TO: Professor Whitney Olsen
FROM: Kallie Reed
February 26, 2021
Final Project Freelance Comprehensive Editing
RE: Memorandum for Final Project

Document

The document I edited for my final project is the 2020 Annual Report for the Department of Surgery at Washington University in St. Louis. The point of contact for this document, a friend of mine, is an editor and technical writer for the Department of Surgery. The Department of Surgery report does not follow a standard annual report format. There are no financial numbers or discussions of goals and figures. Instead, the report features two stories and three highlights from each section within the Department of Surgery.

Within the Department of Surgery, there are two divisions: the Division of Cardiothoracic Surgery and the Division of General Surgery. Additionally, there are different sections within each division. The Division of Cardiothoracic Surgery includes the Cardiac, Pediatric Cardiothoracic, and Thoracic departments of surgery. The Division of General Surgery includes the Acute and Critical Care (ACCS), Colon and Rectal, Hepatobiliary-Pancreatic Gastrointestinal (HPB), Minimally Invasive Surgery (MIS), and Surgical Oncology departments of surgery. For each surgical section featured in the report, there are two stories showcasing accomplishments and personnel of the section and three highlights that focus on different areas of study: clinical, education, and research.

Editing and Design Goals

The report is quite text heavy, and I was not given any visual aids. The main goal of my editing was to make this document appealing, functional, and user-friendly. I organized the text by division, and then further organized by section. I chose a color palate that is pleasing and eye-catching, and I attempted to make the section stories the main focus central to the page. I used separate page parts and shapes for the section highlights, while these are still important pieces of the document, they are shorter and slightly less focused than the longer stories.

Errors and Problems Encountered

Overall, the report text was not in bad shape. The author has a clear, concise, journalistic-type writing style. The stories are engaging and interesting, and the highlights provide readers information on research and educational opportunities. The areas where this document was lacking were organization and inconsistencies with things like capitalization and punctuation. To combat the organizational issues, I simply grouped the text together by division and then section.

Document Point of Contact Information

Author: William Morris

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Following is a copy marked copy of the original text.

Thank you for your time and attention.

Sincerely,

Kallie Reed

ATTN: Copymarked Original Copy

Clinical Highlight (General Surgery, ACCS)

Since its establishment as a Level II trauma center, Memorial Hospital of Carbondale, Illinois, has brought improved trauma care to Southern Illinois. As part of the BJC Collaborative, Memorial Hospital's trauma center received its Level II designation in 2019. "Before that, if you were in a car crash or had a gunshot wound in Southern Illinois, your options were limited," says Acute and Critical Care Surgery (ACCS) Section Chief and acting Trauma Medical Director for Memorial Hospital Grant Bochicchio, MD, MPH. Bochicchio notes that there have been many great saves in the past year and a half. "This is a story of us collaborating, extending our reach outside the walls of WashU to save peoples' lives in Southern Illinois."

All Hands On Deck (General Surgery, ACCS)

Foot and lower extremity care are an important and often overlooked component of diabetes and peripheral vascular disease treatment. People with these conditions are at high risk of vascular problems in the lower extremities, making it more difficult to treat and heal wounds. Wounds and other lower extremity complications can lead to amputation for many people with diabetes or peripheral vascular disease. The Department of Surgery is developing a team-based care program for the treatment of these patients. Acute and critical care surgeons (ACCS) are working in collaboration with vascular and plastic and reconstructive surgeons to coordinate a truly multidisciplinary limb preservation program.

The program began when three chiefs of surgery came together to address a common problem. Section Chief Grant Bochicchio, MD, MPH, met with Chief of Vascular Surgery Luis Sanchez, MD, and Justin Sacks, MD, MBA, Plastic and Reconstructive Surgery division chief, to discuss the need for a coordinated effort. Many of these patients begin with ACCS after traumatic injury or for wound care. They often require vascular procedures to restore blood flow and reconstructive surgery to address wounds that will not heal. The need for a multidisciplinary team was clear.

