Brigham and Women's Hospital Launches the STRATUS Patient Simulation Center

With the February 26th opening of The STRATUS Center within the Department of Emergency Medicine, Brigham & Women's Hospital became the only civilian medical center in the world to create a medical simulation program that combines high fidelity human patient simulators with sophisticated micro-computer human physiology simulators and a laboratory for advanced skills training within a single functional unit. STRATUS is capable of training physicians, nurses, paramedics, police and firefighters to respond to the full spectrum of patient emergencies, ranging from trauma and cardiac arrest through bioterrorism or chemical warfare incidents. The technology creates real-time case scenarios that are applicable to anesthesia, critical care, trauma, emergency medicine, and pre-hospital care.

Comprised of three virtual and hands-on "classrooms of the future," The STRATUS Center (Simulation, Training, Resuscitation and Technology Utilization System) features two full-scale computer controlled patient simulation systems, a 17-station interactive computer simulation lab, and an advanced skills laboratory in which students may learn invasive or high-risk procedures without any potential for injury to a patient. Instruction may be given in seven languages.

The STRATUS "patient" is a computer controlled, adult-sized mannequin that breathes, talks, moans, has a pulse and blood pressure, heart tones, breath sounds and bowel sounds. Students interact with the simulator by asking medical history questions, evaluating physical exam findings, ordering interventions and diagnostic tests, forming problem lists and differential diagnoses, and initiating treatments. Depending on the scenario, students may perform intravenous cannulation, phlebotomy, medication administration, airway maintenance, intubation, fiberoptic procedures, needle or surgical cricothyrotomy, needle chest decompression, chest tube insertion, CPR, cardiac defibrillation, and Foley catheterization, among others.
The simulator's clinical condition can be monitored by continuous evaluation of its computer generated carotid, femoral and radial pulses, blood pressure, ECG, pulse oximetry, arterial blood pressure waveform, CO2 and capnograph waveform and respiratory rate. Each choice made by the instructor or the student is digitally recorded. The treatment provided by the student causes the simulated patient to improve or deteriorate, just as would happen in real life. At the conclusion of the session, the instructor debriefs the team of students, using synchronized digital video of the scenario to help identify potentially serious errors, communications breakdowns, missed or ignored symptoms, incorrect diagnoses and inappropriate treatments.

Commenting on the impact of this new teaching technology, Ron Walls, MD, Chairman of the Department of Emergency Medicine at BWH, said, "Human patient simulation bridges the gap between traditional training methods, such as classroom instruction, and performance of procedures by inexperienced personnel on real patients. Simulation training provides us with the ability to present patients of various complexities and gives students an opportunity to experience high-acuity, low-frequency clinical events, and to receive hands-on training in critical procedures, without putting human life at risk."

If you would like information about registering international student groups for classes at the STRATUS Center, please contact Leslie Shane at +1-617-724-4987 or lshane@partners.org.

From the Executive Director's Desk

Twenty-five years ago, when Emergency Medicine first emerged in the US, it seemed unlikely that this nascent medical specialty would one day find itself at the vanguard of international health. In testimony to the global importance of trauma care, the World Health Organization recently devoted World Health Day 2004 to road traffic injury prevention, noting that road crashes kill 1.2 million people every year and injure or disable 1.2 million more. If current trends continue, by the year 2020 road traffic injuries will increase by 80% in developing countries, surpassing tuberculosis, war, and HIV among the leading causes of disease and disability worldwide.

When you combine these dire road crash statistics with the fact that terrorist bombings have inflicted mass casualties across 4 continents in recent months, it's easy to see why Emergency Medicine has suddenly catapulted onto the global health radar screen. Nevertheless, the medical sector as a whole remains ill-prepared to assess and treat victims of mass casualty incidents, particularly those that are related to terrorism and may involve chemical or biological weapons.

New training courses, conferences and international exchange programs must be developed to improve the ability of physicians, nurses, hospitals and "first responders" to meet these urgent needs. Partners was proud to take a first step in this direction by sponsoring an international trauma management conference in Bermuda this spring.

