Nutrition and wound care: what community nurses should know

Emily Stuart

The term 'wound' can cover everything from relatively minor wounds, such as a small surgical scar, to major wounds, such as chronic leg ulcers. Typically, the cause and type of wound determines how quickly and effectively it heals (Thomas and Bishop, 2007). The presence of complications such as infection can dramatically increase the time it takes for a wound to heal. In a 2015 research study, conducted by gathering data from The Health Improvement Network (THIN) database, the cost burden of wound care in the NHS was estimated. After adjusting for comorbidities, the estimated cost to the NHS was between £4.5 billion and £5 billion. Furthermore, the study found that nutritional deficiency and diabetes were independent risk factors for wounds not healing (Guest et al, 2015). Nutritional factors, such as protein-energy malnutrition, dehydration, and deficiency in certain micronutrients, have all been identified as important for some stages in the process of wound healing. Being able to identify those who are malnourished or at risk of becoming so, and those who have micronutrient deficiencies, is key to successful wound healing outcomes.

KEYWORDS:
Nutrition ■ Hydration ■ Wound healing ■ Malnutrition

Leg ulcers are the most treated form of wound (Srinivasaiah et al, 2013). They are a type of chronic wound, along with pressure ulcers, diabetes-related foot ulcers and malignant wounds, while acute wounds are those usually resulting from trauma, injury, or surgery (Thomas and Bishop, 2007).

Wound healing is characterised by three main phases — inflammatory, proliferative, and remodelling phases. Each of these phases has specific cell processes, with specific requirements relating to both macro and micronutrients (Sherman and Barkley, 2011). Ensuring that community nurses understand the different phases of wound healing can provide a link between each of these phases and the nutrition support that may be impactful to improve healing.

NUTRITION AND HYDRATION

Nutrition and hydration play a key role in optimum and timely wound healing. Other factors that are imperative to consider include the type of wound care implemented, such as debridement (for example, surgical or autolytic), dressings used, risk of or occurrence of infection, and any underlying disease states, such as diabetes (Han and Ceilley, 2017), although of course, diabetes management and nutrition are closely linked. Diabetes-related neuropathy is commonly associated with peripheral circulatory damage.

In the UK, type 1 and 2 diabetes are the most common cause of peripheral neuropathy, with a main cause of peripheral neuropathy being persistent high blood glucose levels (NHS, 2019). This, in turn, can lead to tissue viability issues, particularly foot ulcers. Achieving better glycaemic control can:

- Play an essential role in the management of diabetes
- Improve symptoms of neuropathy
- Reduce progression of nerve damage
- Reduce the risk of tissue viability issues, such as foot ulcers (Diabetes UK, 2020).

It is vital that blood glucose levels are well controlled for those with diabetes. In the presence of a wound, this is particularly important, as diabetes influences the use of carbohydrate for energy requirements. As can be characteristic in diabetes, cells can respond poorly to insulin, which can result in inadequate energy being provided for the cells, which can inhibit healing (Casey, 1998).

Following a well-balanced, healthy diet can help people with diabetes to achieve better glycaemic control (Diabetes UK, 2020). Furthermore, a balance of all the food groups is necessary to provide the essential nutrients needed for wound healing. See *Figure 1* for the Public Health England (PHE) Eatwell Guide (PHE, 2016). The Eatwell Guide provides a visual representation of what a balanced diet looks like and can guide individuals toward areas where they could enhance their diet, and where they could consider cutting back on certain foods to achieve a better balance.

As already mentioned, a balanced diet is important to provide the

Emily Stuart, registered dietitian, apetito and Wiltshire Farm Foods; healthcare expert; member of the BDA, with several years of clinical experience in a variety of settings, including acute and primary care dietetics

essential nutrients needed for wound healing. It can also help to prevent and manage obesity (World Health Organization [WHO], 2020), which is another risk factor for wound development, and the impaired healing of existing wounds (Palfreyman, 2016).