"To my knowledge, this is the first time that three chiefs have come together with this kind of unity and common vision for the treatment of a diagnosis," says Bochicchio. "We are truly committed to being partners in this treatment, and I think that's extremely important for our patients."

ACCS podiatrists Jerry Liddell, DPM, and Michael Weiss, DPM, bring expertise in foot care to the program, while surgeon John Kirby, MD, leads hyperbaric oxygen therapy and wound care for limb preservation patients.

To ensure success of the program, the three division chiefs are formalizing an algorithm of care with clinical operations staff. Introducing this new algorithm and raising awareness of the program among emergency room faculty and trainees will allow the limb preservation team to provide this patient population the care they need in a timely and effective manner.

"When a patient hits the emergency room, there is going to be a clear guideline for how we get them the care they need," Bochicchio says. "We want everyone, from residents to faculty, to understand that limb preservation is all hands on deck."

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NOTE: The stories and highlights in this document are not yet in order in their final organization; as such, some acronyms may be defined more than once in this initial, original version.

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Education Highlight (General Surgery, ACCS)

The Surgical Critical Care Fellowship offers multidisciplinary clinical training at the Barnes-Jewish Hospital Level I trauma center in partnership with colleagues from anesthesiology. The Fellowship offers training opportunities in the Surgery/Burn/Trauma Intensive Care Unit (ICU), Cardiothoracic ICU, Neurology and Neurosurgery ICU, Medical ICU, Coronary Care Unit, and Pediatric ICU. Fellows also have the opportunity to train at Christian Hospital, extending the section's mission of providing outstanding quality care to disadvantaged and underserved patient populations in North County. "Our focus is on training outstanding physicians with a high level of expertise in caring for the most critically ill patients," says Fellowship Director Sara Buckman, MD, PharmD.

Research Highlight (General Surgery, ACCS)

High blood sugar in critically ill patients, resulting from metabolic and hormonal responses to injury and stress, is associated with poor clinical outcomes, including infections and other complications, increased length of hospital stay, and death. In 2017, ACCS Section Chief Grant Bochicchio, MD, MPH, reported the findings of a clinical trial using a bedside near-continuous glucose monitor in the Surgical Intensive Care Unit (SICU). The first person in this multicenter trial to be attached to the monitor was a patient at Washington University. The device has since received FDA clearance, allowing SICU physicians to monitor blood sugar without waiting for lab results.

Advancing Critical Care (General Surgery, ACCS)

Acute and critical care research at Washington University School of Medicine in St. Louis, funded by the Department of Defense (DOD), has the potential to revolutionize care for the most critically ill patients.

One in five preventable deaths from trauma occurs because the patient is having difficulty breathing. Typically, emergency medical services (EMS) professionals use one of two methods to help people breathe: an endotracheal tube or a device called a supraglottic airway, which sits over the windpipe. The Prehospital Airway Control Trial (PACT) aims to compare different methods to help people breathe. Washington University is among a group of centers across the nation participating in PACT as part of the DOD's Linking Investigations in Trauma and Emergency Services (LITES) network.

Patients who are critically ill or have significant injuries can develop acute respiratory distress syndrome (ARDS)—a fatal condition causing severe shortness of breath. ARDS patients are sometimes unable to breathe without ventilator support. ACCS surgeons are participating in a national, multicenter DOD clinical trial introducing sigh breaths to usual ventilation of trauma victims at risk of developing ARDS. Sigh breaths are longer and deeper than regular breaths, and they may help patients breathe more normally on their own. The study will evaluate whether adding sigh breaths to ventilation leads to more ventilator-free days, ICU-free days, fewer complications, and lower mortality.

