

# Mitigating the Risks of Blood Loss in Neurosurgery Patients

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“Blood conservation in neurosurgery,” the topic of the article by McGirr et al,<sup>1</sup> is fundamental to neurosurgical care. Neurosurgeons are challenged each day with the task of mitigating the risks of bleeding in our patients. The authors are directing our attention to this important issue and we should use the opportunity to reexamine how we approach mitigating the risks of blood loss in all neurosurgery patients, not just in situations with high risk of blood loss.

The authors have undertaken a single-center retrospective review of experience with preoperative administration of recombinant erythropoietin (EPO) with or without preoperative autologous blood donation (PAD) in neurosurgery patients. The goals for these preoperative interventions were to reduce the risk or the need for allogeneic blood transfusion in patients who are believed to be at high risk of significant intraoperative blood loss. The analysis was undertaken for a 7-year period and included 54 patients (54 EPO and 32 EPO + PAD) who were compared with 108 International Classification of Diseases-10–equivalent control patients. There was no difference in the rate of allogeneic blood transfusion between the two groups. Furthermore, 58.6% of PAD units were not used and were thus discarded (wasted). The authors conclude that there is no evidence supporting the use of EPO or PAD to decrease the risk of allogeneic blood transfusion.

The comparison between treatment and control groups is contingent upon accepting that the patient parameters are similar. The authors have attempted to manage this issue by looking at a number of patient-related factors to allow surgical matching with regard to spinal levels and tumor volumes. Given the retrospective nature of the study, it is challenging to control for all these elements and it is still possible that the severity of the underlying disease or type and duration of the operative procedures may play a role in determining the need for transfusion. However, even with this minor limitation, the study conclusions are reasonable and should stimulate discussion regarding the acceptability of this practice.

Although the authors have focused on a group of patients with a high risk of intraoperative blood loss, it is obvious that minimizing blood loss is an important goal during any neurosurgical procedure. There are many “general” practices that should be used before and during surgery to mitigate both the bleeding risks<sup>2</sup> and the consequences of blood loss; much can be learned from the pediatric neurosurgery literature where this problem is of particular significance.

Preoperative iron supplementation has a limited but relevant role in select patients<sup>3</sup> and must be started weeks to months before surgery. The role of EPO is the first of two preoperative strategies that has been reviewed by McGirr et al. However, recommendations in the literature provide contradictory support of the role for EPO, often used in combination with other intraoperative strategies, in certain high-risk patients and particularly in pediatric neurosurgical patients.<sup>4,5</sup> This issue has not been adequately resolved.

Preoperative autologous blood donation is the second of two strategies examined by McGirr et al. The advantages seem obvious if there is a high probability of a blood transfusion expected for a surgical procedure, but this requires significant preoperative lead time to allow for planning. This procedure has been used most commonly in certain pediatric neurosurgical procedure, especially elective complex spinal surgery.<sup>6-8</sup> This study brings into question the role for autologous donation for the adult patient population. In particular, the authors bring attention to the significant wastage (58.6% of blood not used) and the substantial cost associated with this type of program. Further assessment of this procedure is essential.

Preoperative directed donation of blood by family members has fallen out of favor for a number of reasons and is currently not in common use.<sup>9,10</sup>

Several potential intraoperative strategies also exist. All are in need of more comprehensive assessment to define a definite role in neurosurgical practice. The use of intraoperative cell salvage systems has been examined in pediatric neurosurgical populations, but has a somewhat limited application in adult neurosurgical patients.<sup>11-13</sup> Cell salvage systems collect, filter, and transfuse recycled blood back into a patient and have no established role in neurosurgical oncology because of the concerns regarding contamination of recycled blood with tumor cells. Other possible intraoperative strategies include hypervolemic hemodilution,<sup>14</sup> acute normovolemic hemodilution,<sup>15,16</sup> and induction of hypotension.<sup>17</sup> Of these three strategies, only hypervolemic hemodilution is commonly used. There is also literature regarding a limited role for antifibrinolytics<sup>18</sup> and recombinant factor VIIa<sup>19</sup> in select neurosurgical patient groups.

It is particularly important to emphasize the importance of “transfusion protocols” that incorporate various blood and physiologic parameters to determine when blood transfusion should be used.<sup>20-22</sup> There is good clinical evidence to support using transfusion protocols. The protocols can help guide discussions by surgeons, anesthesiologists, and intensive care staff regarding intraoperative strategies (e.g. hypervolemic hemodilution) and thresholds for transfusion to help avoid what sometimes appears like an arbitrary decision process around the need to transfuse blood products. Transfusion protocols should be developed in all neurosurgical centers and routinely discussed as part of the preoperative safety briefing.

Finally, the authors’ call for additional research “using randomized prospective designs” cannot be overstated. There is a fundamental need to look at all currently “accepted” strategies and determine efficacy so as to allow for the development of clear evidence-based guidelines regarding blood loss and transfusion mitigation in neurosurgical patients. This will improve patient safety and also provide a better understanding regarding the health economics of these practices.

## DISCLOSURES

Mark Hamilton is a consultant and receives honoraria from both Codman Canada and Medtronic Canada.

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