Here in Boston, the Partners hospitals are home to some of the most talented and innovative Emergency Medicine physicians in the world. From the Institute for International Emergency Medicine and Health (IEMH) to the International Medical Surgical Response Team (IMSuRT)
and the newly opened STRATUS Center, our experts are eager to work with colleagues abroad to meet the challenges we all face in this new era of crash and terror-induced trauma.

**Laparoscopic Radical Prostatectomy:**  
*A Minimally Invasive Option for Treating Prostate Cancer*

*Douglas M. Dahl, MD, MGH Urologic Surgeon and Assistant Professor of Surgery, Harvard Medical School*

This year 395,000 men worldwide will get the unwelcome news that they have prostate cancer. In addition to worrying about their disease, these men also will contend with the side effects of treatment. The search for less invasive therapies with less morbidity has led to the development of an innovative surgery – laparoscopic radical prostatectomy – that offers men another treatment choice.

**PATIENT SELECTION.** Surgery is not the best treatment option for all prostate cancer patients, but most patients who are candidates for open radical prostatectomy also are candidates for the laparoscopic procedure. Patients who have had previous extensive abdominal surgery may not be ideally suited to benefit from laparoscopic prostatectomy. Both open and laparoscopic surgeries are more difficult in obese patients, but results of laparoscopic prostatectomy in obese patients appear to be equal to those in thinner patients.

**PROCEDURE.** The procedure is performed through four small ports in the abdomen. The total incision length is less than 1.25 cm as compared with up to 20 cm for open surgery. An incision through the umbilicus allows access for fiberoptic equipment that provides a clear, magnified view of the prostate and the nerves.

The angle of approach for the laparoscopic procedure is different from that of open surgery, and the surgeon needs to be experienced in understanding this view as compared with the overhead view in open surgery. This approach allows us to see and handle the nerves better.

We also employ a nerve-sparing technique known as hydrodissection which was pioneered here at Massachusetts General Hospital and involves injecting fluid along the nerves to help separate them from prostate tissue. The fluid contains some epinephrine which helps control bleeding and minimizes nerve damage.

**TECHNOLOGY.** Advances in technology have made laparoscopic radical prostatectomy feasible and successful. Technological innovations include:

- Fiberoptics that give us the ability to view the field up to 10x magnification, affording an exquisitely clear view, which helps particularly in dissecting nerves from the prostate.
- Ultrasonic dissector, a type of ultrasonic scissors that cut and coagulate small vessels.
- Voice-activated robotic camera holder that is steadier than the human hand, freeing human hands for more precise tasks.
- Entrapment sack. The surgeon places the prostate in the sack, cinches it, and pulls it out through a very small incision without worrying about the cancer seeding.
Latest-generation trocars that spread rather than cut muscle fibers, causing less trauma and fewer complications. They save time in the operating room because we only have to close one of the four incisions.

**EXPERIENCE.** The experience of the surgeon and the team are also critical factors in the success of laparoscopic radical prostatectomy. We are working in the relatively small space of the male pelvis – a high-rent neighborhood – very close to critical structures, and the margin of error is slim. Expert teams including anesthesiologists, nurses, technical specialists and others also makes a difference to the outcome of the surgery.

**ADVANTAGES.** Patients who choose laparoscopic prostatectomy experience less postoperative pain and disability and a shorter recovery as compared with open radical prostatectomy. The laparoscopic procedure is associated with less blood loss, reduced incidence of stricture of the bladder neck, and decreased incidence of postsurgical inguinal hernia.

The oncologic results to date appear to be equal, and men seem to recover urinary continence more rapidly. Although we expect that functional outcomes, including continence and potency, will compare favorably with the results of open surgery, these benefits are as yet unproven.

Reliable data on continence and potency are notoriously difficult to obtain for any surgery, so we are currently conducting a study using an independent evaluator to compare the outcomes of open and laparoscopic prostatectomy. We expect to have preliminary results within one year, and we hope to be able to determine whether there are subsets of patients who are better suited for one procedure or the other.

