



Nutrition
& Wound
Healing

Important

The content of this document has been developed by health experts using available medical evidence and should be used as a guide only. Specific treatment advice should be sought from an expert in your wider healthcare team.

Disclosure

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Overview

Wound management is a significant and growing health burden on the community.¹ Delayed wound healing and wound infection place a substantial financial burden on health care systems, as a result of increasing dependency and increased hospital admissions. Chronic wounds also have a very large social and quality of life impact on individuals and carers.²

Nutrition plays an essential role in wound healing and wound care practices, and nutritional support needs to be considered a fundamental part of wound management. Attending to nutrition in wound care is also cost-effective.³

Poor nutrition before or during the healing process may delay healing and impair wound strength, making the wound more prone to breakdown. Neglecting the nutritional health of an individual with a wound can compromise the entire wound management process.³

By combining knowledge of the wound healing process together with best practice provision of nutrition, healthcare professionals can help decrease the morbidity and mortality associated with chronic wounds as well as reducing their cost and impact.

The guide aims to:

- **Provide simple advice on the role of nutrition in wound healing for healthcare professionals involved in the management of wounds**
- **Summarise the evidence for the relationship between nutrition and wound healing**
- **Provide practical guidance on when and how to implement nutritional support to promote wound healing.**

Wound burden in Australia – the facts

Chronic wounds are a large social, economic and healthcare burden in Australia, and around the world.¹

Chronic wounds can be defined as wounds that take more than 4-6 weeks to heal.⁴

Examples of wounds that may become chronic:

- Pressure ulcers
- Post-operative wounds
- Wounds in people with diabetes
- Ulcers on legs and feet
- Venous leg ulcers
- Extended burns
- Stomas
- Amputation wounds

Risk factors

Chronic wounds may occur in any individual but are more frequent in the elderly and chronically ill. With an ageing population and a dramatically increasing prevalence of chronic disease, wound care will inevitably become an even more significant issue for health systems.^{5,6}

Diabetes is a predisposing factor for wounds (ulcers on legs and feet), which is a major issue considering the increasing number of people with diabetes.¹ The frequency of ulcers and lower limb amputations caused by chronic ulcers in people with diabetes has constantly increased in the US and Europe.¹ In Australia diabetes is the most common cause of lower limb amputation not caused by trauma.⁷

It is estimated that over one million people in Australia have diabetes.⁷ It is reported that the number of people with diabetes in Australia had more than doubled between 1981 and 2001 and the trend is for ever increasing rates of diabetes. Diabetes is under-diagnosed and under-treated.⁷

Individuals with hip fracture are at risk of developing pressure ulcers,⁸ as are individuals with neurological impairment and those who are immobile for prolonged periods of time.⁹ Other wounds at risk of delayed healing are wounds in oncology patients and stomas.

Summary of risk factors for delayed wound healing:

- Arthritis
- Chronic liver disease
- Diabetes
- Excess alcohol intake
- Impaired self-caring
- Inadequate nutrition
- Inflammatory disease
- Older age (over 65 years)
- Polypharmacy
- Poor circulation
- Poor cognition/cognitive dysfunction
- Renal failure
- Smoking
- Vascular disease
- Weakened immune system

Prevalence

There is limited published data on the prevalence of chronic wounds in Australia. The situation has been described as a hidden 'epidemic under the sheets'.⁹

A statewide survey in Victorian hospitals showed pressure ulcer prevalence of 17.6%⁹ however many ulcers go unseen, undocumented, untreated and uncoded.

Reviews have shown that 17-35% of individuals have pressure ulcers on admission to nursing homes and observations of prevalence range from less than 5% up to 26%.¹⁰

For those people cared for in the home setting, figures in the USA and Europe indicate prevalence of pressure ulcers of around 17%.^{10,11} An Australian study stated that 57% of referrals to a home-care nursing service were for wound care.¹²

At any one time it is estimated that 0.11% of the Australian population will have an ulcer on the leg, with 24% of these present for over a year and 35% for more than five years. Around 20% of these people suffer more than 10 episodes of ulceration.¹³ Between 1-2% of the population live with recurrent leg ulceration.¹⁴ Most ulcers on the leg are related to venous disease but arterial disease is also a major contributor.^{13,14,15}

