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MGH Surgical Society
ACS Cocktail Reception

Monday, October 5, 2015
6-8 PM

Chicago Hilton

The MASSACHUSETTS GENERAL HOSPITAL SURGICAL SOCIETY Newsletter

Spring 2015 ***Volume 16, Issue 1***

Message from the Chief, Keith Lillemoe, M.D.

No News Means Lots of News

It's been almost a year since you have heard from me. I apologize, but as you will soon hear, there has been a lot going on here at your "alma mater". I hope to give you an update on these activities.

First, July has come and gone. The finishing eight senior residents have moved on to great opportunities to continue their already successful careers. We welcome them all to the MGH Surgical Society and wish them success in their future endeavors. Like ships passing in the night (of the Change Show) eleven new PGY-1 residents started (This # includes our two new Integrated Vascular residents). I am happy to report all are off to a great start and are continuing the tradition of excellence in the training program.

Also in the last 6 months we have had some changes in the faculty. Former MGH residents, George Tolis (Cardiac) and Genevieve Boland (Surgical Oncology) have joined the Department and are off to a great start. Darrin Clouse, a former MGH Vascular Fellow joined that Division after completion of his military career. Two of our staff, Josh Baker (Missouri Baptist) and Jen Walker (U Mass) both of Cardiac Surgery have taken leadership positions at their new institutions.

Big news coming out of the summer was the establishment of the Susan Miller Briggs, MD, MGH Global Surgery Fund. A large gift from a generous patient plus many other gifts from patients, trainees, friends and colleagues has successfully "jump-started" this fund designed to provide support for travel for our trainees interested in participating in global health activities. As always the support of our alumni has been and/or would be greatly appreciated.

The summer was barely over when we celebrated our Sixth MGH Surgical Society Reunion on September 5-7. We had a great turn out of alums both young and old. The social program at the Russell Museum and the Moakley Courthouse were special and enjoyed by all. The program was tremendous highlighted by current faculty and residents and a number of alums such as Francisco Cigarroa, Provost of the University of Texas, Michael Harrison of UCSF, and HMS Chiefs Bob Shamberger and Elliot Chaikof. It was also great to have a number of young alums. Andrew Adams, Gretchen Schwarze, and Jason Hall participate with talks. Finally, a real highlight was Boston Police Commissioner, Williams Evans, who told the "behind the scenes" story of the apprehension of the Boston Marathon bombers.

At the Business Meeting, the baton was passed from President Denny Lund to Andy Warshaw. Long-time Secretary Tom Dodson was elected as President-Elect. His able replacement as secretary is Gretchen Schwarze, currently a Vascular Surgeon at the University of Wisconsin. Councilors are Richard Cambria, Carrie Sims, and Matt Hutter.

Not long after that, in late October in San Francisco, was the Clinical Congress of the American College of Surgeons. We had a tremendous turnout at the annual cocktail reception, now shared with our sister departments at the Brigham and Women's Hospital and the Beth Israel Deaconess Medical Center. The entire meeting was very special as Andy Warshaw assumed the role of President of the ACS. His presidential address entitled "Achieving our Personal Best – Back to the Future of the American College of Surgeons" not only told the great story of MGH Surgeon, Ernest Codman, but clearly stated the importance of patient safety, quality and "value" associated with patient care. There is no better example of such a program than our own Codman Center for Clinical Effectiveness in Surgery established by Dr. Warshaw and currently lead by MGH surgeons – Matt Hutter, Cam Wright, and Dave Shahian, who work hard every day to improve both our internal efforts and to publish our excellent results.

Other highlights from the year include election to national and regional leadership positions for a number of faculty including David Berger as President of the New England Surgical Society, Susan Briggs as President of the Boston Surgical Society, and Thor Sundt as President-elect of the American Association of Thoracic Surgery.

Major recognition of our faculty included Jay Vacanti receiving the Ladd Medal from the American Academy of Pediatrics (Jay has recently stepped down as surgeon-in-chief of the MGHfC and has been replaced by Allan Goldstein); David Sachs with the Medawar Medal from the American Transplant Society; and Ron Tompkins with the Sheen Award from the ACS. So

(Lillemoe continued on page 3)

Update on the Ferguson-Ottinger Endowed Fund for Surgical Residents – John Mullen, M.D.

The Ferguson-Ottinger Endowed Fund for Surgical Residents at the MGH was established in 2012 with a generous donation from Dr. Charles Ferguson, chief of the East Surgical Service in 1982 and Program Director of the General Surgery Residency from 1998 – 2010. Charlie established this fund in honor of his late father, Dr. Ira Ferguson, who served as a MGH surgical resident from 1952 – 1959 and Chief Resident East Service July 1959 and went on to faithfully serve his local community of Atlanta as a general surgeon, and Dr. Les Ottinger, chief of the East surgical service in 1966 and Program Director of the General Surgery Residency for an amazing 30 years (1968 – 1998). During this tenure, Les served as a tremendous teacher, role model, and mentor to countless surgical trainees, many of whom have gone on to illustrious careers in academic and community surgery. Indeed, many of these individuals, as well as many from my generation who trained under Charlie (in addition to many current MGH surgical faculty), have made very generous contributions to this fund over the past two-plus years, more than doubling the initial gift made by Charlie.

