The impact of bleeding complications and blood transfusions

on hospital costs and treatment outcomes

Blood is a special type of connective tissue consisting of plasma and cellular elements. Recently, numerous research papers have been published indicating the need for a very careful and balanced blood transfusion policy. It is known that severe anemia and massive intraoperative blood loss, which are the most common indications for blood transfusion, are unfavourable prognostic factors for treatment outcomes.

In the preoperative period, it is an independent prognostic factor of postoperative mortality in various types of surgical procedures, especially cancer. At the same time, numerous studies show that in many clinical situations also the transfusion itself is a negative factor. A growing number of large observational studies have consistently demonstrated a dose-response relationship between transfusion and mortality, morbidity, mean length of hospital stay and length of hospitalization in intensive care units. Transfusion of blood or its preparations is a therapeutic intervention with short and long-term consequences.

The short term consequences include: allergic reaction, acute haemolytic reaction. The long term consequences of blood transfusions are: alloimmunization and transmission of infectious agents (bacteria and viruses).

Therefore, it is important to implement technological, pharmacological and organizational measures to limit blood loss during surgical procedures and to conduct rational treatment with blood and blood products.

Retrospective analyzes by Michael E Stokes et al using Premier's Perspective ™ hospital database in the US showed that transfusion and bleeding are factors that significantly influence treatment costs. The authors assessed the total cost of hospitalization for patients with bleeding complications and / or blood product transfusions compared to patients without bleeding or transfusion complications. The rate of haemorrhagic complications was 29.9%, ranging from 7.5% for reproductive organ surgery to 47.4% for cardiac surgery. Overall, the incremental length of hospital stay associated with bleeding complications or transfusions (not adjusted for covariates) was 6.0 days, ranging from 1.3 days to 9.6 days. In addition, patients with bleeding complications and / or blood products transfusions spent an average of about 2.7 days more in the intensive care unit (ICU) than patients without bleeding complications and blood product transfusions (total: 3.3 days versus 0.5 day).(Chart 1)

Hospital LOS and ICU Days related to bleeding complications

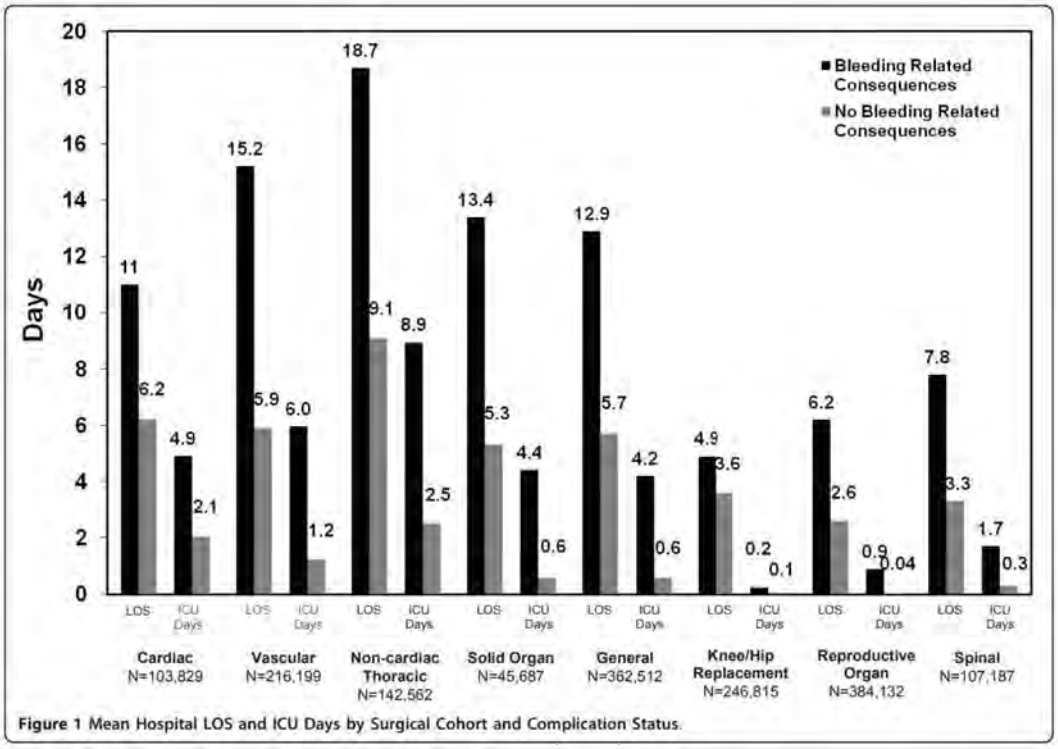

Figure 1 Mean Hospital LOS and ICU Days by Surgical Cohort and Complication Status.

