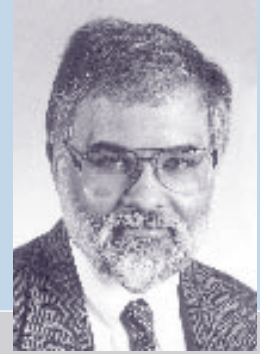


Mika Sinanan, M.D., Ph.D.

• ISIS: Institute for Surgical and Interventional Simulation



The Institute for Surgical and Interventional Simulation (ISIS) is a pioneering collaborative effort between the Department of Surgery and other UW Medicine Departments. The goals of ISIS are to improve the safety and efficiency of surgical and other interventional procedures through training in simulated environments. The charter for ISIS calls for the development, implementation, and validation of procedural curricula based on simulated clinical environments for training of medical professionals before such procedures are incorporated into clinical practice. Although ISIS will initially focus on resident training in academic environments, eventually medical students, practicing physicians needing to acquire or polish skills, and nurses together with other allied healthcare workers will be offered training in procedural areas. Just as training in a surgical procedure may be of tremendous benefit to a resident surgeon, pre-clinical training in wound and drain management, ostomy care, and training at the interface of the patient and bedside technology holds great promise for improving safety, patient and staff satisfaction, and efficiency.

Background

ISIS is our acronym for this new concept in medical procedural training. Isis was venerated in ancient Egypt as the most powerful of goddesses: daughter of Ra, wife of Osiris, and mother of Horus. Isis was the goddess of creation, magic, and medicine, all worthy attributes for our Institute. In searching for a name for our new

procedural patient safety center, this legacy seemed appropriate both for its elegant iconography and for its poignancy.

Patient safety and efficiency in procedures, the domain of ISIS, loom very large today. They are among the most significant societal issues in healthcare as evidenced by the two Institute of Medicine Reports, daily, and national weekly news reports. The prospect that avoidable harm occurs in up to 2.7% of procedures and is a contributing factor in 7.5% of deaths after procedures belies our avowed aim to alleviate suffering and cure illness through such interventions. Procedural errors have also contributed to the crisis in medical liability nationally. Increases in the cost of healthcare beyond 15% of the GNP and beyond the sustainable support of many small businesses are certainly amplified by the economic cost of waste, inefficiency, and error in procedural interventions.

Coincident with increasing recognition of safety and cost issues has been a revolution in computer and other simulation technology that makes clinically realistic, laboratory scenarios increasingly feasible for use as training platforms. The cost of many of these platforms is still high (\$30K to \$90K), procedural options often limited within a given platform, and the lack of a mandate for medical simulation training limiting for extensive commercial investment to expand the industry. However the capabilities of the most advanced training systems, for example the anesthesia simulator or interventional cardiology simulator

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(CathSim), approach the realism and utility of flight simulators that have revolutionized commercial pilot training and certification.

Adult students seem to acquire knowledge and skills best when those are vested in their experience and offer them immediate operational benefits, a recognition of adult learning that has driven development of simulators and curricula toward more practical goals. Instead of saturating them with clinical experience, the new resident work hour limitations both restrict clinical exposure and offer newly available time for training outside the service imperatives of a busy clinical service. In ISIS, we plan to take advantage of this new dedication to “educational time” and offer training that is immediately applicable and practical. In this effort, we intend to construct training curricula within an investigative framework, using the dedicated time of our instructors and students to both train AND analyze the efficacy of training on clinical application of procedural skills. With our internal and commercial partners, we intend to advance and improve procedural training through better simulation and curricula.

Personnel

- Dr. Carlos Pellegrini (Chair, Department of Surgery) is Chair of the ISIS Board of Trustees.
- ISIS Board of Trustees represents leadership from UW medical and allied health care departments with an interest and commitment to procedural training using medical simulation.
- Dr. Richard Satava (Professor, Surgery and a nationally recognized expert in surgical simulation) is the Executive Director of ISIS.
- Drs. Mika Sinanan (Professor, Surgery) and Robert Sweet (Acting Assistant Professor, Urology) are Co-Directors of ISIS.
- Dr. Jacob Rosen (Research Assistant Professor, Electrical Engineering) is our Technical Consultant and strategic partner to the Biorobotics Laboratory in Electrical Engineering.
- Dr. Suzanne Weghorst (Assistant Director for Research, Human Interface Technology Lab) is our Research Consultant for VR simulation to the Human Interface Technology Lab based in Fluke Hall.

We have also called on a wealth of local expertise. Drs. Karen Horvath and Brant Oelschlager in Surgical Education and the Center for Videoendoscopic Surgery, Dr. Blake Hannaford, Director of the Biorobotics Lab in Electrical Engineering, and other colleagues in

medical education at Harborview and the Veterans Administration Medical Center, in Medical Education & Biomedical Informatics, Psychology and the Department of Education will serve as UW consultants. Industrial partners in this enterprise include Simulab, based in Seattle, Surgical Science, Intuitive Surgical, and others.

