MEDICAL COLLEGE OF WISCONSIN
DEPARTMENT OF SURGERY

SURGERY UPDATE
LEADING THE WAY

SUMMER 2016 • VOLUME 8, NUMBER 2

Best Wishes to the Department of Surgery Graduating Chief Residents

General Surgery Chief Residents, Drs. Ryan Berg, Nathan Heinzerling, Kathleen Simon, Abby Rothstein, Betsy Appel, Kevin Hudak, and Ahmed Ali.

The featured picture in this issue of *Leading the Way* pays tribute to our departing Chief Residents as we prepare for the annual Eberbach banquet in their honor. We are extremely fortunate to host David Hoyt, MD, as this year's Eberbach Visiting Professor. Dr. Hoyt was appointed Executive Director of the American College of Surgeons in 2010 and is the voice of the ACS throughout the world. Prior to leading the ACS, he was Chair of the Department of Surgery at the University of California, Irvine. Dr. Hoyt is an honorary member of virtually all major surgical societies throughout the world and is internationally recognized for his contributions to the fields of trauma and acute care surgery.

Congratulations to the graduating Chief Residents. We greatly appreciate their many extra efforts in the care of our patients and all they have done to advance the missions of MCW and our department.

CHIEF RESIDENTS (and their future plans)

General Surgery

Ahmed Ali, MD
(will graduate 12/31/16)
Cardiothoracic Surgery

Betsy Appel, MD
General Surgery
Grafton and Menomonee Falls, Wisconsin

Ryan Berg, MD
General Surgery
Ascension Healthcare
Milwaukee, Wisconsin

Nathan Heinzerling, MD
Fellowship in Pediatric Surgery
Cohen Children's Hospital
New Hyde Park, New York

Kevin Hudak, MD, MS
Acute Care Surgery
St. Luke's Medical Center
Milwaukee, Wisconsin

Abby Rothstein, MD
Fellowship in Vascular Surgery
Medical College of Wisconsin
Milwaukee, Wisconsin

Kathleen Simon, MD
Fellowship in Minimally Invasive and Bariatric Surgery
Medical College of Wisconsin
Milwaukee, Wisconsin

Cardiothoracic Surgery

Moritz Wyler von Ballmoos, MD, PhD, MPH
Fellowship in Thoracic Oncology
Duke University Health System
Durham, North Carolina

FELLOWS (and their staff positions in July)

Endocrine Surgery Fellowship
Kathryn Coan, MD
Dignity Health
Phoenix, Arizona

Hepatopancreatobiliary Fellowship
George Younan, MD
Inova Fairfax—Fair Oaks Hospitals
Virginia

Minimally Invasive Surgery Fellowship
Rana Higgins, MD
Assistant Professor of Surgery
Division of General Surgery
Medical College of Wisconsin
Milwaukee, Wisconsin

Pediatric Critical Care Fellowship
Sarah Walker, MD
Research Fellow
Medical College of Wisconsin
Milwaukee, Wisconsin

Pediatric Surgery Fellowship
Kendra Bowman, MD, PhD
St. Luke's Children's Hospital
Boise, Idaho

Surgical Critical Care Fellowship
Kristin Shields, MD
Practice plans in-process

Surgical Critical Care Fellowship
Alexandria Goldin, MD
St. Luke's Medical Center
Milwaukee, Wisconsin

Vascular Surgery Fellowship
Shahriar Alizadegan, MD
Assistant Professor of Surgery
Division of Vascular Surgery
Medical College of Wisconsin
at St. Agnes Hospital
Fond du Lac, Wisconsin

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Hemodialysis Vascular Access – Where is the Science?

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Professor, Division of Transplant Surgery
Director, Vascular Access Program

Failure to provide a reliable and durable hemodialysis vascular access (HDVA) results in significant morbidity and mortality for end-stage renal disease (ESRD) patients. Evidence-based practice guidelines in this area are less than optimal, and there have been few cutting-edge technical advances for many decades. This is all changing. Science has arrived, addressing two major areas of concern—better alternatives to polytetrafluoroethylene (PTFE) and the biology of arteriovenous fistula (AVF) maturation and failure.

In patients who lack autologous options for HDVA, PTFE is a poor second choice. Long-term patency is limited and patients soon exhaust all future options. A new and exciting tissue-engineered vascular graft should soon start in clinical trials in the United States. Recent clinical experience in Poland has confirmed its safety and efficacy for hemodialysis (HD) in patients. Humacyte, located in Research Triangle Park, North Carolina, has developed this graft consisting of human extracellular matrix, similar in strength to human vein and artery. Current data supports its superiority as compared to PTFE. If its promise is realized, we may have a vascular conduit with long-term patency that equals that of autologous tissue.[1]

The majority of nearly 400,000 patients in the United States with ESRD receive maintenance HD via either an AVF or graft. Despite the enormous medical and economic impact of HDVA failure, our understanding of the factors that result in fistula failure or loss is incomplete. The surgical literature on HDVA failure is marked by a paucity of randomized controlled trials and overwhelmed by uncontrolled case series. To address this deficiency, the NIH and NIDDK initiated the Hemodialysis Fistula Maturation Study—a prospective, multicenter, observational study to identify the clinical and biological variables associated with HD fistula maturation outcomes.[2] In addition to clinical data collection, patients underwent preoperative ultrasound arterial and venous mapping, flow-mediated and nitroglycerin-mediated brachial artery dilation, arterial pulse wave velocity, and venous distensibility. Tissue and blood specimens were collected for analyses of histology, morphometry, immunohistochemistry, and gene expression.

The study is now closed after enrollment of 602 patients. Few publications have resulted yet as data analysis is incomplete. Nonetheless, there are some early observations from this seminal study. Early fistula thrombosis (within 18 days) occurred in 32 patients (5.3%). The primary outcome measure of unassisted clinical maturation, defined as successful use of the fistula for dialysis for four weeks without maturation-enhancing procedures, was achieved in 43.5%. A further 22% of patients achieved assisted maturation following either surgery or a procedure in interventional radiology (IR). Female sex and a higher BMI increased the odds of non-maturation. Whether the AVF was located at the wrist or elbow had no impact on outcome. Following preliminary analysis of the data, AVF flow, diameter, and depth at six weeks following AVF creation appear to be the most significant predictors of outcome.

A major question that this study will address is the impact of pre-existing arterial and venous disease on AVF maturation. A surprising finding of this study was that pathological alterations were found in veins thought clinically suitable for AVF construction. In 57% of veins examined, substantial intimal hyperplasia (defined as 20% or greater luminal narrowing) was present. How pre-existing arterial and venous pathology impact long-term AVF survival and frequency of interventions is also being examined.

Processes of care were also examined. Having a dedicated vascular access coordinator was associated with a lower rate of AVF failure. Average time from AVF creation to first cannulation was too long, at 136 days, which for the majority of ESRD patients only increases their exposure to the risks of a central venous catheter.

This study holds the promise of providing a better understanding of the multiple factors that contribute to AVF maturation/success and identifying targets for novel therapeutic interventions to enhance fistula maturation. This study will have a significant impact on clinical decision-making, and therefore surgeons providing HDVA should remain current on available outcomes data.

MCW surgeons have pledged to provide the highest standard of HDVA care to the ESRD patient population. Our practice will change in response to these new studies and innovations. We look forward to working with this challenging population of patients and their many dedicated referring physicians. •

FOR ADDITIONAL INFORMATION on this topic, see references, visit mcw.edu/surgery or contact Dr. Roza, 414-955-6934, aroza@mcw.edu.

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Thoracic Aortic Aneurysms: Role for Genetic Testing and Earlier Intervention

CHRIS K. ROKKAS, MD
Associate Professor,
Division of Cardiothoracic Surgery

Aortic aneurysms and dissections remain a major public health issue, causing more than 13,000 deaths annually in the United States. The mortality is primarily related to sudden catastrophes, such as aortic rupture and dissection (Figure 1). Even when patients survive the initial insult, surgical treatment is associated with high early morbidity and mortality and impaired late survival (Figure 2). However, these deadly complications usually occur in the setting of asymptomatic aortic aneurysms, which are frequently very difficult to detect. Once these aneurysms are detected, prophylactic surgical treatment by means of open or endovascular procedures is the management of choice to prevent rupture and death.[1]

Currently, the appropriate timing for prophylactic intervention is determined primarily by aortic size criteria that has been shown to be effective for preventing aortic complications and death. However, there are certain circumstances in which prophylactic surgery might be beneficial before the size of an aneurysm reaches the currently accepted intervention criterion threshold.

Lately, it has become increasingly evident that thoracic aortic aneurysm and dissection (TAAD) has a strong genetic component, as shown by the ground-breaking work of Dr. John Elefteriades, Director of the Yale Aortic Center. The Yale group demonstrated that TAAD can be subdivided into two main categories: (1) syndromic, associated with abnormalities of other organ systems (such as Marfan, Loeys-Dietz, Ehlers-Danlos syndromes) and (2) non-syndromic, with manifestations restricted to the aorta. Non-syndromic TAAD includes two distinct subcategories: familial (more than one family member affected) and sporadic forms of TAAD.[2] Patients with certain specific genetic abnormalities have a different natural history, so that aortic size loses its predictive ability. These patients may require intervention at smaller aortic sizes. Therefore, it has become very important to be able to identify individuals with increased risk of aortic complications, based on modern information derived from genetic testing of individual patients.

