

# High Protein Oral Nutritional Supplements in Hip Fracture Patients



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Hip fractures are becoming a major health issue due to the increasingly aged UK population. Each year, there are approximately 70,000–75,000 hip fractures in the UK, incurring a cost of about £2 billion.<sup>1</sup> Fractured neck of the femoral bone is a clearly defined diagnosis, usually established promptly after a patient presents to accident and emergency (A&E) or to the hospital trauma team.<sup>2</sup> It is a widespread cause of admission, quantifying a large proportion of any hospitals inpatient population. This patient group occupy over 4,000 inpatient beds at any one time across England, Wales and Northern Ireland.<sup>2</sup> The management of hip fracture takes a frail, often malnourished, patient through a complex clinical pathway comprising a vast array of multi-disciplinary team (MDT) members, services and specialisms.<sup>2</sup> Fractures of the proximal femur result in increased morbidity and mortality in elderly patients, and often result in significant reduction in mobility or loss of independence.<sup>2</sup> Prognosis is primarily dependent on how well a patient progresses as an inpatient following a fracture.

## Risk of malnutrition

With the prevalence of malnutrition increasing with advancing age, patients with hip fracture are often particularly malnourished when a fracture occurs,<sup>3</sup> with rapid deterioration in nutritional status commonly seen on admission to hospital and post-surgery.<sup>4, 5, 6, 7</sup> Protein-energy malnutrition is common amongst this patient group<sup>5, 6, 7, 8</sup> and is associated with an increased risk of complications.<sup>9, 10, 11</sup> Hip fracture patients undergoing orthopaedic surgery have increased metabolic requirements, which are often unrecognised.<sup>9</sup> Estimation of total energy requirements of patients may be calculated by estimating the basal metabolic rate (BMR), adding a stress factor of 20% (to account for the increased energy requirements due to surgical correction of the fracture), plus an additional 10–25% (based on the level of mobility) to

allow for rehabilitation, physical activity and diet induced thermogenesis.<sup>5</sup> Similarly, when estimating nitrogen requirements, it is thought that patients experiencing hypermetabolism require 0.2 g of nitrogen per kg per day. Hypermetabolism usually occurs after significant injury or trauma to the body, for example, long bone fractures such as fracture of the neck of femur (#NOF). Furthermore, dietary intake of protein and energy is usually insufficient during hospital stay in this patient group, with many patients unable to meet their nutritional requirements through food alone. Evidence illustrates that nutritional support, particularly when overseen by a dietitian, results in lower risk of postoperative complications, particularly in those already underweight patients,<sup>7, 12, 13</sup> and is now advised by the European Society for Parenteral and Enteral Nutrition (ESPEN).<sup>14</sup>

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## High protein oral nutritional supplements

Although oral nutritional supplements (ONS) are established in #NOF pathways in many NHS Trusts, the benefits of a higher protein content nutritional supplement have not yet been established, despite some research indicating favourable outcomes.

Firstly, the ageing process results in a variety of physiological changes that can negatively impact on bone metabolism, such as increased bone resorption, skeletal bone changes, loss of bone strength, and increase the risk of falls. It has also been shown that insufficient dietary protein may decrease bone strength<sup>15</sup> and structure.<sup>16</sup> It is thought that optimal protein intake for good bone health is likely higher than current recommended intakes, particularly in the elderly.<sup>15</sup> Research has also shown that among elderly hip fracture patients, poor protein status at the time of fracture predicts fracture outcome – patients with a low protein status take longer to heal, and have higher complication and mortality rates.<sup>3</sup> Adequate dietary protein is therefore essential for preservation of bone mass in frail, ageing patients.

Furthermore, a systemic review of 36 randomised controlled trials and a series of meta-analysis of high protein ONS – classified as >20% energy from protein (high protein, low volume supplement used in pathway = 24%) – demonstrated a range of effects in favour of the high protein ONS group. These included reduced complications, reduced readmissions to hospital, improved grip strength and improvements in weight.<sup>17</sup> Unfortunately, the study had inadequate information to compare a standard ONS (<20% energy from protein) with a high protein ONS (>20% energy from protein). The study did however provide evidence that high protein supplements produce clinical benefits, with economic implications.

Low protein intake in patients with hip fracture has also been seen to compromise bone quality<sup>3</sup> and increase risk of fractures.<sup>18</sup> An acceleration in fracture healing has been identified with even a modest 10-20 gram increase in protein intake, illustrating further benefits. A recent study found that protein supplementation reduced post-fracture bone loss, enhanced muscle strength and improved medical complications and length of inpatient stay.<sup>19</sup> Normalising protein intake through use of daily ONS significantly reduced both complications and length of hospital stay.<sup>3</sup>

A study that compared protein containing nutritional supplements versus non-protein containing supplements illustrated significantly favourable outcomes in the protein containing group.<sup>20</sup> These findings encompassed reduced length of hospital stay, as well as lower rates of complications and deaths.<sup>20</sup>

Furthermore, as hip fracture patients are a patient group commonly admitted with protein-energy malnutrition,<sup>5, 6, 7</sup> it is imperative to meet estimated protein requirements. However, this is often unrealistic for patients due to the nutritional content of hospital food. Recent analysis within our own department illustrated the low protein content of most hospital meals. With increased protein requirements and low protein containing meals, patients would benefit from a high protein supplement during the period of their hospital stay.