Burden

In terms of financial burden, it has been estimated that pressure ulcers cost the country around \$286M a year in hospital bed days.⁹ It has also been estimated that a stage 4 pressure ulcer can cost in excess of \$60,000 per individual to manage.¹⁰ In human costs, pressure ulcers are associated with pain, discomfort, decreased mobility, loss of independence and social isolation.^{10,16} Older persons with pressure ulcers also suffer higher death rates.¹⁶

Ulcers on the legs greatly affect mobility; 45% of people with them are housebound.¹³ The burden of ulcers on the leg is probably under-reported in people of working age as they are more likely to be caring for themselves at home.¹⁴

Diabetes related lower limb amputation, following an infected ulcer, is a significant personal and public health cost in Australia.¹⁷ Half of all amputations occur in people with diabetes.¹⁸

- Chronic wounds cause significant health, social and financial burden
- Chronic wounds particularly affect the elderly, people with diabetes, the chronically ill and others at risk
- It is estimated that pressure ulcers cost Australia around \$286M each year
- Estimated pressure ulcer prevalence ranges from around 5% to over 35% in care settings
- Up to 2% of the population lives with recurrent ulcers of the leg.

Nutrition in wound healing

There is a large body of evidence demonstrating the essential role of nutrition in wound healing. Without adequate nutrition healing may be impaired and prolonged. Improved nutritional status enables the body to heal wounds² such as the accelerated wound healing seen with nutritional supplementation.³

Wound healing is a complex process – in simple terms, it is the process of replacing injured tissue with new tissue produced by the body which demands an increased consumption of energy and particular nutrients, particularly protein and calories.^{6,19}

A wound causes a number of changes in the body that can affect the healing process, including changes in energy, protein, carbohydrate, fat, vitamin and mineral metabolism. When the body sustains a wound, stress hormones are released in a fight-or-flight reaction and the metabolism alters in order to supply the injured area with the nutrients it needs to heal – known as the catabolic phase.^{2,19} The body experiences an increased metabolic rate, loss of total body water, and increased collagen and cellular turnover.² These effects can be pronounced even with a small wound.

If the catabolic phase is prolonged and/or the body is not provided with adequate nutrient supplies, then the body can enter a protein energy malnutrition (PEM) state. Factors causing prolonged catabolism include the severity of the wound and the pre-existing nutritional status of the individual.³



Protein-energy malnutrition (PEM) is the most serious type of malnutrition – when there is an inadequate or impaired absorption of both protein and energy. PEM causes the body to break down protein for energy, reducing the supply of amino acids needed to maintain body proteins and healing, and causing loss of lean body mass. Therefore PEM may be directly linked to wounds that aren't healing.^{6,20} PEM can be defined as low Body Mass Index (BMI) or unintentional weight loss (of 5% or more) with loss of subcutaneous fat and/or muscle wasting.^{20,21}

$$\text{BMI} = \text{weight (kg)} / \text{height (m)}^2$$

BMI Score	Indication of weight status
< 19	Underweight
20-25	Acceptable
26-30	Overweight
31 +	Obese

As an individual loses more lean body mass (LBM), wound healing is more likely to be delayed. With a 20% or greater loss of LBM wounds compete with muscles for nutrients. If LBM loss reaches 30% or more the body will often prioritise the rebuilding of body over wound healing with available protein.²⁰ This cascade demonstrates the severely negative impact poor nutrition can have on chronic wound healing.

Acute injury or infection induced weight loss²²

Loss of Lean Body Mass (%)	Complications	Associated Mortality (%)
10	Impaired immunity, increased infection	10
20	Decreased healing, weakness, infection	20
30	Too weak to sit, pressure ulcers develop, pneumonia, no healing	50
40	Death, usually from pneumonia	100

Even in today's society where we are fortunate to have access to a variety of nutritional foods, older people often suffer from malnutrition.^{2,3} In fact it has been estimated that up to 60% of older patients in hospitals are malnourished, or at risk of malnutrition. Of those in nursing homes, between 40 and 85% have malnutrition, and 20 to 60% of home care patients are malnourished.^{20, 24, 25}

This is an important consideration as elderly people are more likely to have slow to heal wounds and are more likely to be malnourished.