ACCS faculty are also studying new options to address excessive bleeding in trauma. Bleeding is the most avoidable cause of death in trauma patients, though current treatments for blood loss are sometimes ineffective. The Tranexamic Acid Mechanisms and Pharmacokinetics in Traumatic Injury (TAMPITI) trial at the School of Medicine studied the effects of tranexamic acid (TXA)

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on the immune system and the body's ability to absorb and break down the medicine, as well as TXA's safety and effectiveness in severely injured trauma patients. Researchers are in the process of evaluating study results from the TAMPITI trial, which has the potential to change care for trauma patients suffering blood loss.

By working closely with representatives from government agencies, industries, and foundations on research projects, ACCS faculty are committed to improving patient care and making advancements in critical care medicine as a whole.

One Step at a Time (Cardiothoracic Surgery, Cardiac)

Diseases of the aorta are insidious, life-threatening problems that require complex, high-level care. The aorta is the main vessel that sends blood from the heart to the body. Aortic dissection occurs when the wall of the aorta tears, blocking or diverting circulation and reducing the amount of oxygen and nutrients that reach vital organs. An aortic aneurysm is a balloon-like enlargement in the aorta, difficult to detect but deadly when ruptured.

Cardiac Surgery Section Chief Marc Moon, MD, and cardiac surgeon Puja Kachroo, MD, treat patients with even the most complex aortic pathology. These complex conditions are often related to hypertension, inflammatory conditions, familial history, or genetic connective tissue disorders including Marfan syndrome and Loeys-Dietz syndrome.

"Aortic dissection is often fatal when missed," Moon says. "But with proper education, physicians know what signs to look for. The patient might feel like they are having a heart attack or stroke. Chest pain is the number one symptom for aortic dissection."

The Department of Surgery has a longstanding history of excellence in the care of patients with aortic disease. Moon, the director of the Center for Diseases of the Thoracic Aorta (CDTA), has performed complex aortic surgery for over 20 years. Kachroo, who joined the faculty after completing a fellowship in the Cardiothoracic Surgery Section in 2016, has expanded the number of cases treated at the CDTA and introduced minimally invasive cardiac procedures for valve replacement and coronary bypass. Moon and Kachroo work closely with vascular surgery colleagues and a multidisciplinary team to coordinate the evaluation and management of patients.

"It takes a lot of experience to deal with high-risk aortic patients," Kachroo says. "I have been fortunate to have Dr. Moon as a mentor and teacher. His experience has been very helpful in expanding my abilities, one step at a time. He was one of the earliest adopters of valve sparing aortic root replacement, a very complex and difficult-to-learn operation. Luckily, I learned from him as a fellow and can continue to build on this practice. With the two of us doing these complex aortic surgeries, we can truly treat the gamut of aortic disease."

Clinical Highlight (Cardiothoracic Surgery, Cardiac)

Cardiac Surgery Chief Marc Moon, MD, became president of the American Association of Thoracic Surgeons (AATS) in 2020. Founded in 1917, the AATS is an international organization dedicated to advancing cardiothoracic surgery. At the 100th Annual Meeting of the AATS, held virtually in April, Moon became the seventh Washington University surgeon to lead the AATS. In his President's Message, Moon calls on cardiothoracic surgeons to address gender and racial inequality in medicine: "Let's pledge to lead the way in cardiothoracic surgery as Hippocrates

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outlined 2,400 years ago with beneficence, integrity, respect for patients, mentors, and mentees, and personal and professional virtue in our quest for social justice."

Ahead of the Curve (Cardiothoracic Surgery, Cardiac)

In this unprecedented year, surgeons played a critical role in treating patients with COVID-19. Cardiothoracic surgeons typically treat conditions of the heart and lungs, but the pandemic presented a unique problem: a deadly virus that could affect both organs and required extreme caution to protect healthcare workers from infection. Cardiac surgeons Akinobu Itoh, MD, PhD, Kunal Kotkar, MD, and Muhammad Faraz Masood, MD, met this problem head-on, with a commitment to do whatever it takes for their patients.