Among those who are obese, circulation is often inhibited, due to a higher ratio of fat tissue, particularly visceral fat (British Heart Foundation [BHF], 2020). This can complicate the wound healing process and increase the risk of developing the following conditions, all of which are related to tissue viability:

- Peripheral vascular disease (PVD)
- Deep vein thrombosis (DVT)
- Wound infections
- Cellulitis
- Pressure ulcers (Brown, 2004: Palfreyman, 2016; Han and Ceilley, 2017).

Obesity can also limit mobility and lead to pressure damage (Brown, 2004). Registered dietitians can support community nurses by accepting referrals for patients who are experiencing obesity and would like support from a specialist in this area, or by providing advice and recommending resources. While evidence shows us that obese individuals are at risk of developing conditions linked to tissue viability, it is also common for people following common weight loss diets to experience micronutrient deficiencies. Engel et al (2018) found that among adults following popular diets, including vegan and low carbohydrate diets, requirements for several vitamins, minerals and trace elements were not met. Included in this list of nutrient needs not provided for were vitamins key to the wound healing process, such as zinc and vitamin B1 (Engel et al, 2018).

For obese patients with chronic wounds, it is not appropriate for them to follow aggressive weight loss plans, as they may fail to meet their full nutrient needs, thus impeding the wound healing process. Attempts at weight loss and nutritional support for wound healing should be considered by a specialist dietitian, as part of a multidisciplinary team.

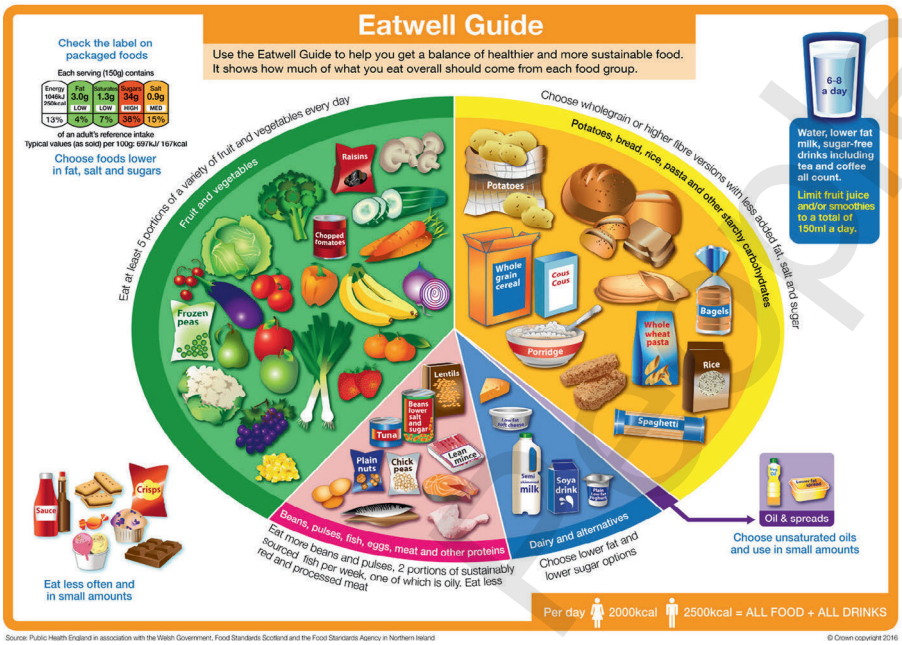

Figure 1.
The Eatwell Guide (PHE, 2016).

'... a balanced diet is important to provide the essential nutrients needed for wound healing. It can also help to prevent and manage obesity (World Health Organization [WHO], 2020), which is another risk factor for wound development, and the impaired healing of existing wounds.'

