

## REPORT OF SCIENTIFIC MEETING

David E. Longnecker, M.D., Editor

### National Institutes of Health Consensus Development Conference on Perioperative Red Cell Transfusion

On June 27–29, 1988, the National Heart, Lung, and Blood Institute, the office of Medical Applications of Research, the Warren Grant Magnuson Clinical Center of the National Institutes of Health, and the Food and Drug Administration convened the Consensus Development Conference on Perioperative Red Cell Transfusion in Bethesda, Maryland. This conference was prompted by a growing concern among the medical profession and the general public over transfusion-related issues. In particular, consideration of criteria for perioperative red cell transfusion, the risk of transfusion transmitted disease, and the development of alternatives to homologous red cell transfusion became focal points of consideration for the 14-member panel.

The panel was chaired by Dr. Tibor Greenwalt, Deputy Director of Research of the Hoxworth Blood Center at the University of Cincinnati Medical Center. Other members of the panel were Dr. Joseph A. Buckwalter, Professor of Orthopedic Surgery at the University of Iowa; Dr. Jane Desforges, Department of Hematology/Oncology at the New England Medical Center; Dr. Leon E. Farhi, Professor and Chairman of the Department of Physiology at the State University of New York; Dr. Virginia F. Gover, Associate Professor in the School of Nursing at Catholic University; Mr. James B. Hubbard, Deputy Director of the American Legion; Dr. Nan M. Laird, Professor of Biostatistics at the Harvard School of Public Health; Dr. David E. Longnecker, Harold Carron Professor of Anesthesiology, University of Virginia; Dr. John C. Morrison, Professor of Obstetrics and Gynecology and Pediatrics, Director of Maternal-Fetal Medicine at the University of Mississippi Medical Center; Dr. James W. Mosley, Professor of Medicine at the University of Alabama at Birmingham; Dr. John D. Saletta, Chairman of the Division of Surgery at Lutheran General Hospital in Park Ridge, Illinois; Dr. Scott N. Swisher, Professor of Medicine at the Michigan State University; and Dr. Girish N. Vyas, Professor of Laboratory Medicine and Director of the Transfusion Research Program at the University of California School of Medicine, San Francisco.

Approximately 12.5 million red blood cell transfusions are given each year in the U.S. and nearly two-thirds of these are administered in the perioperative period. The panel concluded that the available evidence does not support strict adherence to the historical guideline of transfusion for perioperative hemoglobin values of less than 10 gm/dL. Studies in humans suggest there is no increased morbidity or mortality in anesthetizing or performing surgical procedures on normovolemic patients with mild to moderate anemia. Likewise, wound healing is not impaired by anemia unless it is extreme (*i.e.*, hematocrit less than 15). Also, there is no clear evidence that the frequency or severity of postoperative infections is increased by anemia. However, it is critical to maintain normal intravascular volume and normal tissue perfusion.

Instead, the decision to transfuse patients perioperatively should consider preexisting risk factors (*i.e.*, cardiac, pulmonary, cerebrovascular, or peripheral vascular disease), the patient's

intravascular volume status, the extent of operation, the duration of anemia, and the potential for massive blood loss. Good clinical judgment is an essential part of this process. Clinical and laboratory data such as arterial oxygenation, mixed venous oxygen tension, cardiac output, and the oxygen extraction ratio may aid in this decision-making process.

Several presentations addressed the risks of homologous red cell transfusion. Transfusion-transmitted disease is primarily viral, and includes hepatitis (B and non A-non B), the human immunodeficiency viruses (HTLV I, II, III) and cytomegalovirus. Current estimates of the incidence of infection per unit in the blood supply with current screening techniques are between 1 in 100 and 1 in 500 for viral hepatitis, and between 1 in 40,000 and 1 in 1,000,000 for HIV. Because the transfusion recipient's risk is increased with the number of donor exposures, the panel emphasized that the number of units transfused should be kept to a minimum.

Immune reactions to blood also pose a risk to the transfusion recipient. Hemolytic reactions have been virtually eliminated by compatibility testing, but may still occur due to human error. Nonhemolytic febrile reactions due to sensitization to leukocyte antigens occur in 1 to 2 percent of transfusion, and the clinical significance of this observation continues to be investigated.

Several alternatives to homologous red cell transfusion were discussed. Currently, about 2% of all transfusions in the U.S. involve autologous blood. Predeposit of autologous blood appears to be most valuable in procedures where major blood loss is expected. Intraoperative blood salvage techniques were examined in detail, and although expensive, may eliminate the need for homologous blood transfusion in some situations. Anesthetic techniques such as isovolemic hemodilution and deliberately induced hypotension may contribute to reduced blood loss. Desmopressin has been shown to improve hemostasis and thus reduce intraoperative blood loss in several types of operations. Research efforts continue to focus on effective blood substitutes (both perfluorocarbons and modified hemoglobin solutions) as well as the use of recombinant erythropoietin. The panel encouraged such alternatives, but also stressed that primary importance should be given to making the current blood supply as safe as possible, because homologous blood will continue to be the therapeutic mainstay in the near future.

Overall, the panel stressed that the decision to transfuse a patient perioperatively should be made on an individual basis, taking into consideration not only the patient's hemoglobin value, but also coexisting disease. They suggested that otherwise healthy patients with hemoglobin values of 10 gm/dL or greater would rarely require red cell transfusion, whereas those patients with acute anemia and hemoglobin values of less than 7 gm/dL would more often require perioperative transfusion, but the decision should always be based on medical judgment rather than a formula or rigid protocol.

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