseload of any community nurse. Healthy eating and regular physical activity help to prevent chronic illnesses, which in turn have an effect on the development of wounds and ulcers. In particular, malnutrition can impair wound healing and so it is essential that at-risk patients are identified in the early stages using an evidence-based nutritional screening tool. If a wound has developed, adequate nutritional management plays a key role in the healing process. If necessary, patients should be referred to a registered dietitian for a detailed nutritional assessment and treatment plan. This article looks at the link between nutrition and wound care, as well as highlighting preventative measures that can be encouraged in all patients at risk of developing a wound.

KEYWORDS: Nutrition ■ Wound care ■ Dietitian ■ Malnutrition

A wound can be defined as a breakdown in the protective function of the skin, including a breach in the epithelium with or without the loss of underlying connective tissue (muscle, bone, nerves, etc) (Leaper and Harding, 1998). This results from injury to the skin and/or underlying tissues or organs from surgery, trauma, cuts, chemicals, heat/cold, friction, force, pressure or disease processes such as pressure ulcers, diabetic foot ulcers or carcinomas (Hutchinson, 1992)

Nutrition and hydration play an important role in preserving tissue viability and in supporting tissue repair in the event of damage (Posthauer et al, 2014), and are essential elements in wound care management. Eating a well-balanced diet and maintaining a stable healthy weight are also imperative and can reduce the risk of developing several conditions such as diabetes, obesity and heart disease, all of which could predispose an individual to wounds and ulcers (Astrup, 2001). Similarly, wound healing is a complex process which can be further complicated by chronic illness. Poor nutritional status and malnutrition can impair wound healing and increase the risk of infection (Casey, 1998).

A pressure ulcer is an area of localised damage to the skin and/or underlying tissue, usually over a bony prominence as a result of unrelieved pressure, friction and/or shear force (Gandy, 2014). The impact of malnutrition on certain wounds such as pressure ulcers is serious and is only exceeded by nutritional deficiency and impaired immune function (McLaren, 1992).

MALNUTRITION

The Manual of Dietetic Practice (Gandy, 2014) identified four main causes of malnutrition:

- Impaired intake
- Altered nutrient requirements
- Impaired digestion and/or absorption
- Increased nutrient losses.

Malnutrition can be defined as a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects both on tissue/body form, body function, and clinical outcome (Elia, 2000).

Malnutrition is a reversible risk factor for pressure ulcers in adults.
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Nutritional screening should be implemented in all healthcare settings, particularly in the community where undernourished patients are harder to spot. Studies have shown that up to 93% of malnourished people are living in the community and this continues to be a major clinical and public health problem in the UK (Elia, 2000; Elia and Russell, 2009).

It is important to highlight that malnourishment affects those who are obese as well as people who are underweight, with over 34% of patients in the UK found to be at risk of malnourishment in 2010 — higher than the prevalence in 2008 and 2007 (British Association of Parenteral and Enteral Nutrition [BAPEN], 2010). This means that a considerable amount of people are at potential risk of poor wound healing and the use of a nutritional screening or assessment tool is advisable in anyone suspected to be vulnerable.

A validated, reliable and evidence-based nutritional screening tool will generally screen for weight history, body mass index (BMI — a measure of weight relative to height), and oral intake. The most commonly used is the Malnutrition Universal Screening Tool (MUST), which classifies patients with a score ('0' = low risk; '2' or above = high risk) (visit: www.bapen.org.uk). High-risk patients should be referred to a registered dietitian, while those at lower risk may simply need increased monitoring and basic dietary advice and nutritional support. This can include following a high-energy, high-protein diet; fortifying meals with supplements; and eating ‘little and often’, with frequent snacks between meals.

Screening tools such as MUST will identify those who would otherwise go unnoticed and whose poor nutrition could lead to further complications including dehydration, infections, vitamin and mineral deficiencies (Elia, 2003). It should also be noted that it is essential that care home residents be screened for malnutrition risk (NICE, 2006).

**WEIGHT MANAGEMENT**

As previously mentioned, following a healthy well-balanced diet (as shown by the Eatwell Plate, Figure 1; Public Health England, 2013) and regular physical activity can improve general wellbeing and reduce the risk of becoming overweight and/or obese.

A balance of all food groups is required to provide the essential nutrients for wound healing. These groups are:

- Fruit and vegetables
- Bread, rice, potatoes and other starchy foods
- Meat, fish, eggs, beans and other non-dairy sources of protein
- Milk and dairy foods
- Foods high in fat and/or sugar.

The Eatwell Plate (Figure 1) shows how much of each of these foods should be consumed.

With increased BMI, the risk of developing further comorbidities — including heart disease, diabetes and some cancers — increases (World Health Organization [WHO], 2004).