MALNUTRITION

Obesity is a condition that is covered alongside undernutrition, under the umbrella term of malnutrition. As defined by the British Association of Parenteral and Enteral Nutrition (BAPEN), malnutrition is a state of nutrition in which a deficiency, excess or imbalance of energy or other nutrients causes measurable adverse effects. These can include effects on body tissues, shape, size, and composition, as well as bodily functions and clinical outcomes (BAPEN, 2018).

Loss of lean body mass (LBM) can occur in a malnourished state, and the effects on the progress of wound healing and the development of further wounds can be significant. Quain and Khardori found that in the case of 10%, 20% and 30% loss of LBM, the following occurred, respectively:

- Impaired immunity and an increased risk of infection
- Decreased wound healing and thinning of the skin
- Halted wound healing and a predisposition to the formation of new wounds (Quain and Khardori, 2015).

As demonstrated, impaired wound healing is a significant risk associated with being malnourished, and malnourished patients can experience delayed wound healing and increased complications. For those who experience significant, unplanned weight loss, malnutrition is a major risk factor (Quain and Khardori, 2015; BAPEN, 2018). Malnutrition is also strongly associated with an increased risk of wounds, including pressure ulcer development (Han and Ceilley, 2017; Green, 2018). Malnutrition affects immune function, inhibits collagen synthesis, and interferes with tensile strength. Wound healing relies on energy for collagen synthesis. It is imperative, therefore, that to support wound healing nutritionally, energy needs are met (Sagheleini et al, 2018).

Carbohydrate, protein and fat are the three macronutrients — nutrients

that are present in the body in the largest amounts. Amino acids are the building blocks of protein and among their main functions are tissue synthesis and repair (Molnar et al, 2014).

Patients with chronic wounds should ideally have their nutritional status and requirements assessed by a dietitian. Estimated energy requirements of 30kcal/kg body weight have demonstrated adequate clinical validity as minimum requirements for maintaining nutritional status and accelerating wound healing in older adults with pressure ulcers (Crowe, 2009).

Diagnosing malnutrition can be done in various ways, including biochemical tests, anthropometric measurements and clinical assessments, including a discussion of medical history. To the frustration of many dietitians, serum albumin is commonly cited as an essential laboratory test for determining nutritional status. Yet, it is not a sensitive indicator of malnutrition. This is because serum albumin levels are affected by a variety of medical factors such as acute infection, bodily inflammation, and liver dysfunction (Sagheleini et al, 2018).

One evidence-based and commonly used way to determine malnutrition is the Malnutrition Universal Screening Tool (MUST). The MUST highlights those who are malnourished or at risk of becoming so and recommends what an appropriate care plan should be. This is flexible, depending on the healthcare setting, patient group and available resources (BAPEN, 2018). See *Table 1* for the five 'MUST' steps — the full MUST and all supporting documentation can be found at: www.bapen.org.uk

PROTEIN

Wound exudate causes patients with chronic pressure ulcers to lose protein, thus increasing their requirements for this macronutrient. Protein loss reduces collagen production and hampers wound healing (Sagheleini et al, 2018). Increasing protein intake above standard recommended requirements has been associated with superior rates of wound healing. Among healthy older adults, their diet should provide at least 1.0–1.2g protein/kg body weight per day, with unwell patients, including those who are malnourished, requiring more (Deutz et al, 2014).

As previously mentioned, protein is the macronutrient that is vital for tissue repair and collagen production. In addition, protein is necessary for cell growth and structure, fibroblast proliferation (occurs during the proliferative phase of wound healing), and the production of enzymes necessary in wound healing (Green, 2018). For the healing of pressure ulcers, protein requirements vary depending on the ulcer's category. In categories I and II, 1–1.4g protein/kg is recommended, and in categories III and IV, it is 1.5–2.0g protein/kg, with the maximum requirement suggested as 2.2g protein/kg (Cox and Rasmussen, 2014).