Chart 1. This chart is from the publication : Stokes, M.E., Ye, X., Shah, M. et al. Impact of bleeding-related complications and/or blood product transfusions on hospital costs in inpatient surgical patients. BMC Health Serv Res 11, 135 (2011).

https://static-content.springer.com/esm/art%3A10.1186%2F1472-6963-11-135/MediaObjects/12913_2010_1649_MOESM1_ESM.pdf

The covariate-adjusted incremental cost of a single hospitalization for bleeding complications was highest for spine surgery and lowest for reproductive organ surgery.

Impact of bleeding related complications on hospital costs

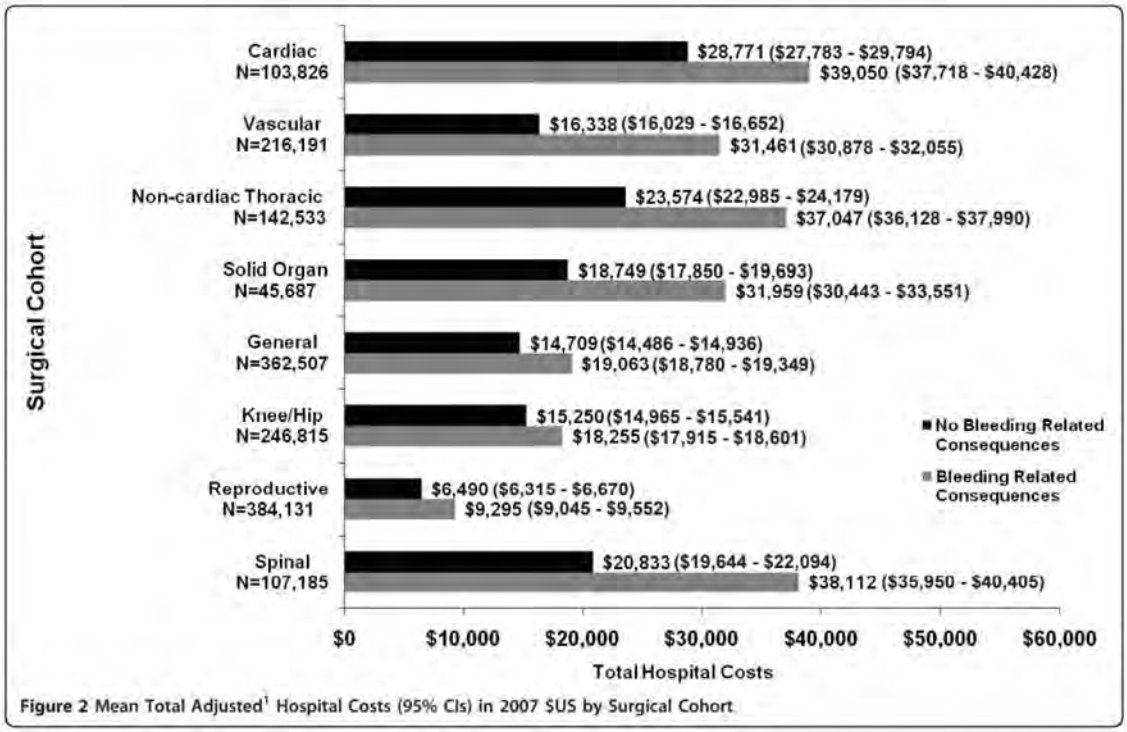

Chart 2. This chart is from the publication: Stokes, M.E., Ye, X., Shah, M. et al. Impact of bleeding-related complications and/or blood product transfusions on hospital costs in inpatient surgical patients. BMC Health Serv Res 11, 135 (2011).

