VMASC has partnered with Englewood Hospital and Medical Center in the development of a web-based simulation training tool that teaches optimal blood management practices for patients undergoing surgery. The importance of this research stems from the mounting evidence of issues surrounding blood transfusion practice. These include the potential negative impact on patient safety and outcomes, the challenges of “blood economics” – the increasing cost to acquire and transfuse blood, as well as the limited supply of blood products. **Physician Training in Patient Blood Management** provides a means to educate clinicians to mitigate these issues and challenges through immersive simulation training built upon the fundamental principles of patient blood management, aka the Three Pillars of Patient Blood Management.

Medical simulation is able to execute training in a multiplicity of modes, house large digital libraries for a breadth of experiences, and accommodate a repetition of exercises to reinforce learning. **Physician Training in Patient Blood Management** is grounded in engineering and mathematical modeling and the simulations, the training materials, are drawn from actual (de-identified) patient experiences that are the basis for a variety of training scenarios. The tool is designed for training physicians whose practice involves transfusion decision-making, *e.g.* anesthesiologists and surgeons, who might benefit from a deeper knowledge of patient blood management practices via an expedient means to train to these practices.

The programming of the simulations, to follow precisely the Three Pillars of Patient Blood Management, began by way of a scripting interface. The approach is a decision tree structure with artificial intelligence and computer science integration. The tool employs parallel systems: one with trainee outcomes and one with actual case study outcomes. The training takes place in a time-compressed fashion with explanations and updates forcing decision points.

Results show that **Physician Training in Patient Blood Management**

- is highly interactive, decision-making training tool
- is user-friendly simulation technology
- engages an artificial intelligence engine
- is patient blood management information-based
- analyzes pre-operative, intra-operative, and post-operative choices
- is (real) patient case-based
- provides the trainee with error comments/evaluations in real-time
- provides actual patient outcome as realized in the case study

The Way Ahead . . . to fully exploit the capability of this tool by populating it with a comprehensive, representative digital library of patient cases. We also want to develop and incorporate additional training materials. To fully vet the tool, we will need to conduct a review of the tool’s content and functionality by a Panel of Experts and execute beta-site testing at four medical institutions.

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**Simulation Tool Development for Physician Training in Patient Blood Management**

**Englewood Hospital and Medical Center**

**Aryeh Shander, MD, FCCM, FCCP** is the Chief of the Department of Anesthesiology, Critical Care Medicine, Pain Management and Hyperbaric Medicine at Englewood Hospital & Medical Center in Englewood, NJ. He is also Clinical Professor of Anesthesiology, Medicine & Surgery at Mt. Sinai School of Medicine in New York City, Executive Medical Director of the Institute for Patient Blood Management and Bloodless Medicine and Surgery at Englewood Hospital, and President of the Medical/Dental Staff at Englewood Hospital and Medical Center. Dr. Shander is board-certified in Internal Medicine, Critical Care, Anesthesiology and Hyperbaric Medicine. Dr. Shander lectures nationally and internationally on a variety of topics related to anesthesiology, critical care medicine, and patient blood management, notably, blood conservation in medical and surgical patients, volume resuscitation, management of anemia, perfusion techniques, novel hemostatic agents, and artificial blood.


He serves on the Advisory Committee on Blood Safety and Availability for the U.S. for the US Department of Health and Human Services, he is a board member and executive committee member and President-elect for the Society for the Advancement of Blood Management (SABM) and is a Fellow of the American College of Critical Care Medicine and the American College of Chest Physicians. Dr. Shander is a founding member of the Board of Directors and serves as the current President for National Anemia Action Council (NAAC). Dr. Shander is also a founding member and treasurer of the American Society of Critical Care Anesthesiologists (ASCCA) where he serves on committees, both locally and nationally, and in addition, is a member of the American Association of Blood Banks (AABB), American Society of Anesthesiologists (ASA) where he serves as Chair of Committee on Patient Blood Management. In 1997 Dr. Shander was recognized by *Time* magazine as one of America’s “Heroes of Medicine.”

**Virginia Modeling, Analysis and Simulation Center**

**John A. Sokolowski, PhD** is Executive Director and Associate Professor of Modeling and Simulation Engineering at ODU. He holds a Bachelor of Science degree in Computer Science from Purdue University, a Master of Engineering Management from Old Dominion University (ODU), and a Ph.D. in Engineering with a concentration in the Modeling and Simulation from ODU. His research interests include human behavior modeling, multi-agent system simulation, and simulation techniques for representing social systems.

He serves as the Chairman of the Governor’s Advisory Council on Modeling and Simulation for the Commonwealth of Virginia and on the Board of Directors of the National Modeling and Simulation Coalition. He is the co-editor of four books on simulation including one book on modeling and simulation in medical and health sciences. He is also a co-author of one book on large-scale event modeling.

VMASC is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education. It is one of the world’s leading research centers for computer modeling, simulation, and visualization. The mission of the Center is to conduct collaborative MS&V research and development, provide expertise to government agencies and industry, and to promote Old Dominion University, Hampton Roads and Virginia as a center of MS&V activities. VMASC furthers the development and applications of modeling, simulation and visualization as enterprise decision-making tools to promote economic, business, and academic development. Annually, the Center conducts approximately $7M in funded research.