A higher ratio of fat tissue to blood vessels can impede circulation in obese patients, complicating wound healing and increasing their risk of developing a range of tissue viability-related conditions including:

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**Table 1: Six practical ways to ensure good nutrition in patients with pressure ulcers**

<table>
<thead>
<tr>
<th>Practical Way</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early identification and referral of patients with pressure ulcers to the clinical nutritionist/dietitian</td>
<td></td>
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<tr>
<td>Identify at-risk patients through nutrition and activity assessment on admission/first visit</td>
<td></td>
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<tr>
<td>Document weight at admission/first visit and regularly thereafter to assess weight changes</td>
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<tr>
<td>Ensure regular meal times should, including high-protein, high-calorie foods with snacks in between meals. Recording calorie and dietary intake is useful for future assessment by dietitians</td>
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<tr>
<td>Other factors that may compromise dietary intake should be considered, e.g. poor dentistry, reduced manual dexterity and positioning when eating</td>
<td></td>
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<tr>
<td>The nutritional content of texture-modified diets (e.g. pureed, liquidised and semi-solid foods) should be maximised using food fortification strategies such as the addition of energy and protein-rich foods and supplements</td>
<td></td>
</tr>
</tbody>
</table>

Source: Rosalyn Tarrant — ‘Diet crucial in pressure sores’. Available at: www.inmo.ie/Article/PrintArticle/3838

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Figure 1. The Public Health England ‘eatwell plate’ (Public Health England, 2013).
Pressure ulcers
Cellulitis
Venous hypertension
Peripheral vascular disease (PVD)
Deep vein thrombosis (DVT)
Wound infections.

Obesity can also restrict patients’ mobility and lead to pressure damage (Brown, 2004).

Blood glucose
Uncontrolled blood glucose levels (HbA1c over 48mmol/mol) can significantly increase the microvascular and macrovascular complications of diabetes. Blood glucose can be affected by nutrition, particularly a diet high in sugar and fats.

Macrovascular complications affect the larger blood vessels, with the most common being cardiovascular disease (CVD), as well as PVD and stroke. Associated risk factors include a high BMI (patients who are overweight/obese), hypertension, high-fat diet, dyslipidaemia (abnormal amount of lipids, e.g. cholesterol and/or fat, in the blood), hyperglycaemia (excess of glucose in the bloodstream) and minimal physical activity (Gandy, 2014).

Conversely, microvascular complications in diabetes affect the smaller blood vessels, especially those in the eyes, kidneys and nerves. Diabetic neuropathy (nerve damage) is commonly associated with peripheral circulatory damage from persistent high blood glucose levels, which can lead to tissue viability issues, particularly foot ulcers. Appropriate diet and glycaemic maintenance plays an essential role in the management of diabetes and reducing the risk of these complications.

Table 1: Role of key nutrients in tissue viability and wound healing (Johnston, 2007)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Function</th>
<th>Dietary sources</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>Dietary energy</td>
<td>Fat and vegetable-based spreads, oils, full fat dairy products including cream, milk, cheese, yoghurts. Snacks containing fat biscuits, chocolate, cakes</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>Broken down to provide glucose and dietary energy for cellular activity</td>
<td>Starchy foods — bread, pasta, rice, cereals, potatoes, jam, sugar, honey</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>Tissue synthesis and repair</td>
<td>Meat-based protein — chicken, turkey, beef, lamb, fish, Non-dairy-based protein — eggs, beans, pulses, lentils, nuts, Milk, yoghurt</td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Enhances immune response</td>
<td>Fat and vegetable-based spreads, oils, milk, cheese, carrots, red peppers, tomatoes, eggs</td>
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</tr>
<tr>
<td>Vitamin C</td>
<td>Antioxidant</td>
<td>Citrus fruits including oranges, grapefruit, fruit juice, green vegetables, potatoes, strawberries</td>
<td></td>
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<tr>
<td>Selenium</td>
<td>Antioxidant</td>
<td>Brazil nuts, meat, vegetables, fish, cereals</td>
<td></td>
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<tr>
<td>Copper</td>
<td>Collagen cross linkage</td>
<td>Meat, vegetables, cereals, tea, coffee</td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>Components of enzymes needed for tissue regeneration</td>
<td>Tea, also widely distributed in various foods</td>
<td></td>
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<tr>
<td>Zinc</td>
<td>Fibroblast proliferation</td>
<td>Meat, milk, potatoes, bread</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>Promotes collagen synthesis</td>
<td>Red meat, liver, fortified breakfast cereals, eggs, green leafy vegetables, pulses, sardine</td>
<td></td>
</tr>
<tr>
<td>B vitamin complex</td>
<td>Efficient energy usage</td>
<td>Fortified breakfast cereals, wholegrain, milk and milk products, meat, fish, liver</td>
<td></td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Antioxidant</td>
<td>Vegetable oil, egg yolk, nuts, seeds</td>
<td></td>
</tr>
<tr>
<td>Vitamin K</td>
<td>Blood clotting</td>
<td>Liver, green leafy vegetables</td>
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Optimum nutrition is a key factor in maintaining all phases of wound healing. The basal metabolic rate (the amount of energy expended...
Reduced energy intake will also lead to a decrease in fat stores and consequently a loss of protective cushioning, thus increasing the likelihood of pressure ulcers (Todorovic, 2003). The role of specific nutrients in tissue viability and wound healing is shown in Table 2.

