Peri-operative haemoglobin in the elderly: how low can we go?
Nicolai Bang Foss
Dept. of Anaesthesia, Hvidovre Hospital, Denmark

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Anaemia occurs in a large percentage of patients during the peri-operative period [1-3]. This refresher course lecture will focus on current evidence for the detrimental effects of anaemia and peri-operative transfusion triggers specifically in the elderly patient undergoing non-cardiac surgery.

Anaemia in the elderly

Elderly patients are highly vulnerable to the detrimental effects of peri-operative physiological stress, and peri-operative anaemia represents a further physiological insult due to increased cardiac demands and tissue hypoxia [4, 5]. Severe anaemia with haemoglobin levels < 8.0 g/dl has been associated with increased mortality, most pronounced in those with pre-existing cardiac disease [6, 7]. In addition, in elderly patients undergoing non-cardiac surgery even slight to moderate anaemia has been linked with excess mortality [8]. The impact of moderate anaemia in the elderly patient undergoing non-cardiac surgery – that is, a haemoglobin concentration between 8.0 and 10.0 g/dl, is debatable [9, 10]. Anaemia decreases aerobic exercise capacity which will decrease physical performance and, thereby, potentially impede postoperative rehabilitation. Postoperative anaemia in hip fracture patients has been associated with decreased ambulation, reduced functional independence, reduced walking distance on discharge, postoperative delirium, medical complications and increased length of hospital stay [11-13]. Whether the detrimental effect of anaemia on physical function is linear or exponential with increasing anaemia has not yet been established.

Transfusion therapy in the elderly

Transfusions with red blood cells are potentially immunosuppressive and have been associated with increased risk of infectious complications [14]. Surgical patients with severe anaemia (Hb < 8.0 g/dl) who decline transfusions have increased mortality, but transfusion has not been found to improve mortality in descriptive studies of hip fracture patients with Hb > 8.0 g/dl [15]. Restrictive transfusion thresholds – withholding transfusion until the haemoglobin drops < 8.0 g/dl – as opposed to a liberal transfusion policy, with a threshold of 10.0 g/dl, are debatable in everyday clinical use, but evidence is lacking for use of a liberal transfusion therapy to improve outcome in non-cardiac surgery [15].

There are few studies specifically addressing transfusion triggers in the elderly patient presenting for non-cardiac surgery. As age is a proxy for decreased physiological reserves, it would seem obvious that transfusion triggers should be studied, specifically in elderly patients. Two available studies in hip fracture patients - exclusively elderly patients - randomized liberal vs more restrictive transfusion thresholds, and demonstrated a potential to reduce mortality and cardiovascular morbidity when a liberal transfusion threshold was used [16, 17].
Although anaemia has been associated with decreased functional outcome, a liberal transfusion threshold has not been shown to improve functional independence or rehabilitation outcomes [15-17]. This lack of effect of transfusion therapy on functional capacity can, of course, be related to poorly designed studies, but it can also be due to a lack of physiological response to transfusion in the context of postoperative physiological stress with reduced work capacity and fatigue; other factors could be timing of transfusions and inadequate thresholds in these very old and fragile patients. It has been observed, that despite repeated transfusions to greater than a defined trigger level, hip fracture patients continuously drop below the trigger level several days into the postoperative period [1]. As such, a high haemoglobin trigger with a long observation period between measurements of haemoglobin, will lead to a high ‘area under the curve’ of time spent below the trigger level, potentially negating any potential effect of subsequent transfusions.

Due to the potential adverse effects of allogenic transfusions, peri-operative stimulation of erythropoiesis via erythropoietin and intravenous iron supplementation has been proposed. There are very few studies of such a regime in the elderly surgical population, with inconclusive results [18-20].

Conclusion

There is limited evidence for the management of anaemia and transfusion triggers specifically in the elderly patient presenting for non-cardiac surgery. Until large scale randomized studies of transfusion thresholds are available, restrictive transfusion thresholds should probably be used with caution in this population. At present it is not known whether it is the low point of anaemia or the ‘area under the curve’ of anaemia vs time that is most detrimental. It would seem that regardless of the chosen trigger point, intensive peri-operative monitoring of haemoglobin concentration is mandated. Further studies should evaluate both the impact of timing of transfusions and more liberal transfusion thresholds on ambulation and rehabilitation potential.

Key learning points

- Anemia is potentially detrimental in the elderly surgical patient
- The consequences of restrictive peri-operative transfusion therapy has been inadequately researched in the elderly
- Close peri-operative monitoring of anaemia is mandatory in the elderly
- Further studies are needed on the impact of peri-operative transfusion strategies in the elderly on outcome and rehabilitation

References