The risk of elective surgical intervention on the thoracic aorta has markedly decreased over the past several years, due to advances in protecting the vital organ systems. Surgery on the aortic root and the ascending aorta has become extremely safe, while surgery on the aortic arch has benefited from recent technical advances in brain protection.

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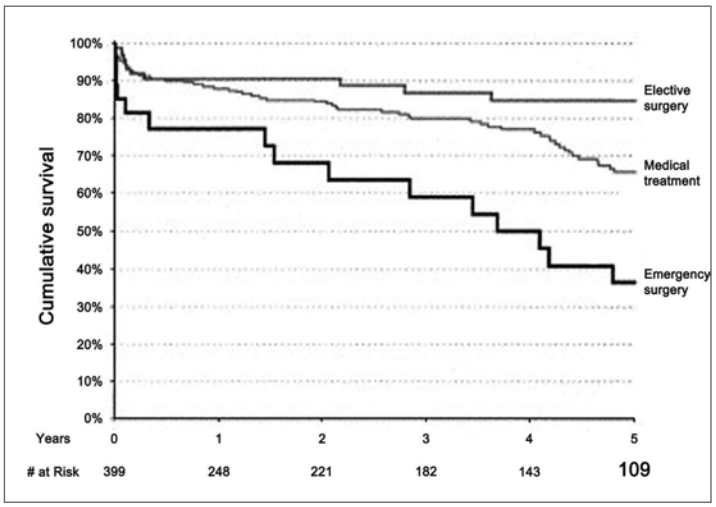

FIGURE 1: Elective surgery offers significantly superior long-term survival for patients, compared with emergent surgical interventions. Surgical repair performed electively promises lifetime protection at a mortality cost comparable to, or less than, a single year's risk of rupture or dissection.[3]

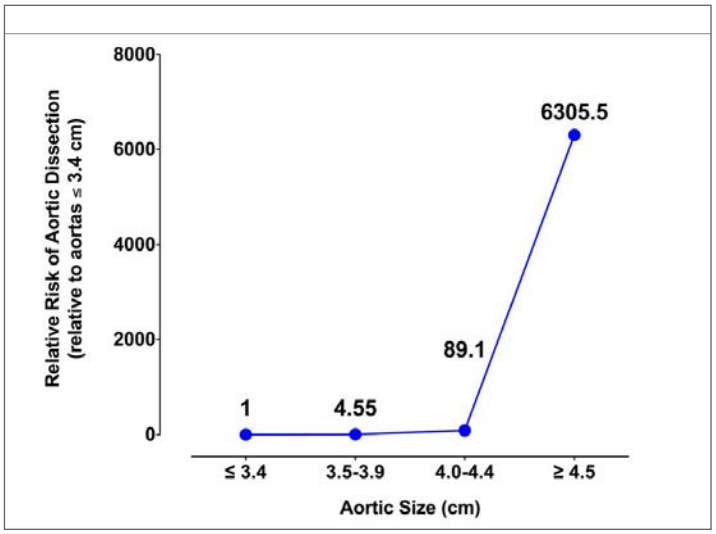

FIGURE 2: Relative risk of aortic dissection is 6,000-fold higher for large aortas than for small ones.[1]

Thoracic Aortic Aneurysms

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The descending thoracic and the thoracoabdominal aorta have notoriously been the most difficult segments of the aorta to treat, with higher perioperative risk compared to the risk associated with interventions on the ascending aorta and the aortic arch. Nevertheless, recent advances in endovascular and hybrid techniques, as well as improved spinal cord and other vital organ protection methods, have made intervention on the descending aorta much safer. We can make an argument that current guidelines based on size criteria may be too conservative, as the risk of aortic surgery decreases through advances in surgical technique, graft technology, and perioperative care. Comprehensive aortic care certainly includes the involvement of multiple clinical, diagnostic, and research disciplines within the umbrella of an academic institution.

In an effort to offer optimal and modern care to patients with aortic diseases, the Medical College of Wisconsin brings together the clinical experience of Cardiothoracic Surgeons, Vascular Surgeons, Interventional Radiologists, Cardiologists specialized in aortic diseases, and genetic counselors to provide comprehensive, multi-disciplinary care within the organizational structure of an "Aortic Center." A special effort has been made to increase physician awareness and educate all disciplines involved in aortic disease through educational activities. These activities have included two Aortic Symposia in 2015 sponsored by the Department of Surgery; one focusing on diseases of the aortic root, and another on aortic dissection. Nationally renowned aortic experts, Dr. Thoralf Sundt of Harvard Medical School and Dr. John Elefteriades of Yale University, have participated in these events.[4] These activities support our ongoing commitment to our mission of providing an excellent aortic health program to our local community and the greater Midwest region. •

FOR ADDITIONAL INFORMATION on this topic, please visit mcw.edu/surgery, or contact Dr. Rokkas, 414-955-6919, crokkas@mcw.edu.

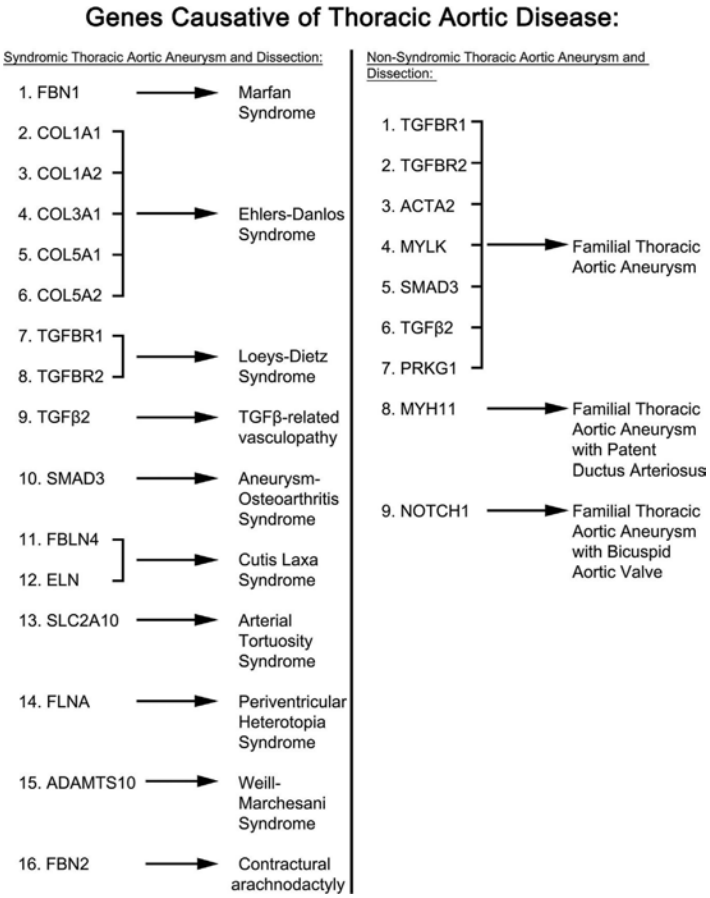

Figure 3: Genes that are known to cause syndromic and non-syndromic thoracic aortic aneurysm and dissection.[2]

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Dr. John Elefteriades of Yale (right) with legendary MCW cardiovascular surgeon, Dr. Dudley Johnson (left), at the MCW Aortic Dissection Symposium, October 30, 2015.

Dr. Wilson Bestowed the Oliver Cope Meritorious Achievement Award

Stuart D. Wilson, MD, Professor Emeritus of the Department of Surgery, was bestowed the *Oliver Cope Meritorious Achievement Award* by the American Association of Endocrine Surgeons (AAES) at the 37th Annual Meeting of the AAES, held April 10-12, 2016, in Baltimore, MD.

Stuart Wilson, MD, and Douglas Evans, MD

Established in 1984, the AAES *Oliver Cope Meritorious Achievement Award* is given to acknowledge an individual whose contributions in the field of Endocrine Surgery (as an investigator, teacher, and clinical surgeon) go above and beyond their peers and whose actions throughout their career have represented the spirit of the award. It is the highest honor a member of the AAES can receive, and is reserved for those who truly aspire to the spirit of the award. Dr. Wilson, a founder and past-President of the AAES, is only the eighth recipient of this prestigious award worldwide.

Dr. Wilson joined the Department of Surgery at the Medical College of Wisconsin in 1965. Dr. Wilson has held numerous clinical and academic appointments throughout his career. Most notably, he served as the Vice-Chairman for the Department of Surgery from 1993–1995, the Chief of the Division of General Surgery from 1995–1997, and the Chief of Pancreatobiliary/Endocrine Surgery from 1998–2009. During his career at MCW, Dr. Wilson also served as Chief of Surgery for the 1st Medical Battalion, 1st Marine Division, in Vietnam from 1968–1969, where he was awarded the Bronze Star with Combat V.

On July 1, 2010, the Department of Surgery created the Stuart D. Wilson Chair for the Chief of the Division of Surgical Oncology. Dr. T. Clark Gamblin was recruited from the University of Pittsburgh and holds the inaugural Wilson Chair.