Table 1: Five 'MUST' steps (BAPEN, 2018)

Step 1
Measure height and weight to get a BMI score using chart provided. If unable to obtain height and weight, use the alternative procedures shown in this guide
Step 2
Note percentage unplanned weight loss and score using tables provided
Step 3
Establish acute disease effect and score
Step 4
Add scores from steps 1, 2 and 3 together to obtain overall risk of malnutrition
Step 5
Use management guidelines and/or local policy to develop care plan

In addition to the broader need for essential protein in wound healing, some amino acids appear to have a specific role to play. Arginine and glutamine are essential amino acids in times of severe stress, such as trauma, sepsis, and/or pressure ulcers (Sherman and Barkley, 2011). Arginine has many functions, including being a substrate for protein synthesis, cell proliferation and collagen production. It has been hypothesised that it enhances nitric oxide (which has vasodilatory properties) production, thus improving wound healing.

Glutamine acts as an energy source for neutrophils, macrophages, and lymphocytes, all of which have a role in wound healing (Sagheleini et al, 2018). Despite knowledge of the roles of these amino acids in various stages in wound healing, more studies are needed to investigate the effects of arginine and glutamine on these processes and supplementation is not widely recommended.

MICRONUTRIENTS

In addition to energy and macronutrients, various micronutrients also play key roles in the prevention and reduction of damage from wounds. Micronutrients are present in the body and required in small or minute amounts (Molnar et al, 2014). *Table 2* shows the micronutrients that may enhance wound healing, along with some useful dietary sources (Johnston, 2007; Thomas and Bishop, 2007).

Determining and interpreting accurate serum levels of micronutrients can be notoriously challenging. Therefore, patients should ideally be referred to a dietitian for further assessment of their nutritional status, to optimise this during wound healing and determine any requirement for supplementation outside of advice on consuming a balanced diet.

FLUID

Dehydration negatively impacts cell metabolism and wound healing. Getting adequate fluid is essential for ensuring optimum blood flow to

the tissues of, and surrounding the wound. Good hydration also helps to prevent additional breakdown of the skin (Sagheleini et al, 2018). Dehydrated skin loses elasticity and is more fragile and susceptible to breakdown.

Requirements for fluid vary according to the individual, although clinical advice suggests that 30–35ml/kg body weight should be sufficient to support good hydration and help with healing of wounds (Posthauer et al, 2015). The guidance for the prevention and management of pressure ulcers in primary and secondary care, commissioned by the National Institute for Health and Clinical Excellence, recommends that offering subcutaneous or intravenous fluids to treat pressure ulcers in adults whose hydration status is adequate is not necessary (NICE, 2014).

ROLE OF NUTRITION IN WOUND HEALING

As previously mentioned, malnutrition and a general poor nutritional status can impair the rate of wound healing, thus placing nutrition support firmly in the frame as an important intervention for malnourished individuals with chronic wounds. However, there may also be a benefit to be gained from nutrition support for those with wounds who are not malnourished.

Practice point

For individuals who are malnourished (or at risk of becoming so) and have a wound, nutrition support can play an integral role in the healing process. The body has requirements for energy, protein, vitamins and minerals and fluid that can all support wound healing. Those who are malnourished may be deficient in one or several of these nutrients. Full nutritional assessment can help to identify any deficiencies and determine an appropriate care plan for patients who are malnourished.

Table 2: Role of key nutrients in wound healing and tissue viability (Johnston, 2007)