**The Future of Laparoscopic Radical Prostatectomy:**
Laparoscopic radical prostatectomy is perhaps the most demanding urologic laparoscopic surgery, but the challenge is well worth the effort in terms of benefits for patients, and on the near horizon, a number of innovations will enhance our ability to perform this procedure successfully.

They include:

- Improvements in technology and instruments. We are working with CIMIT (Center for the Integration of Medicine and Innovative Technology) to develop the best tools and the most appropriate operating environment for minimally invasive procedures.
- Advances in imaging, including laparoscopic ultrasound, will provide a better view of both the cancer and the nerves.
- New chemical agents will better protect the nerves from the trauma of surgery.

*Laparoscopic radical prostatectomy is also performed at Brigham and Women's Hospital.*

**Image-Guided Minimally Invasive Neurosurgery Revolutionizes Management of Brain Tumors**

*Peter M. Black, MD, PhD, Neurosurgeon-in-Chief, Brigham and Women’s Hospital*
New techniques in image-guided minimally invasive neurosurgery have profoundly altered our approaches to treating brain tumors, with the result that we now are able to help more patients, prolong more lives, minimize disability associated with treatment, and improve the quality of life for patients with benign or malignant brain tumors.

**INNOVATIVE MANAGEMENT.** Minimally invasive techniques for managing brain tumors have allowed us to remove many tumors previously thought to be inoperable. The Brigham and Women’s Hospital Department of Neurosurgery has been a world leader in these techniques, which include image-guided surgery, microsurgery, and intraoperative imaging. Taken as a group, they allow the surgeon to identify precisely where the tumor is, identify important parts of the brain, and remove the abnormality safely.

These techniques have changed the way we think about many tumors. For benign tumors such as meningiomas, pituitary adenomas, and acoustic neuromas, new understandings of anatomy and brain monitoring make complete removal possible and safe. For malignant tumors such as glioblastoma multiforme or malignant gliomas, we can remove as much tumor as possible to allow maximum opportunity for other treatments to work. For metastatic tumors that arise from other sites in the body, precise localization, brain mapping, and microsurgical techniques make resection possible even in parts of the brain that control speech, movement, or sensation. In the past, a metastasis to the brain was thought to be a death sentence. Today, we can often completely resect a metastasis that would at one time have been inoperable and send the patient back to the medical oncologist for continuing treatment of systemic disease.

Because of the development of image-guided neurosurgery, we may be changing the natural history of some brain tumors. For patients with lowgrade gliomas, for example, we used to monitor the tumor for a period of time or radiate it. With the availability of minimally invasive techniques, we can remove the tumor earlier, with minimal adverse effects. We believe that early surgery confers a survival advantage for these patients.

The techniques that have caused this sea change in surgical treatment of brain tumors include image-guided surgery with navigational assistance, intraoperative MRI, so-called "awake craniotomy," and a number of minimally invasive techniques using therapeutic laser and ultrasound to destroy brain tumors. These services are offered as part of the Neuro-Oncology Treatment Program of the Dana-Farber/Brigham and Women’s Cancer Center, an integrated adult oncology center combining the expertise of Dana-Farber Cancer Institute and Brigham and Women’s Hospital.

The success of these advanced procedures is dependent on our interdisciplinary team of clinicians – including neurosurgeons, radiologists, nurses, and anesthesiologists – as well as computer experts and scientists at the Surgical Planning Laboratory. In turn, this surgical team works with the larger nervous system oncology group to provide coordinated surgery, radiation therapy, and chemotherapy for our patients.

**IMAGE-GUIDED SURGERY WITH NAVIGATION.** Image-guided surgery allows us to take the benefits of advanced MRI techniques into
the traditional operating room. Prior to surgery, we obtain various types of MR images that provide structural, functional, and tract tracing data. Using sophisticated threedimensional reconstruction software, we then create a road map of the patient’s brain that we can take into the operating room to help guide us throughout the surgery.