WE LOVE JULY!

The Department of Surgery welcomes the incoming 2016–2017 PGY1 General Surgery Residents:

Lucas Boehm
Medical College of Wisconsin

Alexis Bowder
University of Nebraska College of Medicine

Kayla Chapman
Medical College of Wisconsin

Keona Childs
Howard University College of Medicine

Peter Dietrich
Medical College of Wisconsin

Ross Everett
Medical College of Georgia at Georgia Regents University

Kathryn Haberman
Medical College of Wisconsin

Jacob Jipp
University of Iowa Roy J. and Lucille A. Carver College of Medicine

David Rivedal
University of Wisconsin School of Medicine & Public Health

Lanette (Jane) Stewart
University of Colorado School of Medicine

Elizabeth Traudt
Medical College of Wisconsin

K. Hope Wilkinson
University of Wisconsin School of Medicine & Public Health

Standardizing the Preadmission Shower Concentration of 4% Chlorhexidine Glu

CHARLES E. EDMISTON, PhD
Professor Emeritus, Division of Vascular Surgery

The concept of the preadmission shower as a risk reduction strategy was addressed in the 1999 CDC Hospital Infection Control Practices Advisory Committee document, Guideline for the Prevention of Surgical Site Infection.[1,2] This process was originally designated by the CDC guidelines as a Category 1B clinical practice and "strongly recommended." While evidence-based analyses do not appear to support the routine use of a 4% chlorhexidine gluconate (CHG) preadmission whole body cleansing or showering, two sentinel factors should be considered when evaluating this low-risk and low-cost intervention:

- CHG surface-skin concentrations accumulate with repetitive application and therefore a single application may not approach concentrations sufficient to inhibit skin flora.[3,4]
- CHG binding to skin protein is influenced by the amount of CHG exposed to the skin and the duration of exposure prior to rinsing.[3,4]

Many healthcare facilities have incorporated an antiseptic skin cleansing protocol, often referred to as "preoperative bathing or cleansing" to reduce the microbial burden on the skin of patients undergoing elective surgery with the aim of reducing the risk of surgical site infection (SSI). This practice has historically been endorsed by national and international organizations, including the Hospital Infection Control Practice Advisory Committee, Centers for Disease Control and Prevention (HICPAC-CDC), Association for Professionals in Infection Control and Epidemiology (APIC), Association of periOperative Registered Nurses (AORN), Institute for Healthcare Improvement (IHI), and the UK National Institute for Health and Care Excellence (NICE), who recommend bathing or cleansing with an antiseptic agent prior to surgery as a component of a broader strategy to reduce surgical site infections (SSIs).[1,5-8] The Cochrane Collaborative, however, reported that no benefit was derived by taking a series of preadmission showers with an antiseptic agent as a risk-reduction strategy for preventing SSIs.[9] Most of the studies cited in the Cochrane Collaborative were originally published over 20 years ago. An analysis of these publications document significant methodological and operational bias. For example, several studies cited in the Cochrane review offer no standard of practice, the study populations were highly heterogeneous (Class 1, 2 and 3) involving a broad-base of surgical disciplines, and no effort was made to measure patient compliance to a standardized protocol. Studies published since 2009 have controlled for many of these variables and include retrospective, sequential, and prospective cohort analyses; case-control; prospective observational and interventional clinical trials; and randomized control trials.[10-19]

A recent study conducted in the Division of Vascular Surgery and published in *JAMA Surgery* evaluated, for the first time, the preadmission shower with 4% chlorhexidine gluconate from a pharmacokinetic perspective, defining the appropriate dose, timing and duration.[20] What is the optimal number of applications to ensure a maximum preadmission skin surface concentration of CHG? This is an unresolved question associated with the use of CHG for preadmission bathing. Because it is recognized that skin surface antimicrobial activity is enhanced following multiple applications of CHG, most protocols recommend two to three separate applications prior to surgery. However, there is no clinical or pharmacologic data suggesting that three, rather than two CHG showers results in a higher skin surface concentration of CHG.

The study concluded that taking a one-minute pause (timing component) prior to rinsing off the 4% CHG was associated with a significantly higher skin surface concentration at five separate skin sites, compared to immediately rinsing off the antiseptic agent ($p<0.001$). These findings were valid whether two or three 4% CHG showers (durational component) were taken. The findings of the study also documented that using a four ounce (dose, 118-mL) volume of CHG per shower, in addition to a minimum one-minute pause prior to rinsing, resulted in saturated binding of CHG to proteins on the surface of the skin. The high-sustainable skin surface concentrations of CHG were found to be significantly higher than the minimal inhibitory concentration required to inhibit or kill 90% (MIC90) of Gram-positive or Gram-negative surgical wound pathogens (Figures 1 and 2).

as a Strategy to Maximize Skin Surface conate

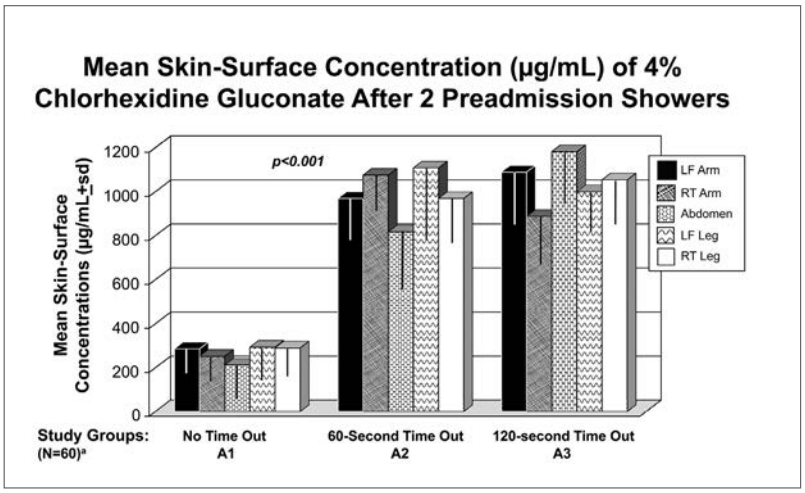

FIGURE 1: Mean skin surface concentration (µg/mL) of 4% Chlorhexidine Gluconate after two Preadmission Showers, N=60

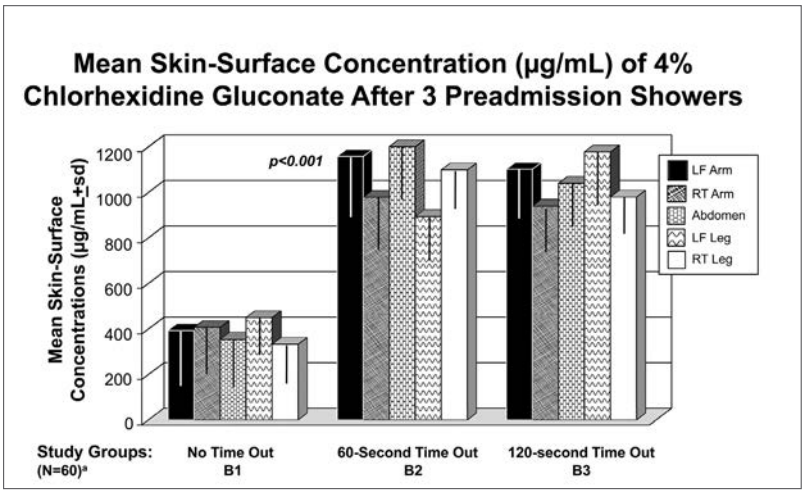

FIGURE 2: Mean skin surface concentration (µg/mL) of 4% Chlorhexidine Gluconate after three Preadmission Showers, N=60

Based on the current accumulated evidence, a standardized preadmission shower regimen should include:

- Education of the patient, emphasizing the benefit of the preadmission antiseptic shower as an element of the pre-surgical checklist
- Oral and written showering instructions for the patient
- A total volume of four ounces (118-mL) of 4% CHG to be used for each shower
- Patients taking a minimum of two showers
- A one-minute pause per shower, observed prior to rinsing the CHG from the skin surface
- Instructions for patients not to apply lotions, creams or emollients following CHG application since they may mask or adversely (pharmacologically) affect antimicrobial activity
- Avoid CHG contact with the eyes and ears, and if exposed, rinse immediately
- If significant burning or itching occurs upon application of CHG, patients should rinse immediately and report occurrence to healthcare provider
- CHG provided to the patient by the healthcare institution or provider
- Enhanced patient compliance to completing the showering using an SMS-texting, email or voicemail alert system.
  Note: All commercial vendors of 4% aqueous CHG support a computer-based alert system.

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Preadmission Shower References

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The findings of this study, in addition to our previous clinical investigations, suggest an evidence-based protocol that standardized the preadmission shower, defining a precise dose (four ounce of 4% CHG), a timing (one-minute pause prior to rinsing) and durational (two showers) perspective to maximize skin surface concentrations prior to hospital admission.