"The differences between COVID and flu or pneumonia patients start with the preparation," Masood says. The necessary personal protective equipment and limitations on personnel in a COVID-19 intensive care unit (ICU) changed how this type of care looked from the very beginning. Normally, a team including surgeons, intensivists, infectious disease doctors, and nursing staff would all be in the room with an extracorporeal membrane oxygenation (ECMO) patient. The interactions with COVID-19 patients on ECMO, Masood says, are more critical and intense. This team still provides the same critical care, but surgeons shoulder a significant burden to limit the rest of the team's exposure.

ECMO provides COVID-19 patients the chance to rest their heart and lungs when the organs are failing. ECMO acts as a heart and lung for the patient, taking blood from the body, oxygenating it, and pumping it back into the body at about six to eight liters per minute. ECMO was originally invented to care for pediatric patients with lung failure, but was rapidly adopted for both congenital and adult patients whose organ failure did not improve with traditional methods.

ECMO is an intensive form of therapy that requires a multidisciplinary team and high-level nursing care. Few institutions nationwide have the resources and ability to provide this care. ECMO is considered an evolving field in cardiothoracic surgery, and has seen significant growth at Washington University School of Medicine in St. Louis over the past three years. This year, over 200 people, including COVID-19 and non-COVID-19 patients, were placed on ECMO at the School of Medicine.

"Unlike flu or pneumonia, COVID affects the entire body," Masood says. "It can have its own effects on the lungs, heart, and immune system."

COVID-19 affects different patients in different ways. In every case, the emotional toll is significant. A typical flu patient might need ECMO for about two weeks. ECMO times for COVID-19 patients can be much longer. During that time, the team is there for them through the long hours, sometimes late into the night. When the surgeons finally leave the hospital, they have to isolate from their families, living in basements or RVs to protect their loved ones. The willingness of Itoh, Kotkar, and Masood to show up every day, despite the uncertainties and challenges, has been vital to delivering the highest quality care to the sickest of COVID-19 patients.

"The ability of our clinical faculty to pull together, problem solve, and rise to the occasion has resulted in superb patient care," says Timothy Eberlein, MD, the William K. Bixby Professor and chair of the Department of Surgery. "We have been ahead of the curve in caring for the sickest COVID patients in our ICU thanks to the innovation and commitment of our faculty."

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Education Highlight (Cardiothoracic Surgery, Cardiac)

Richard Schuessler, PhD, director of the Cardiac Surgical Research Laboratory, retires after an accomplished 35-year career at Washington University. Schuessler's research focused on surgical treatment of cardiac arrhythmias, and his contributions were instrumental in the development of the Cox-Maze procedure—the first cure for atrial fibrillation. As laboratory director, Schuessler also served as a teacher and mentor for the many students, residents, and research fellows who have worked in the Cardiothoracic Surgery Research Laboratory over the years. "It's been a wonderful career," Schuessler says. "I hope my legacy is all of the people we have trained over the years. I'll miss the people most of all."

Research Highlight (Cardiothoracic Surgery, Cardiac)

The International Registry of Acute Aortic Dissections (IRAD) is a consortium of research centers, including Washington University School of Medicine in St. Louis, evaluating the current management and outcomes of acute aortic dissection. Cardiac surgeons and cardiovascular physicians are reviewing the database of aortic dissection cases at the School of Medicine, studying dates and times of symptom onset, presentation, diagnosis, hemodynamic signs of aortic dissection, initial and chronic medical therapy, diagnostic imaging chosen, and surgical and medical management. This comprehensive study of IRAD data aims to identify new breakthroughs in diagnosis and treatment of this potentially life-threatening condition.