Charlie intended that the proceeds from this Fund be used for two primary purposes, the first of which is to support an annual Visiting Professorship. The Ferguson-Ottinger Visiting Professorship (F-O VP) is a particularly unique one, as the choice of the VP is made entirely by the graduating class of chief residents, all of whom have dinner alone with the VP the night before the lecture. Fittingly, the inaugural F-O VP in 2012 was none other than Les Ottinger himself, and he delivered a moving address entitled “Imprimis” to a packed Bigelow Amphitheater audience, including many of Les’ former trainees, some of whom traveled across the country to hear Les speak. Charlie Ferguson then followed as the F-O VP in 2013 and delivered an address entitled “Invictus”. Last year, Dr. David Feliciano, the J. Stanley Battersby Professor of Surgery at Indiana University and a world-renowned academic trauma surgeon, served as the 2014 F-O VP delivering an address entitled “For the Patient”. This coming May 13-14th, Dr. Hasan Alam, a former MGH faculty member and now the Norman Thompson Professor of Surgery and Section Head of General Surgery at the University of Michigan, will be the 2015 F-O VP, and we all very much look forward to his return to MGH.

The second purpose that Charlie hoped that the Ferguson-Ottinger Fund would fulfill is to improve the quality of life of the MGH surgical residents by providing financial resources that are not otherwise budgeted for this express purpose. Charlie envisioned that proceeds from the Fund might be used to support residents who may be struggling with financial difficulties. Indeed, in the past 18 months we have used the Fund to provide financial support to two of our surgical residents, one of whom has been strapped with significant medical bills. Beyond this, the proceeds from the F-O Fund have enabled us to do so much to improve the morale and the quality of life of all of our residents. We have been able to purchase a variety of educational materials and to fund some unique educational opportunities for the residents. Furthermore, we have used some of the Fund proceeds to pay for appreciation and celebratory lunches for the residents as well as to defray the costs of certain social events, such as our annual resident/faculty ski trip.

In sum, the Ferguson-Ottinger Endowed Fund for Surgical Residents has truly proven to be a fitting honor to both Dr. Ira Ferguson and Dr. Les Ottinger, two humble individuals who were called to the profession of surgery to serve humanity and to teach and inspire others to do the same. We hope to grow this Fund such that we can continue to support and inspire our young residents to not only become the finest surgeons that they can be but also to become the finest human beings that they can be. To make a contribution to the Ferguson-Ottinger Fund, please visit the website at https://give.massgeneral.org/fergusonottinger.

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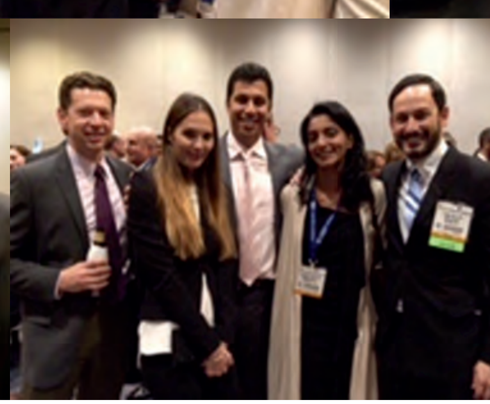
ACS Reception San Francisco October 2014


Message from the President - Andrew L. Warshaw, M.D.

What would Codman do?

More than a century ago, MGH surgeon Ernest Amory Codman began to record the outcomes of his patients on 3 x 5 cards and track them for a year or longer. This was the core of his End Result Idea, which he proposed be the basis for promotion at the MGH, not just seniority, which was the practice at that time.

Having already resigned from the MGH in 1914, he figuratively kicked sand at the surgeons and trustees of the hospital in 1915 (via the infamous cartoon depicting an ostrich with its head in the sand kicking golden eggs to the doctors but ignoring the outcomes of patients), an aberrant behavior which led to further loss of his position at Harvard Medical School, the Suffolk Medical Society, and the American College of Surgeons.

Nonetheless, in 1917, he persisted and published his five-year experience with the End Result Idea at the 12-bed Codman Hospital on Beacon Hill. In his book, A Study in Hospital Efficiency, he boldly and unreservedly categorized the clinical outcomes of all 337 patients seen at the Codman Hospital, including the "calamities of surgery" and his mistakes: error in judgment or treatment, lack of knowledge or skill, diagnostic error, or the patient's unconquerable disease or refusal of treatment. The examination of every failure was intended to raise the standards of practice. His book was a remarkable and unique example of public reporting – unabashedly airing his own dirty laundry. The practice of scrutinizing surgical outcomes in this way became the basis of the modern Morbidity and Mortality conference. Even the nomenclature (EJ, ET, ED, PD) persisted at the MGH and elsewhere until recent years. However, unlike Codman's reports, the M+M conference today is confidential and protected. The fear of exposure to malpractice litigation or diminution of reputation has kept the doors closed. The lessons of the M+M conference are restricted to the attendees and do not benefit other surgeons.

Outcomes research by and large derives from de-identified clinical databases. Registries like ACS-NSQIP, SEER, the National Inpatient Sample, and specialty-specific derivatives – trauma, cancer, bariatrics, and thoracic surgery for example – provide both clinical and administrative data for evaluation and comparison by surgeons, residents, and fellows from the Department of Surgery working in our Codman Center. With these we can track the performance of the MGH as a whole or clinical subgroups and disciplines of surgery; we can follow trends over time and identify trouble spots; and we can use the information to raise our standards as Codman had intended. What is missing from these enormous banks of outcomes is the track record of individual surgeons and therefore the ability of each surgeon to evaluate and improve his or her own performance.

The Surgeon Specific Registry, an American College of Surgeons tool available to all surgeons, is a web-based program for each surgeon to enter each case and its outcomes. While it is currently a manual process taking a minute or two, it will eventually be tied to the EHR, NSQIP, and other registries for automatic downloading. The SSR, which now contains millions of entries, has the additional benefits of sufficing to meet the requirements for the Physician Quality Reporting System (PQRS) of CMS and for Maintenance of Certification (MOC) of the American Board of Surgery.