The modern approach to skin antisepsis strives to reduce the microbial burden at the incisional site, protecting the wound from gross contamination. However, presence of a high microbial burden on selective skin surfaces sites (such as the groin, axilla, perineum or antecubital and popliteal fossae) increases the risk of postoperative infection.[20] The recent *JAMA Surgery* study demonstrated that an economical, standardized preadmission antiseptic cleansing process, using a defined volume (dose) of 4% CHG, for a defined period (two showers) with a minimum one-minute pause prior to rinsing, results in high sustainable antiseptic levels on the surface of the skin, effective against both Gram-positive and Gram-negative microbial populations associated with postoperative infection.[20,21] An economical initiative, resulting in fewer microorganisms on the skin surface adjacent to the surgical incision, should be a sentinel component of all perioperative surgical care bundles. •

FOR ADDITIONAL INFORMATION on this topic, see references below, visit mcw.edu/surgery, or contact Dr. Edmiston, edmiston@mcw.edu.

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The Cost of Ventral Hernia Recurrence

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Director, Condon Hernia Institute
General Surgery Residency Program Director

DANIEL G. DAVILA, MD
General Surgery Resident

Ventral hernias represent one of the most commonly performed general surgery procedures. Annually, approximately 348,000 ventral hernia repairs (VHR) are performed in the United States.[1] Though some occur as inherited defects, up to 20% of surgical incisions can produce an acquired ventral hernia, particularly in the case of midline incisions.[2]

With the advent of minimally invasive surgery over two decades ago, laparoscopic repair of ventral hernias has become increasingly common and shows a decreased short-term morbidity and length of stay, amongst other benefits. Much of the literature to date has focused on the clinical outcomes of repair with cost concerns only becoming a major focus of research in the past decade. These more recent cost analyses of open and laparoscopic VHRs present a range of results, most commonly suggesting a slightly greater initial laparoscopic cost that approaches equivalence or savings long-term.[3-5] Interestingly, these cost analyses show a range of costs attributed to initial repairs of VHRs, yet there have been no structured analyses of recurrent VHR costs to date.

In order to determine the cost of ventral hernia recurrence, we analyzed the Premier Alliance database (an administrative database of over 600 participating hospitals in the U.S. whose discharges cover nearly 20% of U.S. hospital discharges) from 2009-2014 for patients with recurrent repairs within our time period. In addition to baseline characteristics, total hospital cost and resource expenses during index and recurrent repairs were also obtained. The sample was also separated into laparoscopic and open repair groups from initial operation.

Ultimately, 1,077 patients were used for our analysis with a recurrence rate of 3.78%. For the combined sample, costs were significantly higher during recurrent hernia repair hospitalization ($21,726 vs. $19,484, $p<0.0001$). However, for index laparoscopic repairs, both the adjusted total hospital cost and department level costs were statistically similar during the index and the recurrent visit (all $p>0.05$). This was true, despite a greater illness severity during the recurrent visit as determined by the Charlson Comorbidity Index (CCI score: 0.92 vs. 1.06; $p=0.0092$). Not surprisingly, open surgery sub-group patients showed higher total costs during the recurrent visit compared to index visit ($23,034 vs. $20,236; $p<0.01$), presumably due to mesh and added complexity cost, though mesh details cannot be obtained. Using a matched sample, the total hospital cost was higher for the initial open repair group compared to initial laparoscopic group ($14,520 vs. $12,649; $p=0.05$).

Our study supports the theory that recurrent ventral hernia repair adds substantially to total hospital costs and resource utilization. Though a minimally invasive approach may minimize morbidity and possibly initial cost, a durable initial repair is the primary aim regardless of approach. Though our study performed some subanalyses of initial open and laparoscopic groups (finding greater recurrent costs for the initial open group), the analysis was not designed to compare hernia complexity, procedure appropriateness, or quality of technique. Thus, our results should not then be used to directly justify or compare techniques, but rather represent the end economic result of two surgical approach processes. •

FOR ADDITIONAL INFORMATION on this topic, see references below, visit mcw.edu/surgery, or contact Dr. Goldblatt, 414-805-5714, mgoldbla@mcw.edu.

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Staged Ventral Hernia Repair in the Setting Surgical Site Infection Rates

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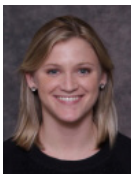

MELANIE BOBBS
Medical Student

Up to a quarter of the two million Americans who undergo abdominal operations eventually develop an incisional hernia. Despite advances in technology, materials and techniques, recurrence rates remain as high as 60%.[1-7] Options for repair of ventral hernias in the setting of contaminated and infected fields are limited. Primary repair of the hernia defect with component separation has historically been preferred in the setting of contamination, due to the concern for mesh infection. While mesh has been shown to significantly improve outcomes of hernia repair, the majority of surgeons opt for biologic mesh in the contaminated field due to its temporary nature and resistance to infection.[8] Multiple recurrent hernias, mesh infections, enterocutaneous fistulas (ECF), and enteroatmospheric fistulas (EAF) are some of the most severe complications of ventral hernia repair (VHR), often leading to the transfer of care to specialized centers for definitive management.

An emphasis on improving care and outcomes of patients with hernias has led to published grading systems to better classify and understand likely outcomes of hernia repair. The Ventral Hernia Work Group (VHWG) classification system risk-stratifies individuals according to patient and case specific factors.[9] Rosen *et al*. subsequently developed the Modified Hernia Grading System (MHGS), which encompasses all aspects of the VHWG system. This defined three distinct categories: low-risk (grade 1), co-morbid (grade 2), and contaminated (grade 3).[10] The MHGS is outlined within Figure 1.

As a referral center for patients who develop complications following ventral hernia repair, we have adopted a staged approach to repair for those suffering the most severe complications, particularly infected mesh, ECF, and EAF. The staged approach is rooted in the basic scientific concept of delayed primary closure, in which neutrophil and macrophage cell counts are highest between day two and three, providing an ideal antimicrobial environment for wound closure. Our dual-stage approach involves an initial operation, in which source control and debridement of

Figure 1. Modified Hernia Grading System

	Grade 1	Grade 2	Grade 3
Description	Low Risk of Complications No History of Wound Infection	Smoker Obese DM History of Wound Infection	Clean-Contaminated Contaminated Dirty
Expected SSO	14%	27%	46%

Figure 1: Legend: SSO=Surgical Site Occurrence

# of Significant Contamination Improves

Table 1. Cohort Characteristics

Age (years)	52 (48.5,67.2)
Sex (n / %)	
Male	8 (53%)
Female	7 (47%)
	38.3
BMI (kg/m^2)	(27.9,43.5)
Co-Morbidities (n / %)	
Hypertension	12 (80%)
Diabetes	5 (33%)
Immunosuppression	3 (20%)
COPD	3 (20%)
CKD	2 (13%)
CHF	1 (7%
Smoking History (n / %)	7 (47%)
Active	2 (13%)
ASA Score	3 (3,3)
History of SSI (n / %)	13 (87%)
Prior Abdominal Operation	4 (2.5,5)
Prior Ventral Hernia Repair	11 (73%)

All values median / IQR unless otherwise stated.

COPD = Chronic Obstructive Pulmonary Disorders; CKD = Chronic Kidney Disease; CHF = Congestive Heart Failure

Table 2. Hospitalization Characteristics

Pre-Op Outpatient Antibiotics (n / %)	
Active Mesh Infection	2 (13%)
Intra-abdominal Abscess	1 (7%)
Immunosuppression Prophylaxis	1 (7%)
Operative Indication (n / %)	
ECF	6 (40%)
ECF with Mesh Infection	2 (13%)
Mesh Infection	2 (13%)
Bowel Resection	5 (33%)
Time between Procedures (days)	2.0 (2, 3)
Repair Type (n / %)	
Retrorectus	7 (47%)
Mesh Underlay	5 (33%)
Bridged Repair	3 (20%)
Mesh Type (n / %)	
Biologic	13 (87%)
Synthetic	2 (13%)
Length of Stay, days (Median / IQR)	16 (10,23.5)
Ventilator Days (Median / IQR)	0 (0,0.5)
Follow-Up, days (Median / IQR)	490 (180,609)
Lost to Follow-Up @ 6 months (n / %)	2 (13.3%)
Discharge Destination (n / %)	
Home	10 (67%)
Skilled Nursing Facility	4 (27%)
Long-Term Acute Care	1 (7%)

ECF = Enterocutaneous Fistula; IQR = Interquartile Range

Table 3. Complications

30-day Readmission (n / %)	3 (20%)
Surgical Site Infection (n / %)	4 (27%)
Superficial	3 (20%)
Deep	1 (7%)
Surgical Site Occurrence (n/%)	8 (53%)
Surgical Site Infection	4 (27%)
Seroma	2 (13%)
Skin Dehiscence	2 (13%)
Intra-abdominal Abscess	1 (7%)
Enterocutaneous Fistula	1 (7%)
Mesh Infection (n / %)	0 (0%)
Recurrence Rate (n / %)	
6-month Recurrence	1 (7.7%)
Overall Recurrence	3 (23.1%)

infected tissues is conducted. Patients are temporarily closed and placed on antibiotic therapy for two to three days prior to implantation of permanent or biologic mesh, with definitive closure at a second operation. The patients who undergo a staged repair fall within the highest risk category (grade 3) of the MHGS.[10] We conducted a recent study analyzing our institutional experience with a true dual-stage approach to repair.