Nutrition for chronic wounds needs to be assessed on an individual basis (refer to following sections), however pressure ulcers – especially larger or multiple ulcers – and ulcers on legs in people with diabetes place high demand for nutrients on the body.

As such, these types of chronic wound may be a priority for healthcare professionals in terms of providing nutritional support and supplementation.

Infected wounds also increase nutrient demand as they cause more tissue damage, further strain and a deeper ulcer.⁶

Protein loss via wound exudate needs to be monitored. If dressings are being changed frequently due to the amount of exudate, protein is being lost at a high rate and therefore protein replacement should be considered.

Frequent dressing changes

=

Protein loss

=

Impaired nutritional status

The nutritional evidence

There are a number of nutrients that play an important role in wound healing. The following is a summary of these nutrients.

Protein

Protein is essential for the maintenance and repair of body tissue. Depleted protein levels will cause a decrease in collagen development, slowing the wound healing process. Adequate protein levels will help achieve optimal wound healing rates.^{2,26,27}

Protein requirements should be calculated on an individual basis, and they should be monitored closely. This needs to happen along with the provision of calories, because if energy needs aren't met the body will use protein for energy rather than for wound healing.²⁶

- In slow to heal/chronic wounds a recommended daily intake of 1.5g/kg/day will meet the protein needs of most individuals, but up to 3g/kg/day may be appropriate for those with more severe wounds^{6,26}
- Sources of protein include red and white meats, fish, eggs, liver, dairy products (milk, cheese, yoghurt), soy beans, legumes, seeds, nuts and grains.⁶

Amino acids

L-Arginine

L-Arginine is an amino acid that has several properties that enhances a number of the pathways involved in wound healing, such as its role in structural protein synthesis.

As the body needs more protein during wound healing the demand for normally non-essential amino acids, such as L-arginine, becomes essential.

Dietary supplementation with arginine has been shown to enhance protein metabolism, helping to decrease muscle loss, and collagen synthesis, which helps to increase the strength of the wound.^{1,3,16,20}

In addition, L-arginine is essential for the stimulation of the nitric oxide pathway, which is in turn important for collagen deposition in wound healing.^{16,28,29}

L-Arginine supplementation has also been shown to enhance the immune system and improve the secretion of growth hormone and insulin that are also involved in wound healing.³

People with pressure ulcers who have been treated with supplements containing arginine show a significantly improved rate of ulcer healing.^{11,16} L-Arginine is also effective in healing chronic ulcers in people with diabetes (ultimately helping to reduce leg amputations).¹

- Supplementing with 9g of L-arginine has been shown to promote wound healing¹⁶
- An average dietary intake provides about 4g L-arginine per day³⁰
- Arginine is conditionally essential, meaning that when we are healthy our bodies produce sufficient arginine however during healing requirements increase to a level where supplementation is recommended.

Side effects

L-Arginine supplementation can cause diarrhoea. Gradual increase of daily dose may help tolerance.

Energy

The main sources of energy for the human body – and for wound healing – are carbohydrates and fats. The main demand for energy from a wound is for collagen synthesis. Caloric needs for healing increase according to increasing size and complexity of the wound.²

- For patients with wounds, energy requirements are estimated at 30-35kcal/kg²⁶
- Energy requirements vary according to gender, age, activity and clinical status.

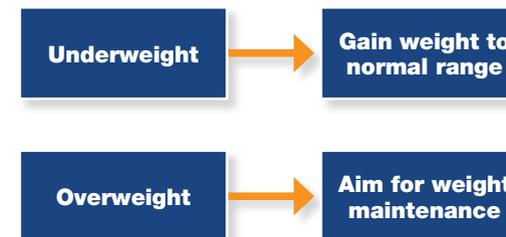
Fats

Fats, including mono- and polyunsaturated fats, provide fuel for wound healing. Fats are a safe and concentrated source of energy. For example, fat has more energy at

9cal/g than carbohydrate at 5cal/g.³¹ Importantly adequate fats are needed to prevent the body using protein for energy.²⁶