Clinical Highlight (General Surgery, Colon and Rectal)

Colon and rectal surgeons from the School of Medicine are addressing disparities in health care by expanding access to screening and treatment throughout the St. Louis area. The section has secured grants to provide funding for patients who cannot pay for routine colorectal cancer screenings. Surgeons from the section see patients at a growing number of clinical locations. Kerri Ohman, MD, joins the section, extending care to Christian Hospital and Siteman Cancer Center North County. Ohman completed a Colorectal Surgery fellowship and General Surgery residency at Washington University School of Medicine. Her specialty areas include colon and rectal cancer, anal cancer, inflammatory bowel disease, ulcerative colitis, and Crohn's Disease.

Clinical Story (General Surgery, Colorectal)

New Standard of Care for Rectal Cancer

Colon and Rectal Surgery Section Chief Matthew Mutch, MD, and surgeon Steven Hunt, MD, have introduced a new standard of care for the treatment of locally advanced rectal cancer (LARC). This new regimen utilizes total neoadjuvant therapy to reduce the length of care, improve disease-free survival, and increase the chance of complete pathologic response in rectal cancer patients.

This new treatment administers five days of short-course radiotherapy, delivering the same biologic dose of radiation as the current standard of treatment in the United States in a shorter time. Systemic chemotherapy is then administered preoperatively. For patients with complete pathologic response to these therapies, nonoperative management can replace surgery if there is no residual tumor. Close surveillance ensures that, if the tumor grows back, it will be identified and treated with surgery.

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The regimen is the result of an international multicenter clinical trial to study the impact of neoadjuvant therapies on disease-free survival of patients with LARC. Researchers at Washington University School of Medicine in St. Louis and Siteman Cancer Center were the only participants from North America involved in this phase 3 clinical trial.

The Rectal Cancer And Pre-operative Induction Therapy Followed by Dedicated Operation Trial (RAPIDO) compared conventional treatment of rectal cancer with an experimental treatment involving more preoperative therapy and shorter overall treatment time. The results of the RAPIDO Trial were published in the Journal of *Clinical Oncology* in May 2020.

The RAPIDO Trial is the first trial to demonstrate an improvement in a lower rate of distant metastases in high-risk LARC patients, meaning the new treatment regimen reduced the rate of disease-related treatment failure and increased the rate of survival. Colorectal surgeons at Washington University have found that systemic chemotherapy is better tolerated before surgery than after, patients receive more systemic chemotherapy when given before than after surgery, and more total patients receive systemic chemotherapy—and their rectal cancers are more likely to shrink—with total neoadjuvant therapy.

Surgeons in the section continue to participate in further clinical trials researching the impact of total neoadjuvant therapy on rectal cancer treatment.

At the School of Medicine, surgeons, radiologists, and oncologists take a truly multidisciplinary approach to managing rectal cancer, ensuring the most effective diagnosis, staging, and treatment.

"Patients with rectal cancer will receive multidisciplinary care every step of the way, including diagnosis, staging, and treatment," Mutch says. "We work closely with our colleagues in radiation oncology and medical oncology to ensure that patients see all of the physicians they need in a timely fashion and receive the best possible care."

Education Highlight (General Surgery, Colorectal)

Residents are making critical contributions to research in colon and rectal surgery under the mentorship of Matthew Silviera, MD, MS. Lab resident Ebun Otegbeye, MD, is researching ways to identify patients at increased risk of postoperative complications. Using the National Institutes of Health (NIH)-validated Patient-Reported Outcomes Measurement Information System (PROMIS) tool, Otegbeye studied patient-reported outcomes related to overall function, physical ability, and gastrointestinal symptoms. These PROMIS scores provide an opportunity for physicians to intervene in the preoperative period to reduce a patient's risk of complications by engaging the patient in physical therapy, addressing medical issues, or providing other forms of rehabilitation prior to surgery.