The data are not publicly available (so the laundry will not be aired), but each surgeon has access to his/her own entries and can compare them to the entire category entered in the SSR nationally. It thus allows each surgeon to improve his/her personal performance based on data. As Codman asked, "If not, why not?".

Incidentally, whether or not you are aware of it, your activities are being watched every day, not just by video cameras mounted on public streets, your cell phone which acts as a GPS to pinpoint you, and marketers who track your purchases or internet browsing, but also by CMS which compiles the cost and quality outcomes of your practice through the Quality and Resource Use Reports (QRUR). Payment for patient care is becoming tied to value-based criteria like QRUR. The SSR may help you to understand, manage, and drive the quality of your own practice to benefit both you and your patients. Better than being surprised by penalties? What would Codman do?

* *

(Message from the President continued from page 1)

you don't think all the recognition goes to the senior surgeons, this year we had an unprecedented two residents receive the ACS Resident Research Fellowship – Jordan Bloom and Robert Goldstone.

I'd like to acknowledge two big events in early 2015. First, on January 22nd, former Chief Paul Russell celebrated his 90th birthday. Paul still makes weekly "Russell Rounds" on the Transplant Service every Wednesday with David Sachs and Ben Cosimi. Finally, hot off the press, our own David Torchiana has recently been selected as the President and CEO of Partners Healthcare. After over 12 years of leading the MGPO, Torch has taken the position as leader of one of the largest and arguably most prominent health care systems in the world. We all feel lucky to have him leading us through these challenging times.

So, as I said, lots of great things are happening. We are confident the rest of 2015 will be just as exciting. We would all love to hear from you at anytime and look forward to the next ACS reception in Chicago on Monday, October 5th.

PLEASE SEND US YOUR NEWS
MGHSURGSOC@PARTNERS.ORG

A Rationale for Long-term VAD Support – Jose Garcia, M.D.

Advanced heart failure (HF) constitutes a rapidly growing sector in modern cardiovascular and cardiac surgical care, with nearly $30 billion per year in health care expenditures for readmission, morbidity, and end-of-life care. Traditionally, patients with advanced HF have been offered inotropic support or cardiac transplantation, with long wait times and mortality on the waitlist. In the past 10 years, an evolution in ventricular assist device technology has heralded a renaissance in mechanical circulatory support for advanced HF. Patients with advanced systolic HF who are inotrope-dependent can now take advantage of left ventricular assist devices (LVADs) or total artificial heart (TAH) technology as a "destination" therapy (not transplant eligible), "bridge" to decision (for transplant candidacy) or "bridge" to transplantation. Across the last 10 years, advances in VAD technology have spanned pulsatile pumps used for durable long-term support in the hospital (e.g., the Thoratec PVAD technology) or out-of-hospital (e.g., Thoratec Heartmate I) to continuous flow devices (e.g., Thoratec Heartmate II, HeartWare HVAD, Jarvik 2000). The initial comparison studies (REMATCH study; Rose et al. N Engl J Med 2001) suggested a relative risk reduction of 48% in death with first-generation LVAD pumps (Heartmate I), with a 1-year survival 52% in patients receiving LVAD therapy (relative to 25% in patients on optimal medical therapy). Contemporary studies and small observational cohort studies with continuous axial flow devices (e.g., Heartmate II or HeartWare HVAD) have demonstrated near 70-80% survival at 1 year, with increasingly durable outcomes and reports of LVAD survivors receiving destination therapy out to 7 years and beyond. While concerns over LVAD thrombosis, stroke, and infection rates have certainly intensified over the past several years, the improvements in device technology coupled with care delivery have established LVAD implantation as a mainstay consideration in patients with end-stage, advanced HF with or without the option of transplantation.

Modern Use Devices: Heartmate II (Thoratec), HVAD (HeartWare) Current FDA-approved devices for bridge to transplantation LVAD support include the Heartmate II (Thoratec) and HVAD (HeartWare).

Heartmate II In April 2008, Heartmate II was approved for bridge to transplantation, and received an FDA approval for destination therapy in January 2010. Heartmate II is a continuous axial flow pump capable of providing up to 10 liters per minute with a range of operating speeds, with a 6 month survival of 91% and 75-85% survival at 1 year in post-approval studies. These statistics have been improving over time as implantation strategies and post-operative care have evolved. The device is placed in the LV apex (inflow cannula), oriented parallel to the interventricular septum and co-axial with the mitral valve inflow, with an outflow graft anastomosis to the ascending aorta. A percutaneous driveline tunneled through the anterior abdominal wall connects the pump to a system controller that allows continuous monitoring, power delivery, and keeps a log of system power and flows. Power generally can last up to 12 hours for a pair of batteries. In general, depending on severity of initial HF and post-implant complications (e.g., mediastinal bleeding, right heart failure), patients usually leave the ICU within 3-4 days and are home after LVAD education by day 10-14. Major post-operative complications include heart failure (most commonly right heart failure), arrhythmia, bleeding, and infection; strategies to protect the right ventricle pre-operatively (via hemodynamic optimization) and intra-operatively (e.g., meticulous deairing and avoidance of fluid overload) are critical to ensuring good post-operative outcomes. Post-operative care of the driveline site, fluid balance, mean arterial blood pressure targets, and continued evaluation for transplantability are critical to ensure long-term success. A keen understanding of pump parameters (power, flow, and "pulsatility index"—the pulsatile nature of flow across the pump, an index of native contractility) is critical for proper operation. Indeed, many nascent programs are now partnering with major transplant centers to perform destination and bridge-to-transplant LVADs.