Fatty acids are a major component of cell membranes,²⁶ and demands for essential fatty acids increase after injury.² Essential unsaturated fatty acids must be supplied in the diet as the body cannot synthesise enough for the needs of wounds.² The benefit of omega 3 fatty acid supplementation in wound healing is still not clear and there is some evidence this may reduce wound strength.^{26,32}

- Good sources of fats to promote wound healing include meat, full-fat dairy products such as milk, cheese, butter, cream, yoghurt, ice-cream, and oils and fats used in cooking or as spreads
- If an individual is overweight then low fat varieties may be better choices however it is important to consider recent weight changes as individuals who have recently lost weight may also be malnourished
- Aim for weight maintenance during wound healing. If a person is overweight they should not try to lose weight until their wound has completely healed. A person who is underweight should try to put on enough weight to bring them into the normal range.³¹



Diets and wound healing

In clinical practice, there can often be conflicting nutritional goals that interfere with goals for healing. Specialised diets in particular can be a risk factor for delayed wound healing. It is not appropriate for people with wounds to follow diets that limit intake, such as diets to reduce cholesterol or weight and diets that avoid entire food groups such as carbohydrates.

People with vegetarian or vegan diets, food allergies, or on dialysis need careful consideration and in these situations it is recommended that you seek the help of a dietitian.

Carbohydrates

Carbohydrate is a major source of calories for use by the body, and its availability is essential to prevent other nutrients (e.g. protein) from being converted into energy. It is not clear how carbohydrate deficiency influences wound healing but increased carbohydrate intake provides energy that is essential for optimal healing.² This needs to be undertaken with caution in people with diabetes, and monitoring (e.g. blood glucose levels, glycated haemoglobin) will be required.

- Carbohydrate sources include wholegrain cereals, breads, potatoes, rice, pasta, biscuits.⁵

Antioxidants

Vitamin C

Vitamin C plays an important role in collagen synthesis and subsequent crosslinking, as well as the formation of new blood vessels (angiogenesis). Adequate vitamin C levels help strengthen the healing wound.^{2,20,26,32}

Vitamin C also has important antioxidant properties that help the immune system, and it increases the absorption of iron.²⁶

Vitamin C deficiency impairs wound healing and has also been associated with an increased risk of wound infection.² Research has shown vitamin C supplementation helps promote pressure ulcer healing.²⁰

- Recommended vitamin C supplementation for deficient patients is 60-200mg daily. Doses over 200mg a day are not necessary as tissue saturation occurs at this point²⁶
- Vitamin C is found mostly in fruit and vegetables, especially oranges, grapefruit, tomatoes, and leafy vegetables. Fruit juices with added vitamin C are also a good source, although often they contain only small amounts of vitamin C.²⁶

Side effects

Vitamin C supplementation can cause diarrhoea.

If a person has been on high supplementary doses of vitamin C they may be at risk of developing scurvy when supplementation ceases.

Vitamin A

Vitamin A increases the inflammatory response in wounds, stimulating collagen synthesis. Low vitamin A levels can result in delayed wound healing and susceptibility to infection.^{2,20}

It has also been shown that vitamin A can restore wound healing impaired by long-term steroid therapy or by diabetes. Serious stress or injury can cause an increase in vitamin A requirements. While the mechanisms of vitamin A in wound healing are still not well understood, it is clear that it plays an important role.²

Supplementation with vitamin A requires caution, as there is a risk of toxicity.²⁰

- Vitamin A is found in milk, cheese, eggs, fish, dark green vegetables, oranges, red fruits and vegetables⁶
- The recommended dose in cases of vitamin A deficiency is 700-3000 IU – the higher range being for males.²⁰

Vitamin E

It is possible that vitamin E can reduce injury to the wound by controlling excessive free radicals.^{2,26} Contrary to popular opinion, there is limited evidence for the benefits of vitamin E in decreasing scar formation. There is also some evidence that suggests oral supplementation of vitamin E over 400mg/day has an increased health risk.³³

- Vitamin E supplementation or topical application is rarely needed for wound healing.²⁰

Minerals

Zinc

Zinc is a trace element, present in small amounts in the body, which has a well-established role in wound healing.