Research Highlight (General Surgery, Colorectal)

Colorectal cancer is the third most common cancer and cause of cancer death globally, according to the American Cancer Society. Surgical resident William Chapman, Jr., MD, MPHS, is collaborating with a team of biomedical engineers, pathologists, radiation oncologists, and radiologists at the School of Medicine to improve diagnostic and surveillance imaging for colorectal cancer patients. The results of a pilot study using a real-time co-registered photoacoustic and ultrasound tomography system to image ex vivo samples indicate the potential of using this system for future cancer screening and post-treatment surveillance of the colon and

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rectum. Chapman continues this research in the section with in vivo imaging, and continues to obtain funding for the project.

Research Story (General Surgery, Colorectal)

Decreasing Opioid Prescriptions

Surgeons and researchers at Washington University School of Medicine in St. Louis are working to reduce opioid use and prescriptions following surgical procedures. Practices of opioid prescribing vary widely across general surgery providers in the United States. The Section of Colon and Rectal Surgery is participating in a number of studies to assess opioid use and prescription practices after surgery.

A recent study led by general surgery resident Bradley Kushner, MD, in partnership with surgical oncologists, minimally invasive surgeons and colon and rectal surgeons, used a text-based platform called Epharmix to assess patients' post-discharge opioid utilization. The study, published in *Surgery*, sent text messages to enrolled patients after discharge inquiring about the number of opioid pills taken since discharge as well as pain medication refills. The study, which was funded by the Barnes-Jewish Hospital Foundation, found that all patients consumed 25 percent or less of their total prescribed pills.

In response to these findings, colon and rectal surgeons have decreased the number of pills they prescribe after abdominal and anorectal surgery. Reducing the prescription has not been found to have an impact on patient utilization, and surgeons did not see any significant increase in requests for refills.

Surgeons have also developed an updated patient journey guide and preoperative opioid practice education. The patient journey guide is meant to educate patients, families, staff nurses, and home care nurses on proper care of a colorectal surgery patient, while the opioid practice education informs patients about safe use of prescription medication following surgery.

"We then asked how we can decrease narcotic use in the postoperative period, while the patient is still in the hospital?" Colon and Rectal Surgery Section Chief Matthew Mutch, MD, says.

Surgeons in the section collaborated with colleagues in anesthesia to utilize the pain service for ileostomy closures and laparoscopic right colectomies. By providing preoperative adjunct pain control—such as a TAP block—and not administering patient-controlled analgesia in the postoperative period, the team has minimized narcotic use for these patients while still providing pain control. The section has since expanded this practice to all laparoscopic cases.

The Section of Colon and Rectal Surgery has long been committed to patient safety initiatives, with the goal of providing up-to-the-minute care in all aspects of colon and rectal surgery.

Clinical Highlight (General Surgery, HPB)

For patients with chronic pancreatitis, pain is almost constant and treatment options are limited. HPB surgeon Chet Hammill, MD, has introduced a procedure new to the School of Medicine to treat pancreatitis patients early in the disease progression. Total pancreatectomy and islet auto-transplant (TP-IAT) removes the pancreas while also harvesting islet cells and returning them to the patient. By giving the patient their own islet cells, TP-IAT reduces the risk of developing severe diabetes after pancreatectomy. This procedure is most suited to younger patients with a

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genetic predisposition who are most likely to have more functional islet cells at the time of pancreatectomy.

Clinical Story (General Surgery, HPB)

A Sentinel Career in HPB Surgery

Steven Strasberg, MD, retires from Washington University School of Medicine in St. Louis after a 50-year career in hepatobiliary-pancreatic and gastrointestinal (HPB-GI) surgery.

Strasberg joined the Department of Surgery faculty in 1992 and founded the Section of HPB-GI Surgery, of which he was the Chief until 2007. He is the Pruett Family Professor of Surgery and Carl Moyer Departmental Teaching Coordinator.

Strasberg's many prestigious honors include the American Surgical Association Medallion for the Advancement of Surgical Care and the Distinguished Service Award of the Americas Hepato-Pancreato-Biliary Association (AHPBA). He is a past president of the AHPBA and has published over 250 peer-reviewed papers and 50 book chapters.