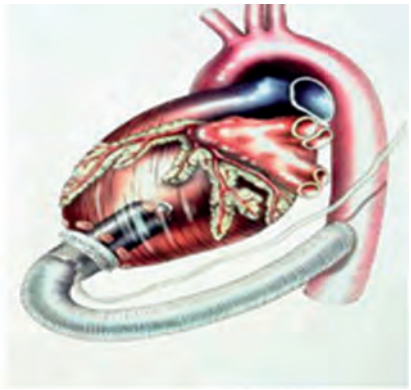
Heartware HVAD An emerging concept in LVAD technology has been miniaturization and surgical implantability. The HeartWare HVAD device (HeartWare, Framingham, MA) has provided an alternative approach. Unlike the Heartmate II, the HVAD is placed within the pericardium and does not require creation of a pump pocket for housing. The flow design is centrifugal, and relies on a hybrid magnetic/hydrodynamic impeller. The pump flow is up to 10 liters per minute, and the system monitor provides a graphical display of flow profile to assist in management. The principles of post-operative management are nearly identical to the Heartmate II device. The HeartWare HVAD device has obtained FDA approval for bridge-to-transplantation, and is awaiting definitive trials to obtain a destination therapy approval. Additional innovations in device technology (including further miniaturization—the HeartWare mini-VAD or MVAD) are currently under development to further optimize surgical approach and post-operative outcomes. Post-operative survival with the HVAD is similar to that of Heartmate II.

Total Artificial Heart In some cases, right ventricular function may not support the use of left ventricular support alone. In those cases, some form of mechanical biventricular support may be necessary to bridge patients to transplantation. The CardioWest Total Artificial Heart (TAH; SynCardia, Tucson, AZ) is FDA approved as a bridge-to-transplantation device. The device provides a total of 9.5 liters per minute support, and is physiologically responsive to changes in venous return without the fear of suction (as in other LVAD support devices). Within 2 weeks, restores organ function and ambulatory status (> 100 feet) in over 60% of patients. While the initial driver technology was quite cumbersome, newer "Freedom" driver technologies allow patients more mobility and even a safe discharge home. Currently, SynCardia is seeking approval for destination therapy applications of the total artificial heart. The longest duration of TAH support is over 3 years. With increased research in the durability of this device, biventricular support with a TAH may soon become a competitor to other LVAD technologies.

Emerging VAD technologies: Smaller and more durable pumps, transcutaneous energy delivery, VAD support in more stable HF Several new themes in VAD technology have emerged in the past 5 years. Both HeartWare and Thoratec have released designs for a new class of LVAD systems smaller than their previous continuous flow market devices. The HeartWare MVAD is about 1/3 the size of the marketed HVAD pump, with a similar range of flow and controller design. The goal of the MVAD is to support even smaller individuals and potentially provide a new paradigm for supporting the right ventricle as part of a biventricular assist configuration. Finally, the surgical approach may be different from an HVAD or HeartMate II (less invasive), potentially improving operative outcomes and allowing patients with less severe HF to enjoy the benefits of ventricular assist. Thoratec has a similar design in its HeartMate III system, which already has CE Mark approval in Europe and has been implanted in a human. The benefits of a smaller pump with similar degree of support are clear: better outcomes, more patients at earlier stages of illness. Finally, an Achilles' heel in the design of contemporary LVAD systems is the transcutaneous driveline for power and control delivery that opens LVAD patients to chronic infection and its subsequent complications (e..g, thromboembolism). In response to this critical limitation, device companies are developing transcutaneous energy transfer ("TET") systems that rely on inductive current transfer through the skin to recharge the VAD, with a goal of providing hours of battery support without a driveline or battery requirements.

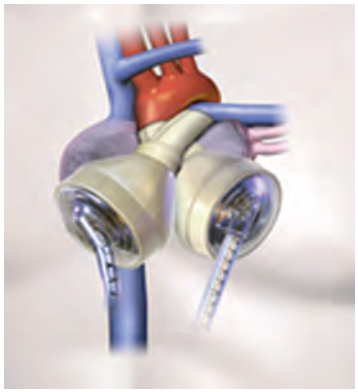
Conclusion With the increase in HF morbidity and mortality and the limited number of potential donor organs, there has been an uptake in the acceptance, utilization, and comfort level with VAD pumps. With miniaturization, transcutaneous power delivery, and more durable biventricular support, the use of LVAD systems will become mainstay in the management of severe, chronic HF, perhaps even before the onset of end-stage HF-related complications (e.g., cachexia and end-organ dysfunction). The field of mechanical circulatory support certainly has come a long way since the day of the intra-aortic balloon pump and the first artificial heart. With an ever-forward march in VAD technical innovation, we may soon see a change in the landscape of modern HF care.

HVAD
(HeartWare)



Jarvik 2000
(Jarvik)

HeartMate II
(Thoratec)



CardioWest TAH
(Syncardia)

(Editor's Note: An honors graduate of the University of Texas (Austin), Dr. Garcia matriculated to Harvard Medical School; upon graduation he trained in both general and cardiothoracic surgery at Brigham and Women's Hospital. After heading successful programs in heart and lung transplantation and mechanical cardiac assist at Montefiore Medical Center in New York and at the University of Maryland in Baltimore, Jose was recruited to join the cardiac surgical staff at MGH , where he is Surgical Director of the Cardiothoracic Transplantation and Artificial Heart/Lung Program within the Cardiac Surgical Division. Additionally, Dr. Garcia has served as clinical evaluator of several new mechanical cardiac assist devices in this rapidly evolving field, as well as accomplishing important basic, translational and clinical research in cardiac physiology and heart failure.