Nutrient	Role in wound healing	Dietary sources
Vitamin A	Antioxidant vitamin, improves immune response and promotes collagen synthesis	Red peppers, tomatoes, carrots, milk, yoghourt, cheese, eggs, fortified spreads and cereals
Vitamin C	Antioxidant vitamin, promotes collagen synthesis and angiogenesis, increases absorption of non-haem iron, and improves immune response	Red and yellow fruits and vegetables, green vegetables, and potatoes
Vitamin E	Antioxidant vitamin, improves immune response	Vegetables oils, nuts, seeds, and eggs
B vitamin complex	Helps to release energy from food, supports collagen formation and is a component of important enzyme systems	Meat, fish, and offal, fortified breakfast cereals, wholegrains, milk, and milk products
Copper	Role in collagen cross linking, required for the reconstruction of tissues and iron	Meat and vegetables, cereals, tea and coffee
Vitamin K	Critical for production of prothrombin and other clotting proteins, which are required for the initial phases of wound healing	Leafy green vegetables such as kale, cabbage, spring greens and spinach
Iron	Improves delivery of oxygen to tissues	Red meat, liver, fortified breakfast cereals, eggs, green leafy vegetables, and pulses
Manganese	Tissue regeneration	Nuts, seeds, grains, vegetables, fruit (present in many foods)
Selenium	Antioxidant	Brazil nuts, meat, fish, and cereals

This was demonstrated in one multicounty, randomised controlled, double-blind, parallel group trial (van Anholt et al, 2010). In this trial, 43 non-malnourished people with category III or IV pressure ulcers were provided with additional nutritional support, in the form of an oral nutritional supplement (ONS) drink, alongside standard wound care and their regular diet. The ONS was a 200ml drink (given tds) that was high protein and enriched with the amino acid arginine and micronutrients, given for a maximum of eight weeks. The results indicated a statistically significant improvement in the following, compared to the control group:

- Decrease in ulcer size
- Decrease in severity score (Pressure Ulcer Scale for Healing)
- Time spent changing dressings
- Fewer dressings were required in the intervention group (van Anholt et al, 2010).

While these results must be interpreted with caution due to other factors (i.e. dressings used and type of wound care treatment), which can influence wound healing, and ONS will not be suitable for everyone, it is an interesting confirmation of the impact that specific nutrition support can have.

CONCLUSION

Wound healing is a complex process and a challenge for community nurses and other healthcare professionals, often coming at a great cost to patient quality of life, as well as the undeniable significant financial cost to the NHS. Current nutrition therapies in consideration of wound healing should be aimed at correcting nutritional deficiencies and identifying and treating malnutrition. There is a risk of wound development and delayed healing time among obese individuals as well, although restricted diets are contraindicated in those with chronic wounds. Oral nutritional supplements providing additional energy, protein and key amino acids and micronutrients may support enhanced healing of wounds and should be considered among those whose intake and nutritional status is suboptimal. Community nurses can enlist the help of dietitians to support with nutritional assessment and recommendation of appropriate supplementation. JCN

REFERENCES

British Association of Parenteral and Enteral Nutrition (2018) *Introduction to Malnutrition*. Available online: www.bapen.org.uk/malnutrition-undernutrition/introduction-to-malnutrition

British Heart Foundation (2020) *Obesity*. Available online: www.bhf.org.uk/informationsupport/risk-factors/your-weight-and-heart-disease

Brown J (2004) Nutrition and wound healing. *Complete Nutrition* 5(1): 14–18

Casey G (1998) The importance of nutrition in wound healing. *Nurs Standard* 13(3): 51–6

Cox J, Rasmussen L (2014) Enteral nutrition in the prevention and treatment of pressure ulcers in adult critical care patients. *Crit Care Nurs* 34(6):15–27

Crowe T (2009) Nutrition therapy in the prevention and treatment of pressure ulcers. *Wound Practice Res* 17: 90–9

Deutz NEP, Bauer JM, Barazzoni R, et al (2014) Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group. *Clin Nutr* 33(6): 929–36

Diabetes UK (2020) *The Eatwell Guide: What does it mean for diabetes*. Available online: www.diabetes.org.uk/guide-to-diabetes/enjoy-food/eating-with-diabetes/the-eatwell-guide

Engel MG, Kern HJ, Brenna JT, Mitmesser SH (2018) Micronutrient gaps in three commercial weight-loss diet plans. *Nutrients* 10(1): 108