Carbohydrates — alongside fats — are the primary source of energy required for wound-healing. Glucose (a form of carbohydrate) is the major source of fuel used to provide energy for new tissues and prevent protein depletion (Guo and DiPietro, 2010). Protein energy malnutrition (PEM) has been proven to have a direct effect on non-healing of wounds due to impaired collagen synthesis and deposition. Numerous studies have shown that increasing the dietary protein of patients with chronic ulcers leads to faster healing times than low-protein diets (Hurd, 2003).

Micronutrients also serve a vital role in healing, particularly vitamins A, B1, B2 and B6, as they have a metabolic function in energy production and collagen deposition (Woodward et al, 2009). Copper, zinc and selenium have a role in immune function and significant amounts can be lost through wound exudate in people with burns (Woodward et al, 2009). The author does not routinely recommend that patients are given copper or selenium supplements as there is not enough evidence to support this, however small amounts can be found in the dietary sources highlighted in Table 2.

Although various studies provide conflicting information, there is evidence that vitamin C supplements can help improve pressure ulcers and wound healing in general (Castellanos et al, 2003; Winkler, 2004; Woodward et al, 2009). Vitamin C is also an essential micronutrient for collagen formation and critical for wound care.

Similarly, vitamin A deficiency, although rare, can result in impaired wound healing and susceptibility to infection due to its function in enhancing the immune system (Cresci, 2005).

Zinc also has a role in all stages of wound healing (Table 2) (Bradbury, 2006) and a zinc deficiency has been shown to delay wound healing by reducing the rate of epithelialisation and decreasing scar strength and collagen synthesis (Andrews and Gallagher-Allred, 1999). It is important to note that excess zinc can cause toxicity — this has been shown to induce both copper and iron deficiency anaemia, which can ultimately lead to reduced oxygen delivery to the wound (Gray, 2003). However, studies appear to show that on balance it is preferable to promote wound healing by providing zinc supplements for patients who are deficient (Bradbury, 2006).

Five-minute test

Answer the following questions about this article, either to test the new knowledge you have gained or to form part of your ongoing practice development portfolio.

1 – Can you explain how the community nurse can recognise malnutrition?
2 – What is the main role of nutrition in wound care?
3 – What are some of the key nutrients involved in wound healing?
4 – How might certain nutrients aid wound healing?
5 – What are the benefits of providing adequate fluids in patients with a wound?

Finally, iron supports the transportation of oxygen in the blood, which aids healing (Woodward et al, 2009). If the patient has a history of iron anaemia deficiency a supplement can be recommended (Table 2).

Expert commentary

Edel McGinley, service lead dietitian for nutrition support, London North West Healthcare NHS Trust

The information presented in this article will help community nurses to consider the effect of nutrition on wounds as well as the ongoing impact of poor nutrition, which can increase the risk of pressure sores.

The author encourages nurses to consider the quality of life of patients with wounds. In today’s economic climate, community nurses are trying to deal with an influx of patients who are unable to afford to eat properly to adequately support their health and manage the risks which develop as a result, e.g. weight loss, low body weight and pressures ulcers. The article also examines the importance of weight management, particularly in people who are obese and at-risk of pressures ulceration. Managing obesity is equally as important as managing low body weight, but can be overlooked when the focus is so often on malnutrition in underweight patients.

The information the author has provided will help nurses to provide first-line nutrition advice to support patients in making the dietary changes necessary to improve their health and skin integrity. I feel this article is an excellent resource for community nurses and a useful overview of the role of nutrition in wounds. It also provides an interesting discussion point for nurses to take-up with local dietitians.
Adequate fluids are required to maintain good skin tone and bloodflow to tissues, which is critical in the prevention of skin breakdown. Dehydration specifically is a substantial risk factor in the development of pressure ulcers, as the skin becomes loose, fragile and more susceptible to breakdown (Horns et al, 2004).

The majority of the adult population require a minimum fluid intake of 1500mL/day (the equivalent of 6–8 cups), however this is a guideline and clinical judgement should be used to adjust the amount depending on the patient’s clinical condition.

**CONCLUSION**

Any nurse has a duty to promote a healthy lifestyle. A nutritious diet and regular physical activity help to prevent chronic illnesses and wounds and ulcers. If a wound has developed, good nutritional management plays a key role in the healing process.

Malnutrition impairs wound healing and it is essential that at-risk patients are identified at the early stages using an evidence-based nutritional screening tool. If necessary, patients should be referred to a registered dietitian for a detailed nutritional assessment and treatment plan.

Quality of life should always be emphasised, particularly in those patients with non-healing chronic wounds. This means ensuring that a patient-centred approach is followed at all times to achieve an appropriate outcome. Evidence has shown that improving a patient’s nutritional status and reducing the risk of malnutrition with dietary support can help prevent any further deterioration.

Preventative measures, including nutritional management, should be encouraged in all patients at risk of developing a wound. However, not all wounds are preventable and the appropriate guidelines should be followed to monitor and assess the risks.

**REFERENCES**


Public Health England (2013) *The Eatwell Plate part of: Obesity and healthy eating*


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