

The Identification of Barriers to Pressure Ulcer Healing

Using Nutrition/Hydration-related Blood Work



BY Chris Fraser,
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Introduction

Any screening process that assists in the prediction of pressure ulcer response to costly or time-consuming wound management—which may include dressings, adjunctive therapies and surgeries—and that assists in the prediction of healing potential will lead to a more appropriate allocation of healthcare resources. In addition, it could help to prevent well-intentioned clinicians from inadvertently contributing to the frustration and disappointment of clients with pressure ulcers by initiating treatments and therapies that are likely to be unsuccessful because all aspects of a person's ability to heal have not been considered and addressed optimally.

It is imperative that wound care clinicians ask the following questions: "Is the patient's nutrition and hydration status being addressed?" and "Will the specialized treatments and therapies be effective if the patient is not optimally nourished and hydrated?" Failure to ask these questions may themselves be barriers to healing.

Clues to Healing Potential

In a study performed by Houghton and colleagues, subjects with a spinal cord injury (SCI) and chronic stage II, III or IV pressure ulcers were followed as part of a randomized controlled trial. As part of the screening process a comprehensive assessment was performed by an interdisciplinary team (nurse, physical therapist, occupational therapist and dietitian), including nutrition assessment and intervention.

A comprehensive review of nutrition issues was conducted. This included factors that may influence or impact dietary intake, weight status or change and a wide variety of other factors necessary for a thorough and individualized nutrition assessment.

In addition, blood work analysis was performed to screen for markers of nutrition and hydration status and metabolic disorders such as anemia (iron-deficiency anemia, anemia of chronic disease [ACD]), diabetes or impaired glycemic control, thyroid dysfunction, dehydration, hypoalbuminemia and hypoprealbuminemia.

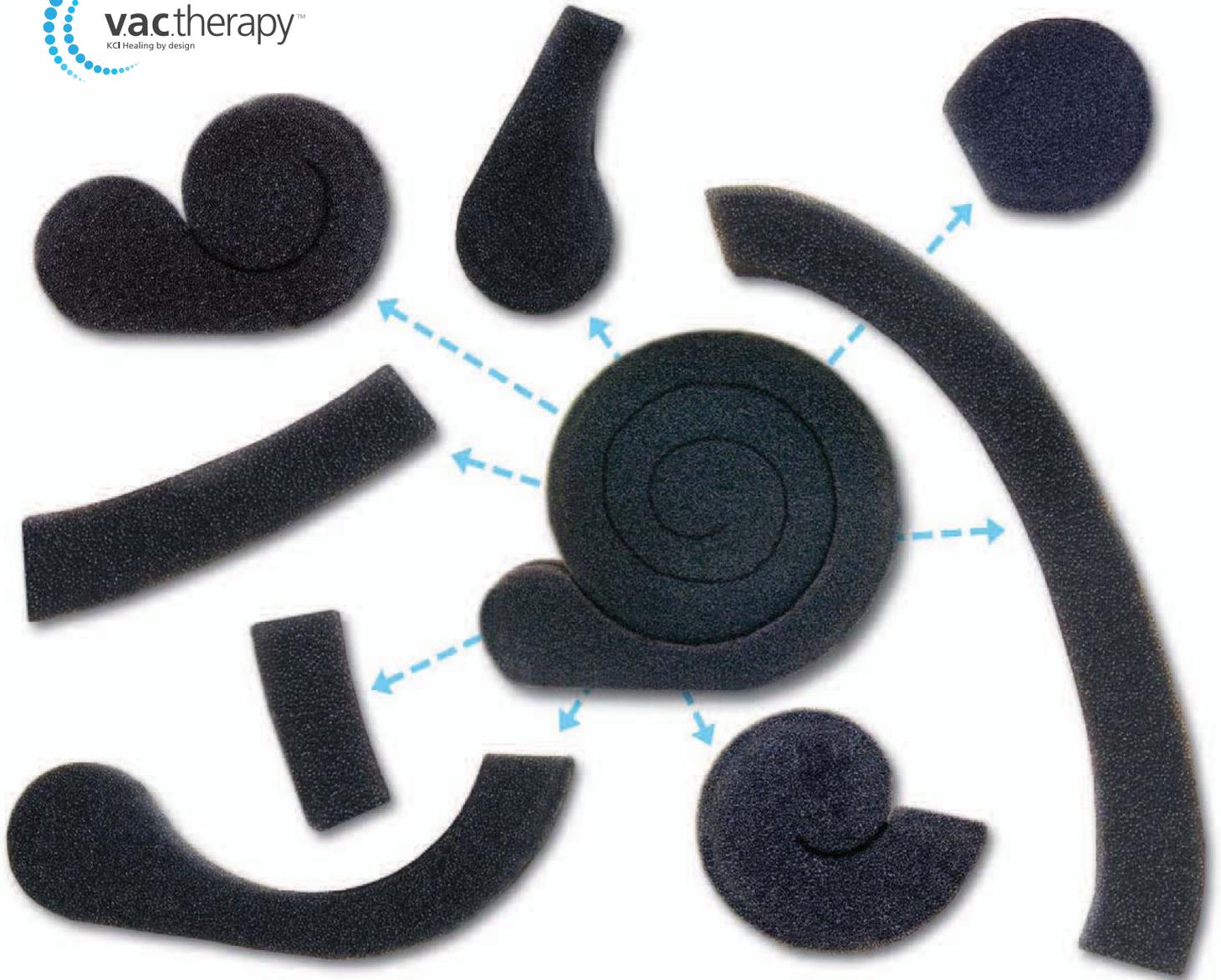
From the nutrition perspective, a judgement on a patient's ability to heal cannot be based on their blood work alone. A comprehensive nutrition assessment must be conducted to identify all potential nutrition- and hydration-related barriers to healing. Indeed, wound healing is much like crime scene investigation! Blood work screening is, however, a necessary step in identifying barriers to healing.