A total of 15 patients underwent a dual-stage VHR for the management of a MHGS grade 3 case. The main indication for dual-stage intervention was management of an ECF/EAF in the setting of a ventral hernia. Complete cohort and hospital characteristics are provided in Tables 1 and 2, respectively. The majority of patients underwent retro-rectus repair with placement of biologic mesh, although lightweight macro-porous synthetic mesh was implemented towards the end of the study period. Mesh choice was entirely based on surgeon preference at the time of the second operation. Overall utilization of the dual-stage approach in an extremely high risk population, as outlined by medical co-morbidities and operative characteristics, appears to yield lower rates of surgical site infection (SSI) with minor other surgical site occurrences (SSOs). The limited six-month follow-up prevents assessment of its utility for prevention of recurrence. However, previous work has conclusively shown that postoperative SSI is a significant risk factor for hernia recurrence.[1,11]

The results of this study are congruent with a single other study evaluating the concept of staged repair in the setting of contaminated cases.[12] Interestingly, one of the main concerns with this prior study was that their staged approach often required greater than two operations to obtain source control and achieve closure, increasing the cost of repair. Overall, the dual-stage approach, as described, provides a unique alternative to the unnecessary complications of single-stage repair. In the setting of heavy contamination, the dual-stage approach will decrease the rate of SSI while containing costs. It is the hope of the authors to further delineate potential cost benefits and evaluate the potential for synthetic mesh placement through a multi-institutional prospective trial. •

FOR ADDITIONAL INFORMATION on this topic, see references below, visit mcw.edu/surgery, or contact Dr. Webb, 414-805-8622, trwebb@mcw.edu.

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Center for Advan

Launches Construction of the Integrated

GARY R. SEABROOK, MD
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The Center for Advanced Care, the newest addition to the Froedtert Hospital campus, was dedicated in October 2015, with a sequential occupancy that will conclude in the summer of 2016. Located on Doyne Avenue between Parking Structure 1 and the Clinical Cancer Center, the building is recognized by a series of green vertical fins along the south exterior which serve as a way-finding tool for patients and visitors. Spacious reception and waiting areas welcome outpatients and visitors with glass walls providing a southern exposure to the campus. The 12-story facility, which includes three levels of underground parking for patients receiving care in the Center, is the new home of the **Transplant Center** and the **Surgery Clinics** (Level 2), the **Preoperative Clinic** and the **Procedural Arrival and Recovery Unit** (Level 3), the **Heart & Vascular Center** (Level 4), and **Ear Nose and Throat & Oral Communications**, **Oral Surgery,** and **Pulmonary Medicine and Bronchoscopy** (Level 5). Level 6 will be reserved for future program growth. Level 7 and 8, each being constructed with 32 inpatient beds, will be the new home of the inpatient **Bone Marrow Transplant** program and inpatient **Medical Oncology**. A two story skywalk will connect the Center for Advanced Care with the adjacent Cancer Center on Levels 2 and 3.

Several Department of Surgery outpatient clinics have moved to the Center for Advanced Care, vacating two large footprints that are now being remodeled to allow consolidation of all Froedtert operating rooms, cardiac catheterization and interventional radiology suites into a single integrated treatment platform. Many of the original Froedtert operating rooms will be rebuilt, creating larger, more sophisticated facilities for advanced surgical procedures. Combining 32 operating rooms in a single platform will finally complete the merger of surgical facilities that were developed separately as departments in the original Froedtert Hospital and the Milwaukee County Medical Complex (Doyne Hospital), which was purchased by Froedtert in 1996. With relocation of outpatient clinics to the Center for Advanced Care, space has been vacated to construct new surgical and interventional treatment suites. This platform will provide a geographic concentration for all Froedtert operating rooms and complex imaging for vascular, cardiac, oncologic, neurological, and musculoskeletal diseases, addressing the current and future demand for efficient, multidisciplinary care. The integrated platform will allow for cross-specialty fertilization and innovative techniques to deliver state-of-the-art care. Design teams are planning innovations for the remodeled space, including operating rooms for laparoscopic and video-assisted minimally invasive surgery, robotic surgery, procedures performed with computer-guided

ced Care Opens

Surgical and Interventional Platform

imaging, and emerging technology in surgical and interventional therapy. An intraoperative MRI will be linked to two specialized operating rooms and an interventional suite is being designed to connect a CT imaging and angiography unit.

A new Sterile Processing Department stacked on two floors (Lower Level and Level 1), and connected by dedicated elevators, will be constructed to support the surgical platform. To ensure sterility of equipment and supplies, this new state-of-the-art facility will feature a single direction, controlled processing pathway. An additional floor is being added to the West Clinic Building to house mechanical support for the integrated platform, additional inpatient imaging facilities, conference space, locker rooms, and a staff lounge and dining area. Windows on the western elevation of this addition will provide access to daylight for staff and contribute to a new façade for the Froedtert Hospital 92nd Street entrance.

The Surgery Clinic on Level 2 is the new home for clinic services for the Division of General Surgery including the Bariatric Surgery Program and the Condon Hernia Institute. The Division of Colorectal Surgery has an outpatient clinic for benign colorectal disease that includes specialized facilities for endoscopic evaluations. Clinics for the Trauma and Critical Care outpatient visits are located in this area. The Transplant Center, which occupies a significant portion of Level 2, now provides a single site of care for the solid organ transplant program, including facilities for pre-transplant assessment, consolidation of support for transplant coordinators and organ procurement, and clinic space for assessment and post-operative care.

Level 3 of the Center for Advanced Care will become the new front door for all patients scheduled for surgery, interventional radiology procedures, or cardiac catheterization and electrophysiology interventions. The Preoperative Clinic, previously called pre-admission testing (PAT), has been moved to the perioperative area on Level 3 – providing risk assessments, preoperative anesthesiology planning and coordination of patient education prior to procedures. Patients visiting the Preoperative Clinic will have the opportunity to become familiar with

Bradley Tech High School TechTerns experienced construction management firsthand with immersion in the design and building process.

The Center for Advanced Care, the newest addition to the Froedtert Hospital campus.

the logistics of traffic and parking, navigating in the building, and locating the procedure check-in area, thereby reducing anxiety associated with arrival on the day of their procedure. The Procedural Arrival and Recovery Unit provides a single registration desk and facilities for all procedural preparation. A service desk provides support for family members waiting during procedures and a dedicated staff coordinates communication between families and surgeons or procedural providers. For patients scheduled for outpatient procedures, anesthetic recovery and discharge also occurs from this unit, providing continuity of nursing care through the continuum of the patient experience. An outpatient pharmacy on this platform provides patients the convenience of filling new prescriptions prior to discharge.

The Heart & Vascular Center occupies all of Level 4. Outpatient clinics for Cardiovascular Medicine, Cardiothoracic Surgery, Vascular Surgery, Interventional Radiology, Vascular Medicine, and the Wound Care Program are located in coordinated clinical pods. Services for echocardiography, electrophysiology monitoring and device interrogation, nuclear cardiology evaluation and non-invasive vascular testing facilities are located in a diagnostic unit adjacent to clinic facilities.

The Health Practice at CannonDesign is providing architectural planning and design for the project, and they have organized hundreds of hours of user group meetings, ensuring that every detail of the facility will function optimally. Mortenson Construction continues to contribute their considerable expertise in health care as the construction managers of the project, with the commitment to uninterrupted operation of the surgical platform as it is completely rebuilt. Through this entire construction initiative, Froedtert, CannonDesign, and Mortenson are partnering with Bradley Tech High School in a program called TechTerns to provide students curricular and immersion learning in design, construction, and healthcare. Exposure to the project on our campus is providing life-changing experiences for Milwaukee students making choices and plans for their future careers. •

A DEPLOYED SURGEON'S EXPERIENCE
Seven Months in Djibouti

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Djibouti is a tiny country in Eastern Africa where the Indian Ocean and Red Sea meet. A quick look at the map makes the strategic importance of this place obvious. Surprisingly few people have heard of this country, but the United States has had a base there for over 10 years. Camp Lemonnier is located along an airstrip in the port city of Djibouti. This former French Foreign Legion base is our country's only permanent base in Africa, and serves as the point of operations for anti-piracy and counter-terrorism operations throughout the Horn of Africa. Almost 5,000 service members are stationed at this base and all of their medical and surgical care is provided by the Expeditionary Medical Facility (EMF), the largest U.S. medical facility in Africa.

Our provider group at the EMF included an anesthesiologist, two emergency physicians, a family practitioner, a physician assistant, a dentist, a psychologist, and just one general surgeon, me. Four nurses (ICU, ER, Med/Surg, and OR) cover the "ward," which consists of eight multi-purpose beds. The Navy utilizes medics, called Corpsmen, and about 20 were on our clinical team. Half of these Corpsmen perform general duties, while the other half have additional training as surgical, laboratory, radiology, and pharmacy technicians. By civilian standards, the clinic is low-volume, averaging approximately 200 encounters a week. The case load was even lighter for me. A deployed surgeon is an insurance policy whose job is to care for unexpected trauma and surgical emergencies. Fortunately, the Horn of Africa sees few U.S. casualties, especially as compared to Afghanistan. No significant traumas occurred during my seven-month deployment, although just before my arrival there had been a femoral artery laceration from a blunt trauma.