In 2019, Barnes-Jewish Hospital recognized Strasberg's career with the Lifetime Achievement "Master Physician" Award. The annual award honors physicians for superlative service and commitment for 25 years or more at Barnes-Jewish Hospital and its predecessor institutions.

"Steve Strasberg has made sentinel contributions to the field of HPB surgery," says Section Chief William Hawkins, MD. "He was a leader in the development of the Brisbane Classification of Liver Anatomy. He was among the first to develop methods for how to grade surgical complications and classify bile duct injuries during cholecystectomy. Steve Strasberg's career has truly shaped our field."

He is perhaps best known for developing the Critical View of Safety method of identifying anatomic structures during cholecystectomy. This method has been internationally adopted by surgeons and endorsed by numerous surgical societies. Recently, as part of the Safe Cholecystectomy initiative by the Society of American Gastrointestinal and Endoscopic Surgeons, the method was highlighted as a key component of the national initiative to reduce injuries to the bile duct.

Strasberg has also served on the editorial boards of numerous journals, including the *Journal of the American College of Surgeons*, *Journal of Gastrointestinal Surgery*, and *Annals of Surgery*.

Throughout his career, Strasberg served as a mentor and colleague to many of today's leading experts in HPB-GI surgery, including David Linehan, MD; Nathaniel Soper, MD; Jeffrey Drebin, MD; and Pierre Clavien, MD, PhD.

As a resident at University of Toronto in the 1960s, Strasberg became very interested in studying the liver. He was seeing things in patients that had not yet been studied in depth, which piqued his curiosity.

"There was no specialty in surgery of the liver, pancreas, and biliatry," Strasberg recalls. Rather than seeing this as a problem, Strasberg saw an opportunity. He spent two years researching in Boston, then returned to Toronto where he took as many cases as he could in the field of HPB-GI and established a lab of his own. With this wealth of knowledge and experience, Strasberg then came to Washington University, where he has practiced and researched in the Department of Surgery ever since.

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Education Highlight (General Surgery, HPB)

The Washington University Hepatobiliary-Pancreatic Surgery Fellowship is a two-year program that includes both clinical surgical training and a clinical research component. The program expanded to two years in 2020 to accommodate additional training in robotic and laparoscopic HPB surgery. The fellow works with Program Director William Hawkins, MD; Associate Program Director Chet Hammill, MD, MCR; HPB surgeons Ryan Fields, MD; Dominic Sanford, MD; and Steven Strasberg, MD; and is involved in treating a broad array and high volume of surgical patients with complex HPB conditions. The HPB fellow also rotates for up to three months on the Liver Transplant Service.

Research Highlight (General Surgery, HPB)

HPB Section Chief William Hawkins, MD; David DeNardo, PhD; and Ryan Fields, MD, are examining how neoantigen expression shapes tumor immunity and progression in pancreatic and lung cancer. Their research, published in *Cancer Cell*, is a collaboration with researchers from across the medical school. Chief Resident Roheena Panni, MD, MPHS, has identified a molecule that, when activated in pancreatic ductal adenocarcinoma, may help address limitations of clinical strategies to overcome resistance to immunotherapy. Additionally, the section is a leading contributor to the CHOLECOVID Collaborative, an international multi-center appraisal of the management of acute cholecystitis during the COVID-19 pandemic.

Research Story (General Surgery, HPB)

SPORE Supports the Future of Pancreatic Cancer Research

Through the National Cancer Institute-funded Specialized Programs of Research Excellence (SPORE) in Pancreatic Cancer, Siteman Cancer Center and Washington University School of Medicine have developed the Career Enhancement Program (CEP).

The primary objective of the CEP is to enhance pancreatic cancer research by providing financial support and mentoring for investigators who are new to the field to help build translational research careers in pancreatic cancer. Research initiatives funded by the CEP have a major translational component, focusing on etiology, prevention, diagnosis, early detection, treatment, or population science in pancreatic cancer.