ISIS Management: Dedicated training and equipment personnel will be hired to maintain the site, coordinate training and research activities, and to track and archive the training records of individual trainees.

Trainers: Curriculum development and the hands-on work of coaching, of putting simulation training into a clinical context, will fall to a cadre of surgical educators with expertise and both an academic and an educational interest in procedural simulation training. These specialist trainers will come from all participating departments and will form our core training group for specialized and cross-discipline training. Many have come forward already, expressing their interest through the “Champion’s group” led by Dr. Rob Sweet. Others will need to be recruited as we expand ISIS and develop a comprehensive annual calendar of courses.

Trainees: Recruitment of trainees will proceed in several phases over the first three years of ISIS. With assistance from hospital-based QI and the respective education divisions of UW Medicine departments, we intend to identify high volume and higher risk procedures commonly performed by residents, especially procedures for which we already have basic mentoring and/or training requirements in place. This list will then be matched with available simulation platforms. For some procedures, new platforms will need to be developed or acquired. Many platforms are currently available but inaccessible and underutilized. Residents performing or participating in these procedures will be trained in simulation and the effectiveness of the training (validation) will be measured. In time, basic skills courses for medical students, nursing, and other allied health care workers will also be developed. Based on demand, training in new procedural technology and techniques will be added for practicing physicians in the community.

Simulation Platforms

Simulation training platforms span the range of complexity. In general, we have adopted the principle that the simplest valid training platform that accomplishes the goals of training will be used, to constrain cost and equipment failures. Available trainers at the UW include:

- skills training boxes of several types (Simulab and Hassan trainers)
- latex organ models for simulation of procedures (Nissen, laparoscopic cholecystectomy)
- computer-based training for two handed coordination and special skills (Mist VR™)
- anatomically-correct VR trainings (LapSim™) training for laparoscopic cholecystectomy
- integrated, computer-augmented trainers (anesthesia simulator, TURP simulator, ENT Sinus surgery simulator)
- surgical robotic platform (Zeus system)
- animate models for integration of skills in the experimental surgical lab

A number of additional trainers are under development or just coming to market. ISIS will seek equipment loans or donations, development funds, and training and research grant funding. These funds will be used to acquire and evaluate significant new simulation technology as it becomes available. At the same time, ISIS leadership also acknowledges the importance of developing curricula that incorporate and establish the relevance of the techniques being taught to safe and effective clinical practice.

Research

Training in simulation is a field holding great promise for improving both efficiency and safety. Military and pilot training in simulation have proven the value of simulation in creating efficiency, competency, and in developing appropriate responses to unexpected conditions. Although some studies have demonstrated improved performance in the OR after training on a few procedural simulators, many commercial simulators have been deployed without adequate validation. We

recognize that our access to trainees and trainers time is extremely limited and costly, so the effective use of this educational time will require that simulators deployed be validated in all appropriate dimensions including translation of skills to clinical practice. This will be a critical focus of research in ISIS. In addition, we plan continued work on tissue and organ accuracy, the implementation of force feedback (where appropriate), and further development of interactive manipulation with multiple instruments and surgeons in open and minimally invasive procedural simulated environments.

Location

The University of Washington Medical Center has allocated premium space on the first floor of the Surgery Pavilion, between the new Vascular Diagnostic Service and the Urology Clinic and Prostate Center, as ISIS-One, the first of a number of anticipated simulation training sites distributed among the various clinical sites of the School of Medicine. "ISIS-One" will house both dedicated training simulators and a number of computer work stations with appropriate connectivity to the School of Medicine and other training laboratories. Coordination and administration of ISIS and ISIS-related research activities will be carried out from ISIS-One. Although not fully developed yet, current plans anticipate other centers in the next five years perhaps located at Harborview, Children's, and the Veterans Administration Medical Center to maximize access for residents regardless of their clinical training location.

Timeline

ISIS training will commence in the spring of 2005. Planning and renovation of space will proceed concurrently.

DEPARTMENT CO-INVESTIGATORS

Karen Horvath, M.D. / Brant Oelschlager, M.D. / Carlos A. Pellegrini, M.D. / Richard Satava, M.D.

OTHER CO-INVESTIGATORS

Blake Hannaford, Ph.D.; UW Department of Electrical Engineering-Biorobotics / Jacob Rosen, Ph.D.; UW Department of Electrical Engineering / Robert Sweet, M.D.; UW Department of Urology / Suzanne Weghort, Ph.D.; UW Human Interface Technology Lab