Registration marks on the images that correspond with reference marks on the patient's skull provide landmarks, and the surgeon uses a pointing device similar to a global positioning system (GPS) to help locate the tumor, navigate to the tumor, and avoid eloquent brain. Image-guided surgery with navigation allows us to remove tumors through much smaller exposures and with minimal risk for disrupting normal tissue. It is a good choice for metastatic tumors, which look different from normal brain; for smaller tumors such as meningiomas on the cortex where a smaller exposure would be desirable; and for tumors such as glioblastomas where the margins and location may not be entirely evident.

INTRAOPERATIVE MRI. Intraoperative MRI, by contrast, takes the operating room into the MR suite. It provides real-time images and navigational assistance that help the surgeon to locate the tumor, to remove it completely, and to ensure before closing that there are no surgical complications such as bleeding.

Real-time imaging has several clinical benefits.

- Sequential imaging allows the surgeon to see and compensate for brain shift during surgery.
- Repeat imaging assists in complete tumor removal. Malignant tissue may be hidden behind normal tissue and may only become evident on repeat imaging.
- The patient does not need to be moved in order to obtain additional imaging. This may be a safer practice than moving a patient in and out of the MR scanner during surgery.

To assist in navigation, we use an extraordinary device known as the 3D Slicer. This software system essentially gives the surgeon MRI vision. It consists of a hand-held "pointer" that lets the surgeon know his or her location in the brain. The device is integrated with a software program that synthesizes data from pre-operative images as well as real-time imaging and provides a color-coded three-dimensional model of the individual patient’s head to help the surgeon locate and remove the tumor without harming nearby sensitive areas.

CRANIOTOMY WITH INTRAVENOUS SEDATION. This technique is sometimes called "awake" craniotomy, but the patient is very drowsy for almost all of the procedure. We use this technique when we need to remove a tumor that is close to areas of eloquent brain. There are enough differences in individual anatomy that we need to do functional testing on the awake (and sedated) patient as the surgery proceeds, so we can ensure that we are not disrupting important speech, movement, or sensation areas. Awake craniotomy can be performed in either the traditional operating room or in the intraoperative MRI suite and is usually well tolerated.

PROMISING THERAPIES. MRI has two unique properties that may prove valuable in locating and treating brain tumors – the ability to distinguish between normal and malignant tissue that may appear similar to the naked eye and sensitivity to changes in temperature. Researchers hope that two image-guided minimally invasive protocols involving laser ablation and focused ultrasound therapy may in the future prove effective in treating selected brain tumors. These and the image-guided techniques
described here assure that the most up-to-date systems are available to destroy a tumor with the least possible injury to normal brain.

*Image-guided minimally invasive neurosurgery is also performed at Massachusetts General Hospital.*

**Physician Interview: Dr. Mark Davis**

“In countries with developing medical systems, the distinction between primary care and trauma management can be blurry at best," explains Dr. Mark Davis, "Therefore the bedrock of any country's public health effort is an organized front-line emergency care and response system with broad capacities."

As a leading practitioner of international emergency medicine, Dr. Davis isn't particularly focused on applying the latest surgical gadgetry or experimental drug regimens abroad. When he thinks about advancing global medical development efforts, he emphasizes first and foremost the need to expand education ("human capacity") and enhance systems, thereby improving care provided by "first responders" - whether they are professionals in urban settings or village health workers. To illustrate his point, Dr. Davis tells this story...

*Not too long ago, a young boy fell out of a tree near his home in a rural part of Ethiopia. He suffered a displaced femur fracture, and by the time he arrived at the local clinic, he was bleeding to death internally. Lacking modern medical supplies, several fellows from Brigham and Women’s Hospital - who just happened to be traveling through the area - trained local caregivers to fashion a splint out of sticks, thereby saving the boy’s life. This treatment did not require a great deal of equipment or cost, just simple training.*

"In the past, international health initiatives were organized in a very vertical fashion," Dr. Davis continues, "For example, the medical community tackled malaria, polio and respiratory diseases one by one, frequently in isolation... not only from one another, but also from their inherent political and economic contexts. Now the burden of disease is shifting, particularly in urban areas, as road accidents and terrorism have become greater threats in the developing world. By structuring clinical programs and allocating resources with a focus on broader training, we are redefining international emergency medicine and saving lives that otherwise would be lost."