The EMF has a basic lab which can do most necessary tests. Our radiology tech could perform plain film X-rays, and we had a portable ultrasound that I used for evaluating conditions from abdominal pain and kidney stones, to soft tissue masses and gynecologic conditions. When CT scans were necessary, we had to send our patients across town to a French hospital. Images were sent back to us on film, and about 24 hours later a radiologist's interpretation would be sent to us, in French.

Aside from a "lump and bump clinic," I performed inguinal hernia repairs, lap cholecystectomies, lap appendectomies, and even two laparotomies for perforated bowel. Additionally, I performed a number of complex laceration repairs on injuries related to construction projects on base. Military surgeons get called on to see and do all kinds of things outside of the normal "general surgery" practice, but fortunately I received the necessary diverse experience during my Navy residency. Similar to my other deployments, I found myself reducing fractures, managing hand trauma, evaluating scrotal pain, and performing colonoscopies and EGDs. My medical colleagues were similarly challenged, because our clinic in Djibouti received transfers from all over Africa. They took care of people with malaria, pneumonia, strange dermatologic conditions, acute myocardial infarctions, seizure disorders, and psychiatric conditions. We provided the best care possible with our limited resources, but any patients that we couldn't manage were sent to an Army hospital in Germany for further evaluation or treatment.

In addition to our clinical responsibilities, every physician is responsible for collateral duties that are broad in range and time-consuming. As the Blood Bank Officer, I made sure we had an adequate supply of stored blood and whole blood donors. This duty allowed me to learn about establishing a walking blood bank, storing blood products and screening donors. Assisting with the management of the lab, I became fluent in quality control processes and troubleshooting the analyzers. As Senior Medical Officer, I served as the administrator responsible for all care provided at our clinic and learned about scheduling, patient satisfaction, and managing a budget. I find these unique experiences so rewarding; it is interesting to learn about the ancillary side of providing care.

The best part of a deployment is working with people from all over the U.S. and from other countries. We collaborated with physicians from the Army and the Air Force and had a close relationship with the Embassy staff, which was crucial to help us understand the medical resources available in the country. I ate wood-fired pizza with an Italian urologist,

Dr. Carver and fellow medical providers at the Expeditionary Medical Facility.

The Expeditionary Medical Facility emergency room.

exchanged gifts with an orthopedist from Japan, listened to a Grand Rounds about the Paris attacks given by a French surgeon who had cared for those injured, had tapas with a general practitioner from Spain, and toured a Djiboutian hospital with a local general surgeon. These relationships go a long way to help ease the pain of being away from your family for so long.

Each deployment presents challenges and opportunities, but the satisfaction of providing care to those who put themselves at risk for our country makes all of the sacrifices worthwhile. I am thankful to be part of the Navy and have benefitted greatly from my experiences

serving at home and abroad. I want to extend my sincere appreciation to my friends, colleagues, and family for their support over the past nine months because, in a lot of ways, a deployment is harder on them than it is on the person who is actually gone. •

FOR ADDITIONAL INFORMATION on this topic, please visit mcw.edu/surgery, or contact Dr. Carver, 414-805-8622, tcarver@mcw.edu.

Leading the Way

On April 15, 2016, **Dr. Brian Lewis** was honored as one of this year's recipients of the *T. Michael Bolger Standing Ovation Award*. The Standing Ovation Awards recognize individuals affiliated with the College who have enhanced the quality of campus life for the students of MCW and gone above and beyond their required duties to provide exemplary educational, social or organizational improvements in the student community. They are presented annually by the Student Assembly. There are three overall award winners this year, representing two faculty members and a student. These awards are highly regarded by MCW and the students. The Department of Surgery has been very well represented by the Standing Ovation Awards recently, with surgical faculty being honored in each of the last four years (Drs. Almassi, Gourlay, Redlich, Lewis), a surgical resident five years ago (Dr. Jill Whitehouse), and our former student coordinator, Amy Leisten (Homel), in 2014.

On April 28, the Third Annual Innovations in Medical Education Research Conference was held at MCW. Our Department was represented by two oral presentations among 16 oral and 14 poster presentations. In addition, Dr. Travis Webb served as one of the organizers and a session moderator. **Dr. Philip Redlich** presented work and was awarded First Place as the best oral presentation on the resident curriculum entitled, "The Protected Block Curriculum: A Successful and Sustainable Resident Education Model," authored by P. Redlich, J. Paul, T. Webb, M. Malinowski, R. Treat, J. Weigelt, L. Hein, J. auBuchon, and T. Krausert. The second presentation from the Department was given by **Dr. Andrew Kastenmeier** on the independent learning initiative in our M3 Clerkship entitled, "Self-Directed Learning in the Surgery Clerkship through Individual Learning Plans," authored by A. Kastenmeier, B. Lewis, C. Fihn, A. Homel, and P. Redlich.

William J. Hueston, MD, Senior Associate Dean for Academic Affairs (left), presents Philip Redlich, MD, PhD, with First Place award for best oral presentation at the Third Annual Innovations in Medical Education Research Conference at MCW.

Impact of Microbial Biofilms on Surgical

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In 2010, the Centers for Disease Control and Prevention (CDC) reported that 51.4 million inpatient surgical procedures were performed in the United States (CDC 2013). It has been estimated that approximately 400,000 surgical site infections (SSIs) occur in the United States each year with an associated mortality approaching 25% (100,000).[1,2] The global impact of SSIs is monumental and as many as 80% of these infections may involve a microbial biofilm.[3-5] While microbial biofilms have been recognized as being ubiquitous in nature for the past 40 years, it has only been within the past 20 years that clinical practitioners have realized that biofilm-mediated disease plays a significant role in both device-related and tissue-based infections.

Biofilm-Mediated Acute and Late Onset Infection in the Surgical Patient

Biofilm-associated implant infections are characterized by increased utilization of healthcare resources, including prolonged length of stay, increased cost of antibiotic therapy, additional surgical revisions and extended rehabilitation post-discharge. *Staphylococcus aureus* and *Staphylococcus epidermidis* are the two most common isolates recovered from documented infection. Early infections occur within two weeks of implantation and are associated with intraoperative contamination or wound infection in the immediate postoperative period. Infections which present years postoperatively have been thought to occur following an unrelated hematogenous event.[6]

Over 900,000 abdominal wall hernia repairs are performed yearly in the United States.[7] Contamination of the implanted mesh usually occurs at the time of implantation or exogenously in the early postoperative period. Biofilm-associated mesh infections adversely impact the wound healing process by interfering with the in-growth of host tissues through the mesh. *Staphylococcus aureus* colonization of the mesh surface induces fibroblast death (apoptosis), thereby inhibiting the proliferation of these cells during the maturational period of wound healing. Biofilm formation on the surface of a synthetic mesh can result in chronic infection, draining sinuses, mesh extrusion and enteric fistula formation. Most chronic biofilm infections are associated with *Staphylococcus aureus*, but mesh infections following abdominal surgery may also involve selective Gram-negative bacteria. A recent analysis has suggested that chronic relapsing-type infections that are observed with mesh are almost always associated with biofilm-forming microorganisms, and many of these isolates also express multi-drug resistance.[8] Resolution of these infections requires complete mesh removal, along with other foreign bodies such as residual suture material, followed by simultaneous reconstruction. These patients will often require a prolonged period of follow-up to monitor the possibility of occult infection following mesh replacement.

The pathobiology of a vascular graft infection is best understood when characterized as a biofilm-mediated infection. An excellent example of a biofilm-mediated vascular graft infection is the development of a groin sinus tract following insertion of an aortofemoral prosthetic bypass graft. These infections are characterized as late-onset, occurring weeks to months post-implantation, and the presentation may be occult with no systemic signs of infection. Traditional culture methodology often fails to recover an isolate. However, when the graft segment is sonicated, *Staphylococcus epidermidis* is often recovered in numbers which exceed 6-logs.[9]

The occurrence of a biofilm-mediated vascular graft infection requires a series of sequential events.[10,11] First, the device is contaminated at the time of insertion by a biofilm-forming organism, a process that is facilitated by surface conditioning by blood and tissue fluid protein. Once the organism is adherent to the surface of the graft, a microcolony aggregation begins to form, followed by the secretion of an extracellular matrix, which eventually leads to development of a mature biofilm. A low metabolic activity, due to limited substrate availability and production of a luxurious extracellular matrix, contributes to the physiological conditions that foster resistance to both host immune defenses and antimicrobial therapy (recalcitrance). Typically, the biofilm spreads slowly over the exterior surface of the graft, eventually involving the graft-to-artery anastomosis, reducing anastomotic tensile strength, leading to the development of a pseudoaneurysm and eventual graft failure. During this process, there is little or no spread to the perigraft tissues, nor does one observe the development of fulminant sepsis unlike early-onset vascular graft infections involving *Staphylococcus aureus* or Gram-negative pathogens (usually *E. coli*).

The incidence of SSIs following vascular surgery is reported to be in the range of 5% to 15%. The risk is higher in diabetic patients, patients colonized with MRSA and after procedures requiring a groin incision. Early-onset infections are characterized by wound dehiscence and purulent drainage, often within days of surgery (Figure 1). Late-onset infections are more indolent, so clinical recognition can be delayed for months or even years (Figure 2).