Measuring and Improving Procedural Appropriateness - Craig Jarrett, MD, MBA '16 and Creagh Milford, DO, MPH

Abbreviations

AUC	Appropriate use criteria
CAD	Coronary artery disease
CAS	Carotid artery stenting
CEA	Carotid endarterectomy
PA	Procedural appropriateness
PrOE	Procedure order entry
RUAM	RAND-UCLA Appropriateness Method
SDM	Shared decision making

Background

There is substantial variability in population-based utilization of many diagnostic tests, treatments, and procedures that cannot be explained by demographics, disease prevalence, or patient preferences. This variation is likely due to overuse and underuse, and raises concerns among stakeholders regarding appropriateness of care. With increased focus on patient-centered care, improving clinical outcomes, and reducing variations in the provision of care, there is need for a scalable, evidence based approach to determine, document, and improve appropriateness.

The rationale for measuring and improving appropriateness is multifactorial. First and foremost, assessing appropriateness has the potential to improve patient care, which is simply the right thing to do for our patients. Next, decreasing overuse has the potential to decrease costs through avoidance of unnecessary and wasteful tests and interventions. Measuring appropriateness also allows us to meet regulatory requirements, such as reporting to the multitude of registries, and prepare for legislative mandates, such as the new Sustainable Growth Rate fix that includes appropriateness. Lastly, focus on appropriateness increases awareness. Patients, providers, and payers should be aware of our levels of appropriateness and be confident we are providing appropriate care.

Primer on Appropriateness and Appropriate Use Criteria

Appropriateness in healthcare is the suitability of a particular test, treatment, or procedure for a particular clinical scenario. Appropriate care is care where the expected health benefits exceed the expected health risk by a wide enough margin to justify the measure. Procedural appropriateness (PA) is appropriate care with respect to procedural interventions and surgeries. Appropriate use criteria (AUC) are evidence-based criteria to assist clinicians in making the most appropriate diagnostic, treatment, or procedure decision for a particular clinical scenario. AUC are a synthesis of the best available evidence with expert clinical judgment.

AUC may or may not take into account patient specific factors not related to the particular decision being made. For example, AUC for procedures may not consider certain comorbid conditions or other patient factors that would be considered in real life situations when healthcare decisions are made. Specifically, CABG in a patient with terminal cancer, profound dementia, or a fully dependent functional status may be appropriate by AUC, but may not be appropriate in the broader picture. These patient specific factors and the influence they have on the decision of whether or not to proceed with a procedure are often more subtle. AUC, therefore, should be considered a lower threshold of whether or not to proceed with a test, treatment, or procedure. Once a particular decision is deemed appropriate, shared decision making (SDM) and informed-informed consent should then be employed to determine whether the decision makes sense for a particular patient.

Oftentimes, formal AUC are not available for the test, treatment, or procedure of interest. When AUC are unavailable, national societal guidelines are often used as surrogate criteria. Both AUC and guidelines are based on extensive reviews of the literature and are created by content experts. However, AUC implies a rigorous method was used to develop a comprehensive and mutually exclusive set of clinical scenarios or indications for a particular test, treatment, or procedure. Guidelines are broader recommendations and not necessarily all inclusive or mutually exclusive. Guidelines are not all inclusive because there may not be guidelines for certain clinical scenarios. Guidelines are not mutually exclusive because more than one guideline may pertain to the same clinical scenario. AUC go beyond the traditional societal guidelines in that they are meant to be all inclusive and mutually exclusive for a particular scenario.

Development of Appropriateness Criteria

The rationale behind using AUC to determine appropriateness is that randomized clinical trials are often either not available or cannot provide the breadth of evidence sufficient to apply to the wide range of patients seen in everyday clinical practice. Although robust scientific evidence about the benefits and risks of many procedures is lacking, physicians must nonetheless make decisions everyday about when to perform procedures. Consequently, AUC have been developed that combine the best available scientific evidence with the collective judgment of experts to yield a concerted statement regarding the appropriateness of performing a procedure based on patient specific factors.

(Appropriateness continued on page 7)

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RAND-UCLA Appropriateness Method

The RAND-UCLA Appropriateness Method (RUAM) was developed in the mid-1980s to systematically assess variation in the use of surgical procedures by defining which patients should and should not undergo surgical procedures vs. medical therapy. An appropriate indication for a procedure is one for which "the expected health benefit (e.g., increased life expectancy, relief of pain, reduction in anxiety, improved functional capacity) exceeds the expected negative consequences (e.g., mortality, morbidity, anxiety, pain, time lost from work) by a sufficiently wide margin that the procedure is worth doing, exclusive of cost." RUAM starts with an extensive review of the literature on the risks and benefits of a procedure by an expert panel. The panel develops an all-inclusive (to an extent) and mutually exclusive set of clinical scenarios or indications for the procedure. The panel then rates each indication in 2 rounds where the second round occurs after an in-person discussion of the first-round results focusing on indications where there is considerable dispersion. Indications are classified as "appropriate" (the expected benefits of the procedure outweigh the expected harms), "equivocal" (the expected benefits and harms are roughly equal or there is disagreement amongst the panelists), or "inappropriate" (the expected harms outweigh the expected benefits).

Measuring Procedural Appropriateness

PA can be assessed by a thorough comparison of actual clinical practice to societal guidelines or AUC. While guidelines and AUC are clearly written, actual determination and documentation of appropriateness can be burdensome because of the complexity of the recommendations. For example, there are over 200 indications included in the 2012 AUC for coronary revascularization. This complexity makes real-time determination of appropriateness onerous. Considerable work and investment through the leadership of the Massachusetts General Physician Organization (MGPO) has taken place to improve this process. Through computerization of the process, PA can be determined more quickly and accurately at the point of care using Procedure Order Entry (PrOE).