Green K (2018) Pressure ulcers. *CN Magazine* 18(4). Available online: https://nutrition2me.com/wp-content/uploads/2018/12/Pressure_Ulcers.pdf (accessed 25 August, 2020)

Guest JF, Ayoub N, McIlwraith T, et al (2015) Health economic burden that wounds impose on the National Health Service in the UK. *BMJ Open* 5(12): e009283

Han G, Ceilley R (2017) Chronic wound healing: a review of current management and treatments. *Adv Ther* 34(3): 599–610

Johnston E (2007) The role of nutrition in tissue viability. *Wound Essentials* 2: 10–21

Molnar JA, Underwood MJ, Clark WA (2014) Nutrition and chronic wounds. *Adv Wound Care* 3(11): 663–81

National Institute for Health and Care Excellence (2014) *Pressure ulcer management. The prevention and management of pressure ulcers in primary and secondary care*. NICE, London. Available online: www.nice.org.uk/guidance/cg179/evidence/full-guideline-management-pdf-547610510

NHS (2019) *Peripheral neuropathy*. Available online: www.nhs.uk/conditions/peripheral-neuropathy/

Palfreyman S (2016) The Impact of Obesity on the Development and Care of Acute and Chronic Wounds. *Wound Care Canada* 14(1): 22–30. Available online: www.woundscanada.ca/docman/public/wound-care-canada-magazine/2016-14-no1/85-the-impact-of-obesity-on-the-development-and-care-of-acute-and-chronic-wounds/file

Posthauer ME, Banks M, Dorner B, Schols JM (2015) The role of nutrition for pressure ulcer management. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, and Pan Pacific Pressure Injury Alliance White Paper. *Adv Skin Wound Care* 28(4): 175–88

Public Health England (2016) *The Eatwell Guide*. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/528193/Eatwell_guide_colour.pdf

Quain AM, Khardori NM (2015) Nutrition in wound care management: a comprehensive overview. *Wounds* 27(12): 327–35

Saghaleini SH, Dehghan K, Shadvar K, Sanaie S, Mahmoodpoor A, Ostadi Z (2018) Pressure ulcer and nutrition. *Ind J Crit Care Med* 22(4): 283–9

Sherman AR, Barkley M (2011) Nutrition and wound healing. *J Wound Care* 20(8): 357–67

Srinivasaiah N, Dugdall H, Barrett S, Drew PJ (2007) A point prevalence survey of wounds in north-east England. *J Wound Care* 16(10): 413–6, 418–9

Thomas B, Bishop J (2007) *The Manual of Dietetic Practice*. 4th edn. Blackwell Publishing, London

van Anholt RD, Sobotka L, Meijer EP, et al (2010) Specific nutritional support accelerates pressure ulcer healing and reduces wound care intensity in non-malnourished patients. *Nutrition* 26(9): 867–72

World Health Organization (2020). Obesity *Prevention and Control*. WHO, Geneva. Available online: www.who.int/health-topics/obesity#tab=tab_3

Revalidation Alert

Having read this article, reflect on:

- Your knowledge of the different phases of wound healing
- The important role that having a good nutritional status plays in wound healing
- How you would diagnose a patient who is malnourished
- Key nutrients needed for successful wound healing outcomes.

Then, upload the article to the free JCN revalidation e-portfolio as evidence of your continued learning: www.jcn.co.uk/revalidation

KEY POINTS

- Each phase of the wound healing process has specific requirements relating to both macro and micronutrients.
- Nutrition and hydration play a key role in optimum and timely wound healing.
- Obesity is a condition that is covered alongside undernutrition, under the umbrella term of malnutrition.
- Loss of lean body mass (LBM) can occur in a malnourished state, and the effects on the progress of wound healing and the development of further wounds can be significant.
- Oral nutritional supplements providing additional energy, protein and key amino acids and micronutrients may support enhanced healing of wounds.
- Community nurses can enlist the help of dietitians to support with nutritional assessment and recommendation of appropriate supplementation.