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Patient Blood Management: Current Challenges and Future Imperatives

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HIGHLIGHTS

1. Patient blood management improves clinical outcomes while reducing transfusion-related morbidity and costs.
2. Pandemics exposed vulnerabilities in blood supply, reinforcing the necessity of systematic PBM implementation.
3. Sustainable healthcare systems require leadership-driven adoption of evidence-based blood conservation strategies.

Keywords: Blood transfusion, Patient Blood Management, Patient Safety

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Dear Editor

Prior to the widespread adoption of allogeneic blood transfusion, clinicians relied on targeted approaches to control hemorrhage and treat anemia. With the advent of transfusion medicine in the early 20th century, blood transfusion became a widely used, life-saving intervention that often-replaced previous management protocols. However, pioneers like Cooley demonstrated that, through preoperative optimization, meticulous surgical technique, and careful anesthesia, thousands of surgeries could be performed without transfusions. Since the 1990s, Blood Management Strategies (BMS) have been adopted globally, enabling complex procedures without allogeneic transfusions by using coordinated conservation techniques. These programs have shown that patient blood management can reduce reliance on transfusions, improve outcomes, and decrease morbidity, mortality, and healthcare costs, highlighting the importance of minimizing transfusion use whenever possible (1).

The principle of blood conservation recognizes a patient's own blood as a valuable resource requiring careful management, leading to the development of Patient Blood Management. PBM, a patient-centered and evidence-based approach, became prominent in the 1970s and aims to optimize outcomes by conserving autologous blood and prioritizing patient safety. Over time, many countries have implemented PBM at various healthcare levels, with Western Australia making it a standard of care between 2008 and 2012. The WHO endorsed PBM in 2010, and the European Healthcare Commission recommended its adoption in 2017. In the past decade, numerous countries including South Korea, China,

Turkey, Mexico, Brazil, Switzerland, Saudi Arabia, and Iran have also begun implementing PBM with support from national authorities (2).

Demographic shifts, particularly an aging population, strain healthcare systems by increasing demand for medical services while reducing the donor pool, challenging blood supply sustainability (3). Emerging infectious diseases highlight the importance of robust blood management to prevent pathogen transmission and ensure product safety. The HIV epidemic in the 1970s-80s led to significant economic burden from enhanced screening protocols (4). Similarly, the H1N1 and COVID-19 pandemics caused declining blood donations globally, including in Iran, creating challenges for short-shelf-life components like platelets. With elective surgeries deferred during COVID-19, increasing patient morbidity, PBM gained greater attention in 2021 due to the pandemic's unique circumstances (2, 5).

PBM can improve patient outcomes, reduce healthcare costs, enhance safety, empower patients, and significantly decrease allogeneic blood use (5). In Australia, implementation of PBM led to a 41% reduction in red blood cell use nationwide (6), at Mayo Clinic (USA), allogenic transfusions dropped by 33% after PBM, from 607 to 405 per 1,000 admissions (7) and in Germany, a PBM program reduced RBC, platelet, and plasma units by 24%, 25%, and 37% respectively in the first year (8).

Its three core principles are diagnosing and treating anemia, minimizing blood loss, and optimizing tolerance to anemia, requiring a comprehensive approach including triage, anemia management, blood conservation, and education (2). While PBM principles are universal, local adaptation is needed. Implementation is often hindered by limited awareness, funding, education, and resistance to change especially outdated practices so success depends on education, leadership, and policy support to shift toward evidence-based methods and prioritize PBM in healthcare systems (9).

Iran's blood transfusion services face ongoing challenges, including chronic patient needs (like thalassemia), limited plasma-derived drug production, inefficient blood use in elective surgeries, low female donor rates, seasonal donor fluctuations, infectious disease risks, and storage issues for short-lived components. Although the Iranian Blood Transfusion Organization currently meets demand, implementing PBM is essential for the future of Iran's healthcare system (10, 11).

During PBM implementation amid the COVID-19 pandemic, the IBTO analyzed global blood management protocols, reviewed new research, assessed SARS-CoV-2's impact on donation and transfusion, and monitored blood supplies and donor trends. As a result, the IBTO developed evidence-based strategies to address COVID-19-related risks (12).

Given rising medical demands and PBM's growing complexity, its systematic implementation is essential for sustainable healthcare. Optimizing PBM improves patient care quality and supports healthcare system safety and efficiency. Therefore, healthcare institutions and governments should prioritize investing in PBM to achieve better outcomes and patient services.

1. Declarations

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1.2 Ethical Considerations

Not applicable.

1.3 Authors' Contributions

R.F., M.Sh., M.T. and M.NShM. contributed to the preparation of the manuscript. E.MM conceives the study, designed the work, and supervised the manuscript. All authors reviewed and approved the final version.

1.4 Conflict of Interest

The authors declare that there are no conflicts of interest related to this work.

1.5 Fund or Financial Support

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1.6 Using Artificial Intelligence Tools (AI Tools)

The authors confirm that no artificial intelligence tools were used in the preparation, writing, or editing of this manuscript.

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