Zinc plays a key role in protein and collagen synthesis, and in tissue growth and healing.^{2,20} Zinc deficiency has been associated with delayed wound healing, reduced skin cell production and reduced wound strength.²⁶

Zinc levels of less than 100µg /100mL have been associated with impaired wound healing, but supplementation in people who are not zinc deficient generally has no benefit.² Insufficient dietary intake of zinc can be further exacerbated by zinc loss from excess wound drainage.²⁰ Assessing zinc deficiency can be difficult as serum/plasma levels may not be a true indication of zinc levels at the wound itself.³⁴

- The recommended intake of zinc for non-healing pressure ulcers is 15mg/day. With larger non-healing wounds, 25-50mg daily can be used, but this should be limited to 14 days, as excess zinc can interfere with wound healing²⁰
- Dietary zinc sources include red meat, fish and shellfish, milk products, poultry and eggs.

Side effects

Excess zinc supplementation can cause gastrointestinal complaints.²⁶

Iron

Iron is part of the system that provides oxygen to the site of the wound, therefore iron (haemoglobin) deficiency can impair healing. Iron deficiency can also result in impaired collagen production and strength of the wound.^{2,5,26}

Iron absorption from non-meat sources can be enhanced with vitamin C.²⁶ Zinc and iron compete for absorption, therefore if someone is receiving supplements of both, the zinc and iron should be given with meals but not at the same time.³⁵ Dietitian input can be useful.

- Recommended iron intake for the general population is 8mg/day and for females aged 19-50yrs this increases to 18mg/day³⁶
- The best sources of iron in the diet are red meat, offal, fish, eggs, wholemeal bread, dark green leafy vegetables, dried fruits, nuts, and yeast extracts.

Side effects

Excess iron intake can cause nausea and constipation³⁷

Other important factors

Hydration is important in wound healing as dehydrated skin is less elastic, more fragile and more susceptible to breakdown. Dehydration will also reduce efficiency of blood circulation, which will impair the supply of oxygen and nutrients to the wound.²⁶

One of the main risk factors for dehydration is poor oral intake.³⁸

In long-term care, dehydration is one of the most common problems affecting good nutrition.^{35,38}

- A general guide to providing fluids is 30-35mL/kg/day, with a minimum of 1500mL or 6-8 cups/day²⁶
- Sources of hydration include water, juice, milk, jelly, ice-cream, yoghurt and soup. While it is best to offer non-caffeine beverages first, caffeinated drinks – e.g. tea, coffee – can be included.

Implementing nutrition support to promote wound healing

Optimising nutrition is important to best practice care in wound management.²²

The overall goal for the healthcare team should be to make sure the patient is in the optimum nutritional state to give wounds the best chance to heal.² This can be achieved by providing the individual with adequate calories and nutrients, preventing protein-energy malnutrition, and promoting wound healing.⁶

Holistic wound care must include both nutritional support and supplementation where necessary, according to an individual's needs.^{3,26} A nutrient-rich diet is fundamental, but sometimes it is not possible to achieve adequate levels of essential nutrients through normal consumption of food and liquids. In these cases, nutritional supplementation has been shown to promote wound healing.^{2,6}

A minimum standard of nutritional care encompasses three steps – assessment, intervention and evaluation.

Assessment:

- Nutritional assessment with validated screening tool e.g. Malnutrition Screening Tool, Mini Nutritional Assessment (www.mna-elderly.com)
- Regular weighing
- Skin assessment
- Baseline healing score e.g. measured using the PUSH tool (Pressure Ulcer Scale for Healing)
- Energy expenditure. e.g. activity level
- Co-morbidities e.g. diabetes
- Documentation of food and fluid intake

Intervention:

- Improve intake of food and fluids
- Improve nutritional quality of the food
- Remove barriers to food consumption
- Supplementation where requirements cannot be met by diet alone

Evaluation:

- Regular assessment and evaluation of nutritional intake
- Measure success by improvements in measures (e.g. weight, skin condition, PUSH score) compared to initial assessments
- Success can also be indicated by subjective assessment of wound healing and lack of development of new wounds
- Biochemistry