The results obtained by Houghton et al. suggested that only very small differences existed between the mean blood work values of individuals in the healer and non-healer groups. However, the proportion of individuals with two or more abnormal blood values was markedly higher in the group who did not heal over the six-month observation period.

Healing potential decreased when the number of abnormal values increased. The cumulative effect of a

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combination of two or more abnormal blood values, even when mildly abnormal, negatively impacted healing.

Anemia

If a patient presents with anemia it is imperative that the type of anemia is identified. The complete blood count and iron profile (serum iron, total iron binding capacity, per cent saturation, ferritin) should be assessed to distinguish between iron-deficiency anemia and ACD. It is important to note that it is possible for a patient to have mixed anemias.

Both iron-deficiency anemia and ACD result in a decreased hemoglobin level, which is a barrier to healing. If blood cell morphology is available, iron-deficiency anemia will manifest as microcytic, hypochromic (small, pale) red blood cells; ACD will manifest as normocytic, normochromic red blood cells (normal size and shape), but in lower than normal concentration. If iron deficiency is identified, iron supplementation should be initiated and dietary iron intake increased in order to resolve the anemia and promote wound healing. However, supplementation does not negate the need to investigate and address the underlying cause of the deficiency.

Concurrent medical issues and inflammatory and infectious conditions are associated with ACD, which is a barrier to wound healing. A chronic non-healing pressure ulcer is itself an inflammatory process that may lead to ACD. The ferritin level, in the absence of infection or inflammation, reflects iron stores. However, ferritin is also a positive acute-phase reactant, meaning that it is elevated in the presence of inflammation or infection. It is important that a clinician does not assume that a normal or elevated ferritin level is an accurate reflection of iron status under these conditions. The ferritin level is easier to interpret if assessed concurrently with other markers of infection and inflammation, such as C-reactive protein. Supplementation with iron for ACD is contraindicated.

Severity of Illness or Injury and Nutrition Status and Risk

Albumin and prealbumin are hepatic proteins that are often cited in the literature as markers of protein or nutrition status. There is much discussion of this among clinicians and authors, with many disputing the value of albumin and prealbumin as nutritional markers, especially in critical and acute care settings.