*For more information about the Institute for International Emergency Medicine and Health at Brigham and Women’s Hospital, please visit [www.iemh.org](http://www.iemh.org).*

**Partners Researchers Advance the Battle Against Lung Cancer**

Two teams of Partners researchers - one based at the Dana-Farber Cancer Institute and the other at MGH - have discovered a molecular marker that identifies which non-small-cell lung cancer patients will respond dramatically to the drug gefitinib (Iressa™). As lung cancer is the leading cause of cancer mortality worldwide, many thousands of patients stand to benefit from the teams' remarkable research findings, which were described by the *New England Journal of Medicine* as having the
potential to "fundamentally change targeted therapy for solid tumors."

Led by William Sellers, MD, Bruce Johnson, MD and Matthew Meyerson, MD, PhD of Dana-Farber and by Daniel Haber, MD, PhD, Thomas Lynch, MD, Daphne Bell, PhD, and Raffaella Sordella, PhD of the MGH Cancer Center, the researchers worked collaboratively with colleagues from the Nagoya City University Medical School in Japan and the Massachusetts Institute of Technology.

Outside the US, gefitinib is currently available in Japan, Canada and Australia. Regulatory reviews are ongoing in several other regions, including the European Union.

Humanitarian Medical Mission to Cuba

MGH Human Resources Manager Oswald Mondejar (left center), International Nurse Consultant Program Coordinator Donna Perry, RN, and Steve Gardner, MD traveled with 18 other volunteers through Cuba on a humanitarian mission from February 14-21. As part of the 4th annual delegation to Cuba sponsored by ACCESSO, a Boston-based NGO with close ties to MGH, the volunteers dispensed medical supplies, equipment, and medical textbooks to Cienfuegos Hospital, the Chernobyl Children’s Project, the Saint Lazarus Leprosarium and the Panama School for Children with Physical Limitations.

Commenting on his experience as an ACCESSO delegate, Dr. Gardner said, "When I looked at the faces of the Cuban doctors and their patients, I saw my own colleagues and patients. Medical needs and the desire of others to address those needs are seemingly universal -- there is an inherent kinship among people that transcends borders and political differences."

The 2005 ACCESSO mission to Cuba is scheduled for February 19-26. If you are interested in joining the delegation, or if you would like to donate medical supplies, equipment or textbooks, please contact Oswald Mondejar via email at omondejar@partners.org.

Partners in the News

In recognition of his outstanding legacy in the field of orthopaedic surgery as well as the training he has provided to colleagues in his native India, MGH Chief of Arthroscopic Surgery Dinesh Patel, MD received a prestigious Gujarat Garima Award in January from former Indian Prime Minister Atal Bihari Vajpayee.

On April 2nd, Grace Deveney, RN and Katie Fallon, RN became the first two MGH nurses to receive the Durant Fellowship in Refugee Medicine.

Larry Ronan, MD, MGH Director of the Combined Program in Medicine and Pediatrics, traveled to Iraq in March at the invitation of the newly-formed Iraqi Society of Physicians. As one of 32 international medical experts invited to participate in the first post-war medical
Leonard Kaban, DMD, MD, Chairman of the MGH Department of Oral and Maxillofacial Surgery, and Maria Troulis, DDS, MSc, Director of the Department’s Minimally Invasive Surgery Program, have written a book entitled Pediatric Oral and Maxillofacial Surgery. Published in April by Saunders, this new book is the only English text available on the topic. Featuring vivid photographs from all stages of the surgical procedures, the book explains traditional techniques and also provides cutting-edge information on the specific management of pediatric oral and maxillofacial surgery.

GLOBAL HEALTH UPDATE

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The Global Health Update is published three times per year by the International Program of Partners HealthCare System, Inc. The International Program develops opportunities for Partners staff to contribute to the improvement of health care around the world.

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