Assessment

Nutritional screening including a clinical review and diet history should be conducted on admission and when there is any change to the patient's condition. This includes a wound developing, any change in medical condition, delayed healing, any new co-morbidities, annually and when any of the following are present:^{3,6,20,39}

Triggers for nutritional screening:

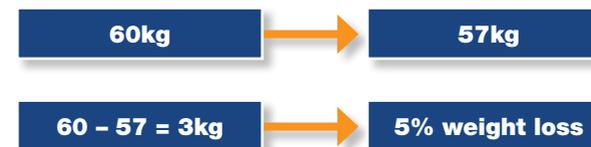
- Any unintentional weight loss, including:^{20,39,42}
 - Unintentional weight loss of 5% or more in one month
 - Unintentional weight loss of 10% or more in six months
- Poor appetite – e.g. eating less than 50% of meals, or refusal to eat a meal, or refusal to eat for 3 days or more
- Nausea or vomiting for more than 3 days
- Loss of skin integrity
- Development of a new pressure ulcer or ulcer on leg/foot
- Deterioration of an existing wound
- Levels of nutritionally relevant laboratory values (see table next page) suggestive of malnutrition or that have recently changed significantly
- Admission / readmission to hospital
- Entry into long term care.

It is important to set timeframes at the beginning of any intervention. As a minimum it is a good idea to weigh the person on a weekly basis. It is important to check at least every four weeks if nutritional intervention is working or more frequently if there are other complications or co-morbidities.

Practical tip:

- Ensure scales used to weigh patients have been calibrated for reliability of measures. A simple way to do this is for one staff member of stable weight to weigh themselves weekly and note any discrepancy.

Example of weight loss calculation:



Normal laboratory values of nutrients⁴⁰

Nutrient	Normal value (reference range)
Albumin (S/P)	36-48g/L
Prealbumin (S)	0.17-0.35g/L
C Reactive Protein (S/P)	0.33-1.47 nmol/L
Folate	>6.8 nmol/L
Haemoglobin	130-180g/L male 115-165g/L female
Iron (S)	8.1-32.6 µmol/L male 5.0-30.4 µmol/L female
Lymphocytes x10 ⁹ /L	1.0-4.0
Potassium	3.5-5.3 mmol/L
Sodium	135-148 mmol/L
Vitamin D	>75 nmol/L

S: Serum, P: Plasma

Screening and assessment of nutritional status can be performed using one of a number of validated tools (e.g. Malnutrition Screening Tool, Mini Nutritional Assessment). Height and weight measures may be difficult to obtain depending on the ambulatory ability of the individual and height measures in particular should be interpreted with caution. Any unintentional weight loss is of concern (refer to Nutrition in wound healing pages 6-8). For people with limited mobility, recent food and fluid intake may be a better indicator of nutritional status.

Malnutrition screening tool⁴¹

1. Has the resident lost weight recently without trying?

No	0
Unsure	2
Yes, how much (kg)?	
1-5	1
6-10	2
11-15	3
>15	4
unsure	2

2. Has the resident been eating poorly (for example less than ¾ of usual intake) because of a decreased appetite?

No	0
Yes	1

If the total score is 2 or more the individual is likely to be underweight and/or at risk of malnutrition and should be assessed by a dietitian.

N.B. Nutritional screening is useful to determine if someone needs further nutritional assessment, intervention and support, not as a baseline to assess if an intervention made a positive change.

It is important to note that overweight or obese individuals can still have protein and nutrient deficiencies that can often be missed. Unintentional weight loss in these individuals may be equally detrimental as they will lose protein stores instead of fat.^{3,26,39,42}

An individual's energy requirement should be calculated and compared with their intake, so that any deficit can be addressed. Dietitian input can be useful.⁴²

Nutritional intervention

When an individual is found to be malnourished or at risk of malnutrition, the multidisciplinary healthcare team will need to intervene with nutritional support.

Following assessment, a plan of appropriate support and/or supplementation should be developed to meet individual needs. The plan should include an evaluation date and plans for regular monitoring and re-assessment.⁴²

Increasing protein and energy intake may be achieved with a normal diet, but if this is not possible or intake is impaired, additional supplements may be required. The increased need for some nutrients, for example L-arginine can be challenging to meet with diet alone.