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In their conclusions, the authors emphasized that due to the high cost of treating patients with bleeding complications and / or haemorrhagic product transfusions, additional comprehensive approaches should be developed to optimize the management of intraoperative bleeding, including product and technical strategies (Chart 2).

There are also publications supporting the relationship between blood transfusion and treatment outcomes. Alexander Kaserer and co-authors have shown an association between the transfusion of allogeneic blood products and an increased incidence of infections and thromboembolic diseases, and longer hospital stay in severely burned patients. This is confirmed by the results of Victor A. Ferraris and co-authors who, in an analysis of the American Surgical Society's National Quality Improvement Program (ACS NSQIP) data on 941,496 operations from 173 hospitals, found that intraoperative blood transfusion has dose-dependent adverse effects. The authors concluded that it is probable that a small, potentially any amount of intraoperative transfusion leads to an increase in mortality and morbidity (Chart 3).

Mortality and morbidity rates related to intraoperative blood transfusion

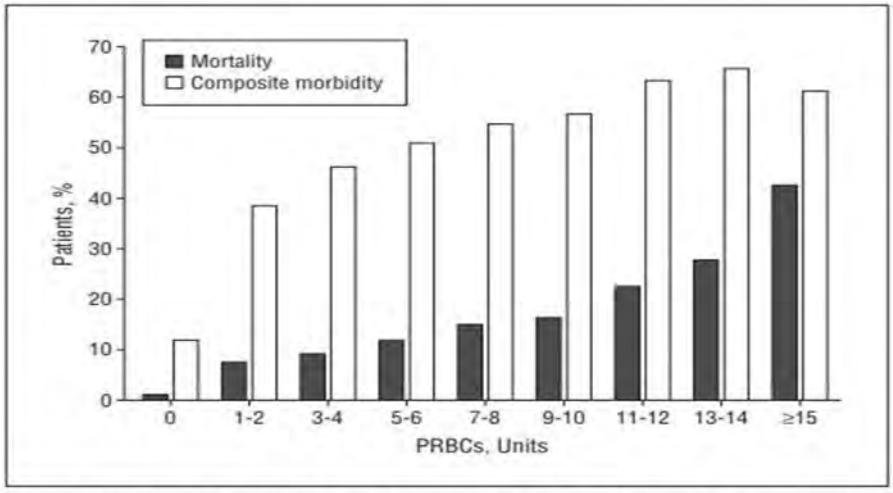

Figure. Unadjusted mortality and composite morbidity rates by number of units of packed red blood cells (PRBCs) received in intraoperative blood transfusion.

Chart 3. This chart is from the publication: Ferraris VA, Davenport DL, Saha SP, Austin PC, Zwischenberger JB. Surgical Outcomes and Transfusion of Minimal Amounts of Blood in the Operating Room. Arch Surg. 2012;147(1):49–55.

A relationship has also been demonstrated between blood transfusion and treatment outcomes in cancer patients. Jung Kwon Kim and co-authors, in a multivariate analysis of 2,713 patients who had undergone radical prostatectomy for prostate cancer, found that allogeneic blood transfusions were associated with a significant reduction in biochemical recurrence-free survival (BRFS), cancer-specific survival (CSS) and overall survival (OS).

This is confirmed by the results of a study by Zhang Pushan and colleagues who in 2018 published data of a systematic review of the PubMed, EMBASE and Cochrane medical databases to assess the relationship between perioperative blood transfusion and the clinical outcomes of prostate cancer patients undergoing radical prostatectomy (RP) surgery. The analyzed results were overall survival (OS) and recurrence-free survival (RFS) after 3, 5 and 10 years.

A meta-analysis of eight studies found that prostate cancer patients with perioperative blood transfusions had shorter overall survival (OS) and relapse-free survival (RFS). Subgroup analysis by different years and group size showed a similar disadvantage of survival and relapse. The authors considered the suppressive effect of the transfusion on the immune system as the main possible reason for the obtained data.

Taking into account the above data, clinical, pharmacological and organizational measures should be taken to reduce bleeding during surgery and to limit blood transfusion to the necessary minimum. We should remember that donor blood transfusions are a kind of allgenic connective tissue transplant with all short- and long-term consequences.

Literature:

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