Site Infections

Figure 1: Acute-onset vascular graft infection, MRSA infection and wound dehiscence at 10-days post-implantation of fem-popliteal vascular graft.

Why are Biofilms Difficult to Eradicate Using Antimicrobials?

Previous studies have documented that the minimum inhibitory concentration (MIC) required to inhibit or kill most microorganisms within a mature biofilm is often 100 to 1,000 times the traditional MIC90 for selective device-related microbial pathogens.[6,12] The device-adherent (biofilm) organisms are metabolically locked in a stationary growth phase and therefore require a much (at time significantly) higher minimal bactericidal concentration (MBC) to resolve the *in situ* infection. This most often leads to therapeutic failure. The optimal strategy is prevention, which requires putting into place an appropriate interventional bundle that significantly reduces the risk of postoperative infection, therefore minimizing the opportunity for wound/device contamination.[13]

Biofilms, Infection and Wound Healing in Chronic Surgical Wounds

Biofilms are present in up to 70% of open wounds, wounds which are healing by secondary intention, and most likely increased in chronic wounds when there are multiple co-morbidities. It is commonly observed that the presence of bacteria (or the bioburden) in chronic, open wounds presents as a continuum from contamination through colonization to local and systemic infection. This may be worsened by underlying pathological processes such as venous or arterial insufficiency, diabetes, pressure damage or an occult malignant process.

The ideal way to manage a biofilm-mediated surgical wound would be to prevent it from occurring through the rational use of antibiotic prophylaxis, in addition to adequate skin antisepsis prior to surgery or the use of antimicrobial-coated sutures. Once there is bacterial attachment to the wound bed and biofilm formation, it is probable that only debridement can control it. Prevention of biofilm reformation in open wounds involves adequate wound irrigation or cleansing using antiseptics, the use of negative pressure wound therapy (NPWT), or the use of antimicrobial dressings. The role that biofilms play in delaying healing in sutured surgical or traumatic wounds is less clear, although it may account for early dehiscence of wounds after sutures or staples have been removed. Separation of the sutured skin is often accompanied with little evidence of acute inflammation or pus formation, and cultures obtained from the margins of the wound are often negative, failing to yield responsible organism. Several unanswered questions remain, particularly for acute surgical wounds: Does biofilm formation turn an acute wound into a chronic one (this may be relevant in early diabetic foot ulcers), does biofilm formation precede donor or recipient site infection, or contribute to burn colonization prior to infection, particularly with pseudomonas?

Treatment/Management and Recognition of Biofilm-Mediated Infections

At present, there are no evidence-based studies focusing on the therapeutic efficacy of selective strategies for managing biofilm-associated surgical site infections. However, in general, the current therapeutic options can be characterized succinctly as follows:

- **Tissue-Based Infection:** Surgical debridement to remove devitalized tissue, followed by copious irrigation preferable with a biocide agent, followed by parenteral antibiotics.[14,15]
- **Device-Related Infection:** Removal of an infected device, followed by insertion of antimicrobial adjunctive technology such as antimicrobial spacer, beads or suture technology plus parenteral antibiotics.[16,17]
- **Antimicrobial Agents:** Selection of therapeutic or agents that appear to penetrate microbial biofilms include linezolid, daptomycin, rifampin and possibly ceftaroline.[18-20]

continued on page 18

Microbial Biofilms

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What indications exist to suggest the presence of a biofilm-mediated infection? Several biofilm investigators have suggested a diagnostic guideline that may serve to suggest the presence of a biofilm-based infection within the host tissue:[3,21]

- Microbiological evidence of a localized or foreign body-associated infection post-surgery
- Microscopic (light or electron optic) evidence of microbial aggregation
- Medical history, documenting a biofilm predisposing condition such as implanted biomedical device, infective endocarditis, previous device-related infection
- Recurrent infection (site-specific) with organisms that are clonally identical
- Documented history of antimicrobial failure or therapeutic recalcitrance (persistent infection) despite selection of appropriate antimicrobial agent (both dose and duration)
- Presence of local or systemic signs and symptoms of infection that resolved primarily with appropriate antimicrobial therapy, only to recur following termination of therapy. •

FOR ADDITIONAL INFORMATION on this topic, please visit mcw.edu/surgery, or contact Dr. Edmiston, edmiston@mcw.edu.

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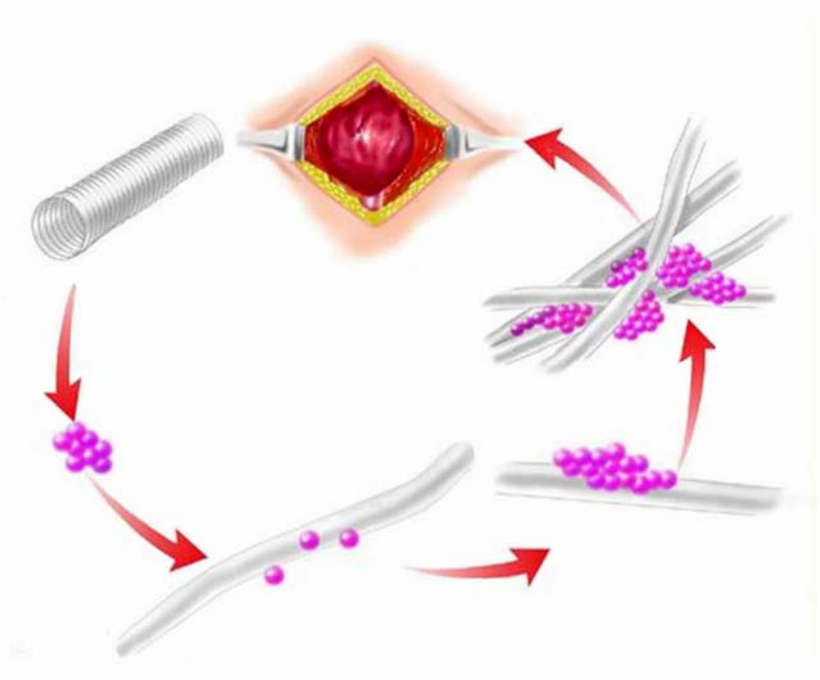

Figure 2: Mechanism of late-onset vascular graft infection following intraoperative contamination (<100 cells), organism down-regulates its metabolism resulting in slow growth. After several weeks or months, microbial burden reach critical density resulting in host recognition of device-based infection.

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Dr. Justin Dux receives 2016 MCWAH Housestaff Award for Excellence in Teaching

The 2016 recipient of the *MCWAH Housestaff Award* for Excellence in Teaching for the Required Rotations across all specialties in medicine is **Justin P. Dux, MD**. Justin is a General Surgery Resident in the Department of Surgery.

Other nominees from the Department of Surgery were:

Required Rotation: Drs. Kevin Hudak and Rachel Landisch, both General Surgery Residents.

Elective Rotation: Dr. Shahriar Alizadegan, Vascular Surgery Fellow, and Drs. Mohamed Algahim and Elizabeth Colwell, Thoracic Surgery Residents.

Please Join Us

RECEPTION AT American College of Surgeons Clinical Congress

OCTOBER 17, 2016 | 6–8 P.M. | WASHINGTON, D.C.

Plan to join us on Monday, October 17, 2016 at the MCW Department of Surgery / Marquette Medical Alumni Association reception during the American College of Surgeons 102nd Annual Clinical Congress.

The reception will be held from 6:00 to 8:00 p.m. at the University Club of Washington, D.C., 1135 Sixteenth Street NW, in the Governors Room.

Mark B. Adams, MD, Visiting Professorship in Transplant

by Meg M. Bilicki, Director of Development for the Department of Surgery

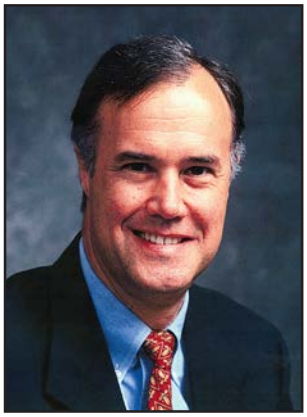
Mark your calendar for Wednesday, October 5, 2016 when **A. Joseph Tector, III, MD, PhD**, kicks off the Mark B. Adams, MD, Visiting Professorship lecture series. Dr. Tector, Professor of Surgery at the University of Alabama at Birmingham School of Medicine, directs the Division of Transplant Surgery's Xenotransplantation Program.

The Mark B. Adams, MD, Visiting Professorship in Transplant Fund, established by the family of Dr. Adams, supports the annual lecture series in tribute to his life and career. Each lecture will feature a visiting professor with extensive experience in organ transplantation. The lectures are meant to inspire generations of medical students and residents (just as Dr. Adams did).

Dr. Adams was appointed Chairman of the Department of Surgery in 2003 after leading the Division of Transplant Surgery for 17 years. He was Professor of Surgery, Chief of Transplant Surgery and former Director of the Froedtert and Medical College of Wisconsin's Transplant Program. The Transplant Program was established in 1967 with a focus on kidney, liver, and pancreas transplantation. Beginning in 2005, Dr. Adams served as Chair of the Medical College of Wisconsin Physicians Executive Committee.