Examples of high protein and/or high energy foods/drinks:^{5,6}

- High quality meats • Butter, cheese, full cream milk
- Bread, wholegrain cereals
- Shakes, smoothies, powder (e.g. milk powder, soy powder)

Minimum energy intake to provide essential nutrients:

- 6,000-7,000 kilojoules/day (1500-1750 calories/day)
- n.b. May be higher for weight maintenance

There are some people in particular who may benefit from supplementation. For example:

- **Nutritional demands may be greater with certain complex non-healing wounds, and supplementation of protein, calories, L-arginine and antioxidants can have a positive effect on healing⁴²**
- **People with diabetes who have ulcers on their feet and lower extremities have been shown to benefit from L-arginine supplementation¹**
- **People who eat little or no meat or other foods high in iron, protein and zinc may need supplements of these nutrients**
- **For malnutrition, a high energy and protein nutritional supplement or a nutritionally complete supplement drink can be given.²⁰**

Extra care needs to be taken when addressing the nutritional needs of an individual with diabetes. Diabetes may delay wound healing, especially if poorly controlled. While people with diabetes need adequate energy for wound healing, tight glycaemic control is also important. For this reason when any nutritional support for people with diabetes is planned, other therapies they are taking must be considered.²⁶

Factors that may hinder adequate nutrient intake:^{6,26}

- Confusion and/or altered level of alertness
- Difficulty swallowing, e.g. due to Parkinson's disease or other neurological conditions
- Individual food preferences e.g. cultural food choices, vegetarian
- Lack of manual dexterity e.g. due to arthritis, peripheral vascular disease, neurological conditions
- Isolation, low socio-economic status
- Taste changes, reduced appetite, early satiety
- Feeding routines in institutions e.g. tray collection times.
- Poor eyesight
- Anxiety
- Poor dentition
- Pain
- Eating environment
- Packaging of food

Ideas to improve nutritional status include:^{6,26}

- Offer food and fluids in a variety of textures and consistencies
- Offer assistance and allow sufficient time for meals and enlist family members or volunteers to help
- Provide encouragement, without pressuring
- Offer a variety of nutrient dense, high calorie and high protein meals
- Encourage grazing – small frequent meals/snacks
- Encourage frequent drinking of fluids
- Provide hydration stations for patients to access drinks at any time
- Provide foods that patients like
- Position upright when eating
- Allow time for individuals to eat in a relaxed manner, with time to chew, feed themselves and finish their meal
- Provide a pleasant mealtime environment
- If the individual has dentures ensure that these are well fitted
- Explain that eating well, and eating the right foods, will aid recovery
- Provide assistance with the opening of containers, lids.

Evaluation

Nutritional intervention should be reviewed as part of the individual's overall care plan and success can be measured by outcomes such as increased weight, improved functional ability, enhanced health-related quality of life, reduced incidence of new wounds such as pressure ulcers and/or healing of chronic wounds.⁴²

Regular ongoing evaluation is necessary, especially as the benefits of nutritional support may take time to appear in those who are malnourished and have chronic wounds.⁴²

Nutrition and wound care in practice

Implementing the nutritional plan and providing appropriate nutritional support to the individual requires involvement of the whole wound management team, and effective communication between all members of that team.⁶

The woundcare team is multidisciplinary and, as well as the individual, should include:^{10,39}

- Physicians
- Specialist wound care nurses
- Institutional nurses
- Community/home-care nurses
- Dietitians
- Physiotherapists
- Podiatrists
- Occupational therapists
- Pharmacists
- Family and/or other carers

For optimal wound healing it is the team's responsibility to ensure that the individual concerned has optimal nutritional support no matter what their setting; be it home, hospital or residential aged care.³

Useful links

- Australian Wound Management Association (AWMA) www.awma.com.au
- National Pressure Ulcer Advisory Panel (NPUAP) www.npuap.org
- European Wound Management Association www.ewma.org
- European Pressure Ulcer Advisory Panel www.epuap.org

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