Procedure Order Entry

PrOE is a powerful, web-based decision support tool developed at MGH that allows clinicians to measure and document appropriateness prospectively, in real time at the point of care. PrOE is integrated into the IT system and leverages the full power of the electronic health record (EHR). The QPID platform, on which PrOE is built, uses natural language processing to search both structured and unstructured information in the EHR, pulling in the existing electronic data that is most relevant to decision-making. This automatic data pull limits the amount of data the clinician has to input to improve efficiency.

Currently, PrOE is active, in development, or planned for 21 procedures across 9 different departments/divisions (Table 1). PrOE is presently active for 8 different procedures: carotid endarterectomy (CEA) and carotid artery stenting (CAS), diagnostic catheterization, coronary artery bypass grafting (CABG), valve procedures, lumbar spine procedures, incisional hernia repair, weight loss procedures, and prostate biopsy. PrOE development is in progress for 4 procedures: percutaneous coronary intervention, vena cava filter placement, total hip arthroplasty, and total knee arthroplasty. PrOE is currently planned for an additional 9 procedures: AICD/PM implantation, angioplasty/stenting for peripheral arterial disease, cervical spine procedures, prophylactic mastectomy, pulmonary resections, pancreatic resections for cystic lesions, treatment of prostate cancer, hysterectomy, and Mohs procedures. Overall, PrOE currently plans to include 12 of the top 20 costliest procedures performed in U.S. Hospitals according to the Agency for Healthcare Research and Quality (AHRQ).

Procedural Appropriateness at MGH

Prior to our work, PA at MGH was unknown. Below is a sample of PA at MGH for CEA and CAS, CABG, valve surgery, and diagnostic heart catheterization.

Carotid Endarterectomy and Stenting

Using published appropriateness criteria and current literature, we convened a multidisciplinary panel of experts at MGH to rate PA of CEA and CAS using modified RAND methodology. We used these ratings to assess PA in all patients who underwent CEA or CAS at MGH from January through December 2011. We then compared our level of PA before and after implementation of PrOE. Prior to implementation, 301 patients underwent CEA and 50 patients underwent CAS. Overall PA was 92.3% (324/351); 91.0% (274/301) for CEA, and 100% (50/50) for CAS. Of the inappropriate cases, 96.3% (26/27) were due to lack of a documented trial of maximal medical therapy. Overall PA was 100% (75/75) after implementation of PrOE (P=.0263 for overall PA pre- vs. post-implementation). In summary, PA of CEA and CAS at MGH was high at baseline. After implementation of a PrOE, PA for those assessed rose to 100%. This study shows that computerized decision support can improve PA even when it is already high.

(Appropriateness continued on page 8)

(Appropriateness continued from page 7)

Coronary Artery Bypass Grafting

Each discrete data element used in the multi-societal 2012 AUC for Coronary Revascularization was mapped to variables in the STS Adult Cardiac Surgery Database Version 2.73 (ACSD 2.73). Variables not available or with different specifications in the STS Database were identified and supplemented with data from the NCDR CathPCI Registry and patients' clinical records. We determined AUC scores for 538 consecutive patients who underwent isolated CABG at our hospital from 1/2012 through 6/2013. Scores for each procedure were categorized as appropriate (7-9), uncertain for the specific indication (4-6), or inappropriate (1-3). Certain data elements necessary to determine CABG appropriateness are unavailable in ACSD 2.73. For acute coronary syndromes (ACS), these include: onset of symptoms, successful treatment by PCI or fibrinolysis, number of episodes of angina within 24 hours, and degree of ST-segment deviation. For patients without ACS, they include noninvasive risk testing, anti-ischemic medications, and fractional flow reserve and/or intravascular ultrasound measurements. After supplementation of STS data with these additional elements, procedures were scored appropriate or uncertain for 99.1% (533/538) of all patients, 98.9% (368/372) of patients with ACS, and 99.4% (165/166) of patients without ACS. CABG appropriateness can be determined using STS ACSD 2.73 with the addition of several variables. Planned incorporation of these variables in the ACSD version 2.8 (July 2014 release) will allow accurate, automated determination of CABG appropriateness on a national scale. In this pilot study, actual clinical practice closely followed AUC.

Valve Surgery

Each discrete data element used in the multi-societal 2014 Guideline for the Management of Patients with Valvular Heart Disease was mapped to variables in the STS Adult Cardiac Surgery Database Version 2.73 (ACSD 2.73). Variables not available or with different specifications in the STS Database were supplemented with data from patients' clinical records. We determined appropriateness for 724 consecutive patients who underwent valve surgery at our hospital from 7/2012 through 9/2013. Procedures were considered appropriate if they met class I, IIa, or IIb guidelines. We then developed a computerized decision support tool, utilizing these guidelines and incorporating a variety of scenarios, to further improve appropriateness.

Prior to implementation of the tool, 401, 124, and 63 patients underwent isolated aortic valve replacement (AVR), mitral valve repair (MVr), and mitral valve replacement (MVR). Other isolated or combined valve surgeries accounted for the remaining 136 cases. Overall appropriateness was 98.8% (715/724); 99.0% (397/401) for AVR; 99.2% (123/124) for MVr; 98.4% (62/63) for MVR; and 97.8% (133/136) for all others. Of the inappropriate cases, 66.7% (6/9) were in asymptomatic patients with severe aortic regurgitation, normal left ventricular (LV) systolic function, and LV dilation approaching, although not meeting, the defined cutoffs. This is the first study of valve surgery appropriateness and it indicates that clinical practice closely follows consensus guidelines. Using STS ACSD 2.73 plus several additional variables, valve surgery appropriateness can be determined prospectively at the point of care and clinicians can be alerted in real time if criteria are not met.