During his tenure, Dr. Adams made enormous contributions to medical student and resident education programs. He directed the student education efforts in the Department of Surgery for many years and inspired the career choices of countless medical students and former surgical residents working across the country today.

Johnny C. Hong, MD, who holds the inaugural Mark B. Adams Chair in Surgery at MCW and is Chief of Transplant Surgery and Director of Solid Organ Transplantation, commented on the visiting professorship as a fitting acknowledgment of Dr. Adams' legacy.



Mark B. Adams, MD

"He was one of the pioneers of the transplant program at MCW and a leader in patient care and instruction," Dr. Hong said. "We are committed to inviting professors who carry these same characteristics to come and share their knowledge with our Medical College of Wisconsin trainees."

The Division of Transplant Surgery selects and invites the visiting professor and organizes/hosts the event. In addition to giving a formal lecture, the professor will hold a "rocking chair session," during which he or she talks informally with MCW students and residents about topics such as patient care, research, and a physician's life in academic medicine. Including this session in the visit would be especially important to Dr. Adams, who cared deeply about all aspects of a medical career, both in and out of the hospital.

The first Mark B. Adams, MD, Visiting Professorship in Transplant lecture will take place during the Fourth Annual Solid Organ Transplantation Research Symposium planned for October 5 – 6, 2016.

Additional contributions to the Mark B. Adams, MD, Visiting Professorship in Transplant Fund can further strengthen the program and are appreciated by the family and the Department of Surgery.

Please contact Meg Bilicki at mbilicki@mcw.edu or 414-805-5731 for more information.•

To refer a patient or request a transfer/consultation, please use the references below:

Froedtert & the Medical College of Wisconsin

All non-cancer requests
Referrals: 800-272-3666
Transfers/Consultations:
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mcw.edu/surgery

Clinical Cancer Center
Referrals: 866-680-0505
Transfers/Consultations:
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Children's Hospital of Wisconsin

Referrals/Transfers/
Consultations: 800-266-0366
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MCW DEPARTMENT OF SURGERY
Continuing Education Programs

The MCW Department of Surgery has a strong emphasis on providing accredited educational events/symposia for the medical community. These are offered to both internal and external physicians, APPs, nurses, fellows, residents, students and other medical professionals.

All upcoming Department of Surgery events are listed **on the back cover of each newsletter issue**. We are happy to offer the following credits for various events:

- *AMA PRA Category 1 Credit(s)™*
- ABMS MOC Part 2 Self-Assessment credit *(for Grand Rounds)*
- Hours of participation for continuing education for allied health professionals
- Contact hours for nursing continuing education *(for select events)*
- Physician Assistant - AAPA Category 1 CME credits *(for select events)*

Note that not all credits shown above are available for each event. Specific credit information will be advertised. For additional information, contact Heidi Brittnacher.

New Feature!

ABMS MOC PART 2 SELF-ASSESSMENT CREDIT

We are happy to announce that the MCW Department of Surgery will be offering ABMS MOC Part 2 Self-Assessment Credit for our Grand Rounds lectures. By watching the video on the Ethos website and scoring 75% or higher on the short post-test, you have the ability to gain credit even if you are not able to attend. Grand Rounds lectures will continue to be uploaded to the website and will be available for viewing for one year after the lecture occurred.

Registering and Claiming Credit for CME Events

How to Register:

1. To register for a Department of Surgery event, visit the Ethos website at http://ocpe.mcw.edu/surgery
2. If you do not already have an account, select "Create Account" in the upper right corner and follow the prompts
3. Once completed, select the event you wish to attend (Grand Rounds, Vascular Access Symposium, etc.)

How to Claim Credit:

1. Log In at http://ocpe.mcw.edu/surgery
2. Click "My Courses" in the upper right corner
3. Under "My Activities" – "Courses (in progress)" or "Transcript", click the title of the CME Activity to evaluate
4. Click the Evaluation icon to complete the survey and claim credit

Note that the website above does NOT work to its full capacity in Internet Explorer. Google Chrome and Mozilla Firefox are the preferred browsers.

Questions? Please contact Heidi Brittnacher, *Symposium and Event Coordinator*, at hbrittna@mcw.edu or 414-805-9427 for more information on any Department of Surgery event, claiming credit, or general Ethos questions.

MEDICAL COLLEGE OF WISCONSIN

CONTINUING EDUCATION PROGRAM

In Memoriam

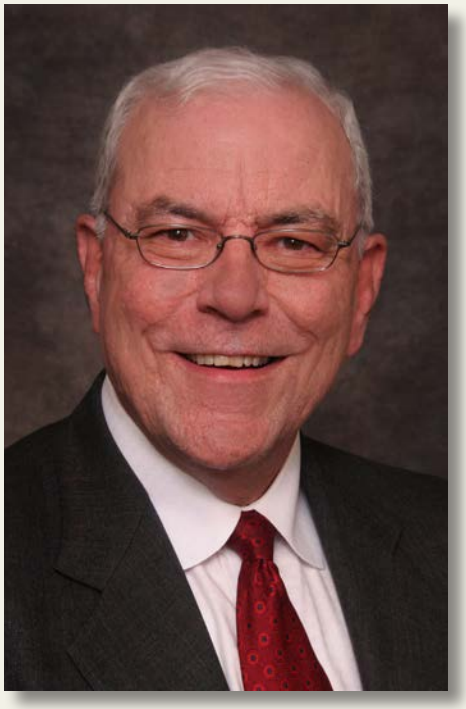
James R. Wallace, MD, PhD, Professor of Surgery

by Matthew Goldblatt, MD, and Jon Gould, MD, Division of General Surgery

Dr. James Wallace died unexpectedly in Chicago on January 24, 2016, upon returning from a medical mission trip to Peru. He was a faculty member of the Division of General Surgery in the Department of Surgery at MCW.

Dr. Wallace received his Bachelor of Science degree in Zoology from the University of Michigan and his MD from Wayne State University in 1980. He completed his general surgery residency at Wayne State in 1985 and subsequently served as an NIH Postdoctoral Fellow while completing his PhD in physiology and cell biology in 1990 at Albany Medical College. He held a faculty appointment at Albany Medical College through 1992 as an Assistant Professor of Physiology and Cell Biology.

He joined MCW in 1992 in the Departments of Physiology and Surgery. Jim epitomized the notion that you have to reinvent yourself every now and again in order to thrive in your career. He started his career as a Trauma and Critical Care Surgeon. During that time, he was also an early adopter of laparoscopic surgery. In the early 2000s, bariatric surgery became more mainstream, mostly because of the improved safety of the latest laparoscopic techniques. Therefore, Jim took on the challenge to start the Froedtert & MCW Bariatric Surgery Program in 2001 and then served as the Bariatric and Minimally Invasive Surgery Fellowship Program Director starting in 2003. Most recently, he accepted a new challenge to spend part of his time at the Zablocki VA Medical Center.



During Dr. Wallace's tenure at MCW, he held a number of administrative leadership positions. Beginning in 2009, he was a member of the Global Health Pathway Council and had personally participated in a number of international medical trips to Central and South America. Dr. Wallace was a member of a number of professional societies and organizations including the American College of Surgeons, American Society of Metabolic and Bariatric Surgery, Society of Laparoscopic Surgeons, Central Surgical Association, Society for Surgery of the Alimentary Tract, Society of Gastrointestinal and Endoscopic Surgeons, Wisconsin Surgical Society and the Milwaukee Surgical Society. He served as the State Chairman for the ACS Wisconsin Committee on Trauma from 1997 to 2002.

Dr. Wallace was a physician/surgeon who was devoted to helping others both in Milwaukee, Wisconsin and through his commitment to global surgery. His dedication to patient care was evident to all through his daily practice of medicine and surgery. As an educator, he was a voice for encouragement and excellence as his medical students, residents and fellows strived to achieve their full potential. In 2013, he was recognized by the graduating Chief Residents who awarded him the Department of Surgery Faculty Teaching Award; one of the highest honors given at the annual awards banquet. Jim Wallace represented everything that is inspirational and exciting about the practice of surgery. Everyone who had the privilege to know him or work with him will miss him. •

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June 21-22: Ron Hirschl, MD – 15th Annual Glicklich Visiting Professor

August 2-3: Steven Kappes, MD – 1st Annual Mendeloff Visiting Professor

August 5: Updates on Metastatic GI Cancer – Harley-Davidson Museum

August 26: Hernia, Foregut and Colorectal Review – Medical College of Wisconsin

September 16: Fall Research Symposium – Medical College of Wisconsin

September 27-28: Steven Libutti, MD – 30th Annual C. Morrison Schroeder Visiting Professor

October 5-6: A. Joseph Tector, III, MD, PhD – 1st Annual Mark B. Adams Visiting Professor
Solid Organ Transplantation Symposium – Medical College of Wisconsin

October 20: Vascular Access Symposium – Medical College of Wisconsin

October 28: Surgical Site Infection Summit – Kalahari, Wisconsin Dells

November 11: North American Neuroendocrine Tumor Society (NANETS) Symposium – Milwaukee Marriott Downtown

NEW FEATURE: *We now offer ABMS MOC Part 2 Self-Assessment credit for our Grand Rounds Lectures. Scan the QR code to proceed.*

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