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## Patient Blood Management Bundles to Facilitate Implementation



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### ABSTRACT

More than 30% of the world's population are anemic with serious economic consequences including reduced work capacity and other obstacles to national welfare and development. Red blood cell transfusion is the mainstay to correct anemia, but it is also 1 of the top 5 overused procedures. Patient blood management (PBM) is a proactive, patient-centered, and multidisciplinary approach to manage anemia, optimize hemostasis, minimize iatrogenic blood loss, and harness tolerance to anemia. Although the World Health Organization has endorsed PBM in 2010, many hospitals still seek guidance with the implementation of PBM in clinical routine. Given the use of proven change management principles, we propose simple, cost-effective measures enabling any hospital to reduce both anemia and red blood cell transfusions in surgical and medical patients. This article provides comprehensive bundles of PBM components encompassing 107 different PBM measures, divided into 6 bundle blocks acting as a working template to develop institutions' individual PBM practices for hospitals beginning a program or trying to improve an already existing program. A stepwise selection of the most feasible measures will facilitate the implementation of PBM. In this manner, PBM represents a new quality and safety standard.

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More than 30% of the world's population are anemic. Anemia is increasingly recognized as a risk factor for a number of adverse outcomes, including hospitalization, morbidity, and mortality. The high global prevalence of insufficiently treated anemia also possesses a major economic burden including reduced work productivity and increased social expenditures [1]. In hospitalized patients, incidence of anemia increases within the processes of care, such as procedural blood loss and phlebotomy [2].

Patient blood management (PBM), as defined by the Society for the Advancement of Blood Management [3], refers to “the timely application of evidence based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patient outcome.” It requires rejecting the standard dogma and one-size-fits-all approach, whereby red blood cell (RBC) transfusions are used as the primary solution to correct low hemoglobin levels in the hospitalized patient.

In recent years, a few reviews, standards, and guidelines have been published providing detailed information on PBM [3–11]. Briefly, PBM must be executed by an institutionally empowered multidisciplinary team that works in a concerted fashion with 4 guiding principles of PBM: The first principle or strategy is to manage the patient's anemia, which primarily involves instituting methods of early detection and using nutritional and pharmaceutical treatments to support erythropoiesis, if it is not mainly genetic or cancer related. While actively treating anemia, the physiologic tolerance of anemia can be enhanced by minimizing oxygen consumption and/or enhancing delivery. The second PBM strategy involves optimizing coagulopathy. This involves determining the patient’s current coagulation status and assessing those medications that affect this, correcting any abnormalities and, if present, rapidly assessing the cause of bleeding. The third guiding PBM principle entails using interdisciplinary blood conservation modalities. Physicians can adhere to this principle by ensuring that their surgical techniques are precise enough to minimize blood loss. Any blood loss should be diagnosed and stopped immediately. In addition, intraoperative and postoperative blood conservation techniques should be used, including autologous conservation modalities. Attention should be given to phlebotomy volume and frequency with the intent to minimize or eliminate this common source of iatrogenic blood loss, which can either induce or exacerbate anemia. The final principle that also especially embodies the overall PBM approach, and optimal blood use is the concept of patient-centered decision making. This involves thorough communication with the patient regarding his/her treatment. It is necessary to effectively communicate the risks and benefits of the various potential interventions and to decide on the right course of action together with the patient.

The patient's own preferences and values should be considered when developing a medical plan [3,4,12].

There is a large amount of research evidence that the successful implementation of PBM reduces perioperative blood loss and transfusion needs [13–20], perioperative morbidity [13,16], mortality [14,16], length of hospital stay [14,16], and costs [21]. In this respect, the World Health Organization has officially been urging member states to implement PBM since 2010 (WHA63.12). Patient blood management programs have already been rolled out successfully in some hospitals in Western Australia [19], Europe [13,18], United States [14,17], and now starting in Asia. Notable, outside Australia, no national PBM programs have been established, and many hospitals worldwide seek guidance with its implementation.

Despite the demonstrated benefits of PBM, many barriers and challenges limit translation of PBM guidelines into clinical practice [22–25], in particular due to lack of knowledge (eg, staff members are not aware of the latest discoveries and new guidelines; imprudent practice is endorsed by common misconceptions), lack of interdisciplinary commitment (eg, many patients have contact with different clinicians from different departments with different opinions about the “best treatment”; resistance from hospital's “culture”), lack of resources (eg, limited staff with limited time; hospital administrators need to invest initially before saving money), and concerns (eg, PBM may initially “cut down” jobs in blood donor service or transfusion medicine).

Strategies for overcoming the hurdles associated with incorporating guidelines into clinical practice often include the use of multimodal “care bundles.”

This article provides comprehensive bundles of PBM components encompassing more than 100 different PBM measures acting as a working template to develop institutions’ individual PBM practices.

**Methods**

After an informal meeting on PBM, held at Frankfurt in January 2015, and attended by several of the authors (PM, CFW, SC, DS, and KZ), further authors (TR, JI, AS, LTG, and MM) and a group developing an European Guide on Good Practices for Patient Blood Management (AH and HG) were invited to participate drafting a manuscript on a new implementation concept, based on current practice and experience in implementation of PBM of the authors, actively working in Australia, Europe, and United States. During several revisions, comments and contributions from the different authors to subsequent versions of the manuscript were harmonized, until agreement on paper content was reached. We would like to stress that this article contains the

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