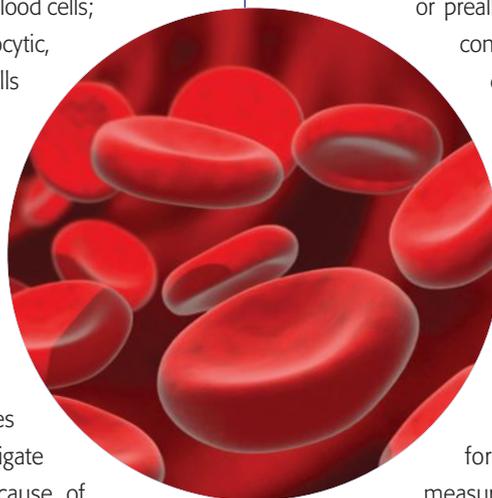
Low values reflect the severity of the illness or injury regardless of protein status and are “red flags” for the potential of a patient to develop malnutrition or become more malnourished. It is therefore imperative that nutrition intervention is launched. In the study by Houghton et al. and in the experience of this clinician in an SCI rehabilitation setting, low albumin or prealbumin values resolve with the consumption of a recommended daily volume of liquid nutrition supplement or provision of nutrition support through supplemental overnight tube feeding.

Glycemic Control

While the measurement of glycated hemoglobin (HbA1C) levels is not a diagnostic tool for diabetes, it is a valuable measure that reflects glycemic control over the previous two to three months. HbA1C levels above seven per cent are associated with a significantly increased risk for both microvascular and macrovascular complications and impaired wound healing.

Hyperglycemia in the SCI population is largely the result of insulin resistance and impaired glucose tolerance. Some individuals may have normal fasting blood glucose (FBG) levels but impaired glucose tolerance following a meal or carbohydrate load. In the study by Houghton et al., the authors observed that had FBG alone been used to screen for hyperglycemia without concurrent assessment of HbA1C, previously undiagnosed prediabetes and diabetes would have been unidentified in some of the study subjects. It is recom-

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mended that both FBG and HbA1C are screened in individuals with pressure ulcers.

Treating ulcers is more effective when screening and management measures are implemented to address underlying factors, such as hyperglycemia, that impede successful outcomes. Controlling serum glucose levels to promote wound healing cannot be overemphasized.

Thyroid Function

Hypothyroidism is one of many conditions that can adversely affect wound healing. It is a metabolic disorder of great clinical importance and exerts biochemical and histological effects on tissue integrity and regeneration. Hypothyroidism and diabetes mellitus can coexist in clinical settings; the influence of these conditions both individually and concurrently warrants the screening for and immediate management of these conditions for optimal wound healing. It is recommended that patients with pressure ulcers are screened for thyroid-stimulating hormone.

Hydration Status

Dehydration is a risk factor for skin breakdown and wound healing. The blood urea nitrogen (BUN) to creatinine ratio may be used as an indicator of a patient's hydration status. An elevated BUN level with a normal or low serum creatinine level may indicate under-hydration, although this may not be accurate in patients with renal impairment. A BUN to creatinine ratio of more than 20:1 is a red flag for dehydration, which must be investigated and addressed.

In addition, BUN and creatinine are indicators of renal function. A clinician must be aware of a patient's renal status before recommending enhanced protein, fluid, vitamin and mineral intakes. Supplementation in renal insufficiency, as well as in other comorbidities, is subject to precautions and contraindications.

Following a preliminary review of the data and identification of the trends related to blood work and healing in the Houghton et al. study, the practice changed such that a review of blood values was conducted for individuals with SCI and a severe pressure ulcer (stage IV). When two or more abnormal blood values were obtained, nutrition intervention was initiated to promote resolution of the modifiable

abnormalities and adjunctive therapy (electrical stimulation) was not provided. The blood work was subsequently reassessed and the adjunctive therapy was initiated once the individual's nutrition and hydration status was deemed supportive of healing (i.e., when he or she had fewer than two abnormal values). If only one abnormal blood value was identified, nutritional intervention was provided concurrently with the adjunctive therapy. If no abnormal values were identified through blood analysis, electrical stimulation was initiated with success in most cases.