Diagnostic Heart Catheterization

The 2012 AUC for diagnostic catheterization were used to build PrOE for diagnostic heart catheterization. Over a period of 8 months, 1383 PrOE assessments were completed with an adoption rate of 86.0% (1383/1608). For diagnostic catheterizations due to suspected CAD, 88.1% (267/303) were deemed 'appropriate' and an additional 10.6% (32/303) were considered 'maybe appropriate.' Just 1.3% of catheterizations performed were considered 'rarely appropriate.' Compared to published data from a New York state registry, PrOE supported decision making resulted in a smaller proportion of 'rarely appropriate' procedures (MGH=1% vs. NY=25%, P<.001).

Beyond Appropriateness

Restructuring how we determine PA provided a unique opportunity to knit together 4 preprocedural processes related to procedural decision making: prospective appropriateness assessment, SDM, personalized risk, and informed consent.

Shared Decision Making

SDM is a collaborative process that allows patients and their providers to make healthcare decisions together by openly discussing the treatment options, the risks and benefits of each option, and the patients' values and preferences. In PrOE, the different treatment options and their risks and benefits are provided by simply stepping through the program. Although ensuring patients fully understand the risk and benefits is challenging, well-designed decision aids, like those used in PrOE, can enhance patients' understanding and quality of their decisions (Figure 1). PrOE then incorporates patients' values and preferences by assessing their predilection for one therapy over another. For example, PrOE for CAD measures patients' preference for surgery vs. medical treatment and records the result. Once patients' aversion or affection for surgery is established, patients and clinicians can use this information to help guide the treatment decision. Through its design, PrOE reliably and routinely integrates SDM into the pre-procedural decision making process, which was remarkably challenging with prior traditional techniques.

(Appropriateness continued on page 9)

(Appropriateness continued from page 8)

Personalized Risk and Informed Consent

Disclosing the risks and benefits of a procedure is one of the key tenants of SDM and informed consent. Presently, most physicians convey risks in general terms using simplified risk scores or population-based complication rates. Ideally, physicians should provide patient specific risk scores, yet doing so at the point of care requires substantial time and effort. For example, The Society for Thoracic Surgeons (STS) Risk Calculator is a free online tool to evaluate specific perioperative risks associated with CABG and valve procedures. Many surgeons and their staff use this Risk Calculator, but few provide clear written documentation of risks in an easily understandable format or retain records of the risk assessment for review. Furthermore, the substantial effort required to complete the Risk Calculator does not easily fit into a provider's busy workflow. Risk models, such as the STS Risk Calculator, have been incorporated into PrOE, which allows precise, reliable, and timely assessment of patients' personalized risks. These personalized risks are then included on the consent forms, which creates a unique opportunity for patients and their care givers to have a frank discussion about the personalized benefits and risks of a particular procedure.

MGH and Partners is Leading the Way

With the development and implementation of PrOE, MGH and Partners is far ahead of other hospitals and healthcare systems when it comes to determining and improving PA. Furthermore, few others are implementing SDM, personalized risk, and informed consent as effectively as we are. Lastly, no one currently has the capability to bundle prospective appropriateness assessment, shared decision making, personalized risk, and informed consent into a single user friendly package.

Figures and Tables

Figure 1:

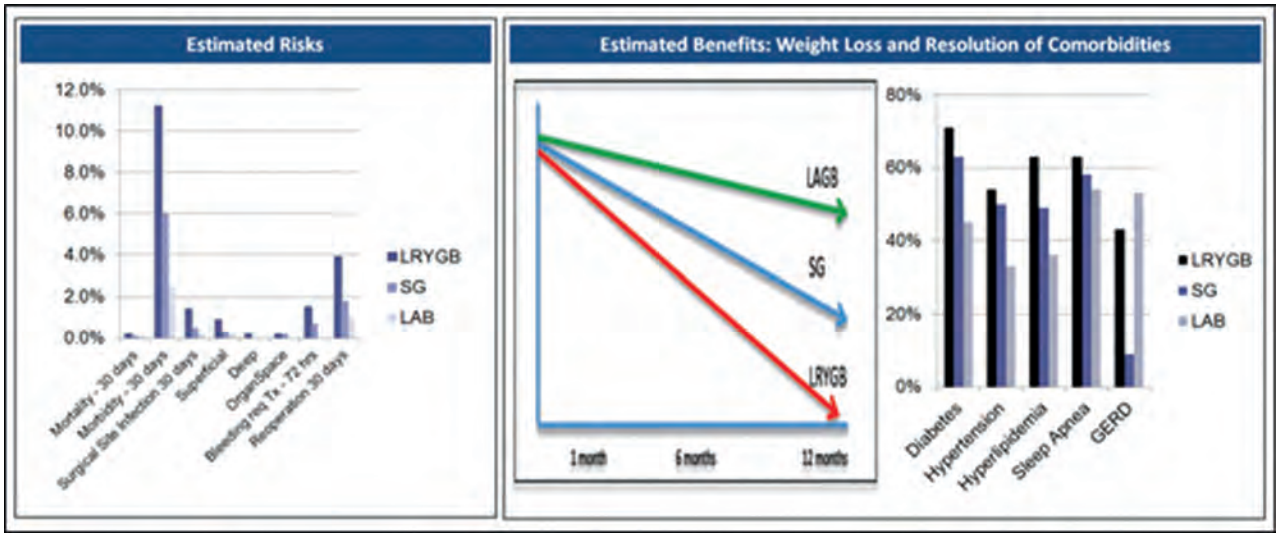


Figure 1: PrOE Screenshot for Weight Loss Procedures. Personalized estimated risks are on the left and personalized estimated benefits are on the right based on data extracted from the EHR and input by the clinician. Abbreviations: GERD=Gastroesophageal Reflux Disease, LAB=Laparoscopic Adjustable Band, LRYGB=Laparoscopic Roux-En-Y Gastric Bypass, SG=Sleeve Gastrectomy.