## Risk of pressure damage

In addition to the high risk of malnutrition, this patient group is also at risk of developing pressure damage.<sup>21</sup> In the UK, chronic pressure damage exemplifies a significant burden to patients, staff and the NHS. Common symptoms include pain, exudate and odour often resulting in poor nutritional intake, interrupted sleep, loss of mobility and social isolation.<sup>22</sup> The cost of chronic wound care in an average district general hospital has been estimated to be in the range of £600,000 to £3 million per year.<sup>23</sup> It is estimated that one in five inpatients have pressure damage, a number that is likely much greater in the #NOF patient group. Development of pressure damage during hospital admission can increase morbidity and mortality, increase burden on nursing resources and delay discharge.<sup>24</sup> Hip fracture in frail elderly patients is a known high-risk factor for the development of pressure damage, due to long periods of immobilisation on high pressure surfaces in the emergency department, on the ward and in theatre during the repair of the fracture.

Adequate nutritional status is essential for wound healing to take place, protein-energy malnutrition may compromise the patient's ability to heal and, subsequently, prolong the healing process<sup>25, 26</sup> and length of hospital stay.<sup>22</sup> It is known that energy demands increase significantly in the presence of a wound, thus indicating a role for high energy supplementation. Additionally, protein is required for synthesis of new tissues,<sup>22</sup> with deficiency resulting in poor wound healing,

exacerbating loss of protein through exudate from the wound and weakened tissue.<sup>22</sup> Prolonged inadequate protein intake may promote tissue oedema, which impedes the healing process by slowing oxygen diffusion from capillaries to cell membranes. Available nutrients will be prioritised to the wound site, with lean muscle mass used to provide the amino acids necessary for wound healing. A 15% or greater loss of lean body mass is associated with compromised wound healing, and a 30% or greater loss is associated with development of new wounds.<sup>26</sup> Evidence shows that increasing dietary protein in patients with chronic pressure damage results in improved healing.<sup>27</sup>

Studies exploring this topic are difficult to perform due to the multifactorial origin of pressure ulcers, numerous uncontrollable factors affecting the

development of pressure damage and the necessary long observational periods.<sup>14</sup> A meta-analysis of four randomised controlled trials showed that ONS was associated with a significantly lower incidence of pressure ulcer development in at risk patients, when compared to routine care.<sup>28</sup> Three of the four studies used high protein ONS and illustrated improved healing of existing pressure damage in patients receiving ONS.<sup>25</sup>

ONS may not prevent pressure damage entirely, but may delay the onset and progression of pressure ulcers. It is most effective when introduced early,<sup>29</sup> thus the decision was taken to implement a #NOF pathway for patients on admission to the Orthopaedic Ward at the Queen Elizabeth Hospital Gateshead, avoiding delay. Due to the complex nature of the pressure damage process and the difficulty in associating

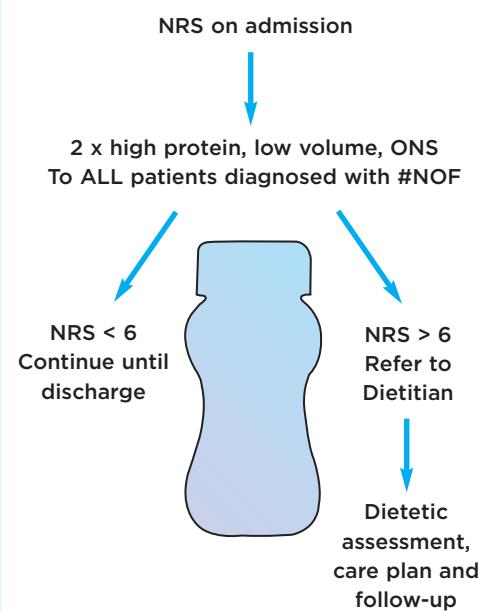
sole factors attributing to this, it is difficult to pin point protein as the influencing factor but evidence illustrates its benefit in both prevention and the healing process.

## Conclusion

Although there is little evidence directly recommending the use of higher protein content oral nutritional supplements in hip fracture patients, the individual evidence for each aspect of this patient group suggests numerous beneficial effects. Despite some concerns that excessive protein may be harmful for bone health, this patient group, who are often protein-energy malnourished or have low baseline protein intake, are unlikely to consume harmful amounts of protein during this inpatient period, even with two high protein, low volume, oral nutritional supplements per day.

## The #NOF Pathway

This rationale has led to the implementation of a new #NOF pathway on the Orthopaedic Ward at the Queen Elizabeth Hospital, Gateshead. Implementation of a nutrition pathway for this patient population is a cost-effective method of tackling malnutrition and pressure damage with the aim of improving clinical and social outcomes, whilst reducing the need for individual dietetic assessments. This pathway aims to improve perioperative outcomes, focusing on the nutritional status and pressure damage of hip fracture patients on the ward. All patients with #NOF should be offered two high protein, low volume supplements, amounting to 600 kcals and 36 g protein daily from admission to the Orthopaedic Ward, and for the period of their inpatient stay. Patients with a Nutrition Risk Score (NRS) of '6 or above' must also be referred to the ward dietitian who will then assess and provide a further individualised care plan. Patients under the care of the dietitian will have their supplements continued in the community and be followed up post-discharge. However, patients scoring NRS 'less than 6' will not be discharged on continuous oral nutrition support or followed up post-discharge. An effort has also been made to overcome possible limitations of the pathway, such as patients with renal problems (e.g. acute kidney injury or chronic kidney disease), swallowing difficulties, allergies/intolerances and those who do not like milky drinks, by formulation of a guidance table for staff.



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