Conclusion

Blood work analysis can be a valuable tool in identifying nutrition-related barriers to pressure ulcer healing. The identification of these barriers should lead to appropriate interventions to resolve modifiable nutrition-related issues. A patient's healing potential decreases as the number of abnormal values increases. The cumulative effect of two or more blood work abnormalities, even if mildly abnormal, negatively impacts healing. ☹

References

1. Anthony D, Reynolds T, Russell L. An investigation into the use of serum albumin in pressure sore prediction. *Journal of Advanced Nursing*. 2000;32(2):359–365.
2. Arnold M, Barbul A. Nutrition and wound healing. *Plastic and Reconstructive Surgery*. 2006;117(7 Suppl.):42S–58S.
3. Barnes P, Sauter T, Zaheri S. Subnormal prealbumin levels and wound healing. *Texas Medicine*. 2007;103(8):65–68.
4. Bauman WA, Spungen AM. Carbohydrate and lipid metabolism in chronic spinal cord injury. *Journal of Spinal Cord Medicine*. 2001;24(4):266–277.
5. Campos AC, Groth AK, Branco AB. Assessment and nutritional aspects of wound healing. *Current Opinion in Clinical Nutrition and Metabolic Care*. 2008;11(3):281–288.
6. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 clinical practice guidelines for the prevention and management of diabetes in Canada. *Canadian Journal of Diabetes*. 2003;27(Suppl. 2):S1–S201.
7. Duckworth WC, Solomon SS, Jallepalli P, et al. Glucose intolerance due to insulin resistance in patients with spinal cord injuries. *Diabetes*. 1980;29(11):906–910.
8. Ekmektzoglou KA, Zografos GC. A concomitant review of the effects of diabetes mellitus and hypothyroidism in wound healing. *World Journal of Gastroenterology*. 2006;12(17): 2721–2729.

9. Fraser C. The importance of monitoring hydration status in our clients. *Wound Care Canada*. 2009;7(1):18–20.
10. Fraser C. Nutrition and wound care: The importance of investigating the presence of hyperglycemia in individuals with wounds. *Wound Care Canada*. 2007;5(2):20–21.
11. Fuhrman MP, Charney P, Mueller CM. Hepatic proteins and nutrition assessment. *Journal of the American Dietetic Association*. 2004;104(8):1258–1264.
12. Hatanaka N, Yamamoto Y, Ichihara K, et al. A new predictive indicator for development of pressure ulcers in bedridden patients based on common laboratory test results. *Journal of Clinical Pathology*. 2008;61(4):514–518.
13. Holcomb SS. Anemia: Pointing the way to a deeper problem. *Nursing*. 2001;31(7):36–42.
14. Houghton P, Campbell KE, Fraser C, et al. Electrical stimulation therapy increases healing of pressure ulcers in community dwelling people with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*. 2010;91(5):669–677.
15. Keast DH, Fraser C. Treatment of chronic skin ulcers in individuals with anemia of chronic disease using recombinant human erythropoietin (EPO): A review of four cases. *Ostomy/Wound Management*. 2004;50(10):64–70.
16. Marston WA. Risk factors associated with healing chronic diabetic foot ulcers: The importance of hyperglycemia. *Ostomy/Wound Management*. 2006;52(3):26–39.
17. Neidert KC (ed.). *Nutrition Care of the Older Adult: A Handbook for Dietetics Professionals Working through the Continuum of Care*. Chicago, IL: The American Dietetic Association, 1998.
18. Takahashi PY, Kiemele LJ, Chandra A, et al. A retrospective cohort study of factors that affect healing in long-term care residents with chronic wounds. *Ostomy/Wound Management*. 2009;55(1):32–37.
19. Weinberg AD, Minaker KL. Dehydration: Evaluation and management in older adults. *Journal of the American Medical Association*. 1995;274(19):1552–1556.

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