(Appropriateness continued on page 10)

(Appropriateness continued from page 9)

Table 1:

Department/ Division	Procedure	Status	AHRQ Top 20 List
Vascular	AICD/PM Implantation	FY2015	Yes
	PAD: Angioplasty/Stent/Medical Treatment	FY2015	Yes
	Carotid Artery Disease: CAS/CEA/Medical Treatment	Completed	Yes
	Vena Cava Filter Placement	In progress	No
Cardiology	Diagnostic Catheterization	Completed	No
	Percutaneous Coronary Intervention	In Progress	Yes
Cardiac Surgery	Coronary Artery Bypass Grafting	Completed	Yes
	Valve Procedures	Completed	Yes
Spine	Cervical Procedures	FY2015	Yes
	Lumbar Procedures: Fusion, Laminectomy, Discectomy	Completed	Yes
Orthopaedics	Total Hip Arthroplasty	In progress	Yes
	Total Knee Arthroplasty	In progress	Yes
General Surgery	Prophylactic Mastectomy	FY2015	No
	Pulmonary Resections	TBD	Yes
	Pancreatic Resections for Cystic Lesions	TBD	No
	Incisional Hernia Repair	Completed	No
	Weight Loss: Gastric Bypass, Sleeve, Lap-Band	Completed	No
Urology	Prostate Cancer Treatment	FY2015	No
	Prostate Biopsy	Completed	No
Gynecology	Hysterectomy	FY2015	Yes
Dermatology	Mohs Procedures	FY2015	No

Table 1: PrOE Procedures Completed, In Progress, and Planned. Procedures with PrOE builds completed are in white, in progress are in light blue, and planned are in dark blue. "Yes" or "No" denotes whether the procedure is on the AHRQ list of the top 20 costliest procedures performed in U.S. Hospitals. Abbreviations: AICD/PM=Automatic Implantable Cardioverter Defibrillator/Pacemaker AHRQ= Agency for Healthcare Research and Quality, CAS=Carotid Artery Stenting, CEA=Carotid Endarterectomy, PAD=Peripheral Arterial Disease.

(Editor's Note: Craig Jarrett is at the School of Graduate Studies of Case Western Reserve University in Cleveland. There he is an MS candidate with a concentration in health care organization, outcomes and policy. He is on a leave of absence from the Surgical Residency Program. Craig graduated from Bowling Green State University and the Cleveland Clinic Lerner School of Medicine and also received an MBA from the Weatherhead School of Management of Case Western Reserve.

Creagh Milford is a staff physician practicing Medicine at the MGH. He is an Associate Medical Director for Population Health Management at Partners and an Assistant Medical Director for the Massachusetts General Physicians Organization (MGPO). He received a BA in political science and biology from the University of Colorado, a DO from Midwestern University, and an MPH in health management and policy from the Harvard School of Public Health.)

* *

Graduating Class of 2015

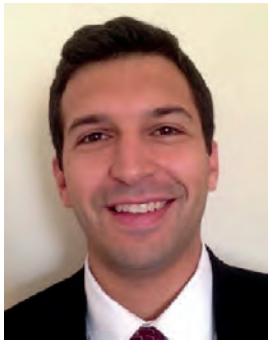
(front row, l to r) Eric Feins, Teresa Kim, Alexander Hawkins, Keith Lillemoe

(second row, l to r) Justin Fernandes, Andrew Loehrer, Michael Kwon, Eric Twerdahl

(3rd row, l to r) Brian George and Hugh Auchincloss

WELCOME INTERN CLASS OF 2015-2016

Douglas Cassidy
Tufts University SoM



Paul Cavallaro
Icahn SoM at Mount Sinai

Paul Furlow
Weill Cornell Medical College

Casey Luckhurst
University of Florida
College of Medicine

Philicia Moonsamy
Sidney Kimmel Medical College at
Thomas Jefferson University

Nikhil Panda
University of Tennessee Health Science
Center College of Medicine

Numa Perez
Harvard Medical School

Siavash Raigani
Case Western Reserve University SoM

Naomi Sell
Sidney Kimmel Medical College at
Thomas Jefferson University

GRADUATING CLASS OF 2015 DESTINATIONS

Hugh Auchincloss	**Cardiothoracic Surgery Fellowship**	**Massachusetts General Hospital**
Eric Feins	**Cardiothoracic Surgery Fellowship**	**Massachusetts General Hospital**
Michael Kwon	**Cardiothoracic Surgery Fellowship**	**Massachusetts General Hospital**
Alexander Hawkins	**Colorectal Surgery Fellowship**	**Washington University**
Eric Twerdahl	**General Surgery**	**United States Navy**
Andrew Loehrer	**Masters in Public Health**	**Harvard School of Public Health**
Justin Fernandes	**Plastic and Reconstructive Surgery Fellowship**	**Lahey Clinic**
Teresa Kim	**Surgical Oncology Fellowship**	**Memorial Sloan-Kettering Cancer Center**
Brian George	**Trauma/Critical Care Fellowship**	**University of Washington/Harborview**