One of the main objectives of the program is to promote participation of women and under-represented minorities in pancreatic cancer research. The CEP specifically seeks to increase the diversity of those participating in pancreatic cancer research through outreach, recruitment, training, and retention activities.

The CEP selects awardees from collaborating SPORE institutions and other qualified institutions. Financial support—including salary, research supplies, and tuition—is provided for awardees for up to two years. The CEP facilitates interactions between awardees and all members of the SPORE, emphasizing the basic and clinical science cross-fertilization that is essential to translational research.

Siteman, Washington University, and collaborating SPORE institutions provide outstanding opportunities for career development in translational pancreatic cancer research. The program has established intra-SPORE collaborations with the University of North Carolina, University of Rochester, and Johns Hopkins University, broadening the CEP applicant pool and helping to match the interests of junior investigators with local expertise and need.

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The CEP has funded projects leading to clinical trials in pancreatic cancer, and CEP-funded investigators have published in top-tier journals, including *Cancer Discover*, *Clinical Cancer Research*, and *Cancer Immunology Research*.

Clinical Highlight (General Surgery, MIS)

Minimally invasive surgeon Shaina Eckhouse, MD, is now Surgery Liaison for the Perioperative Services Leadership Team. Eckhouse leads a gender task force, working with members of each division and section to enhance and improve operating room (OR) culture and develop a peer advocate system for healthcare workers. This system will create more supportive channels for members of the OR team to communicate their concerns to a peer advocate in a supportive and non-confrontational environment. "Ultimately, the process has the potential to help everyone in the operating room come together," Eckhouse says. "We are all here to take care of the patient in the best way possible."

All About the Patient (General Surgery, MIS)

Minimally invasive surgery (MIS) provides opportunities for improved patient care with fewer and smaller incisions, reduced healthcare costs, and shorter recovery times than open procedures. In the past year, MIS surgeons at the School of Medicine have advanced patient care in robotic, laparoscopic, and endoscopic procedures.

Jeffrey Blatnik, MD; Sara Holden, MD; and Arnab Majumder, MD, are leaders in treating abdominal wall hernias with robotic surgery. Blatnik, whose contributions were instrumental in developing the metrics of the Abdominal Core Health Quality Collaborative, is focused on providing the best care and education for patients in this nascent, growing field. In a study published in *Surgical Endoscopy*, Blatnik found that nearly all patients learned about procedures and devices, such as surgical mesh, through Internet and media sources. This media exposure impacted patients' decision-making, emphasizing the importance of providing unbiased information for patients to help them make informed decisions and feel comfortable with their choices at the time of surgery.

Bariatric surgeons J. Chris Eagon, MD; Shaina Eckhouse, MD; and Francesca Dimou, MD, MS, offer laparoscopic procedures at the Weight Loss Surgery Program. Dimou has expanded the program's offerings to include robotic gastric bypass and sleeve gastrectomy. Benefits of robotic weight loss surgery include enhanced visualization, access to targeted anatomy, and improved ergonomics for surgeons when working with patients with high body mass index. Bariatric surgeons have further improved patient care through participation in the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program's Bariatric Surgery Targeting Opioid Prescriptions (BSTOP) initiative. BSTOP enhances patient recovery and pain management while reducing reliance on opioids.

Since 2012, Michael Awad, MD, PhD, has offered therapeutic endoscopic procedures for conditions that affect a patient's ability to eat and drink, such as achalasia. Procedures including peroral endoscopic myotomy (POEM), flexible endoscopic Zenker's diverticulectomy, and the G-POEM procedure for gastroparesis restore normalcy to these patients' lives. Awad and Blatnik have performed over 250 POEM procedures to date, providing relief to patients across the region. In an upcoming publication, Awad reports on longstanding patient outcomes with achalasia to ensure that all patients receive the best treatment.

"That's what this is really about," says Awad, "our patients and their experience."

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Education Highlight (General Surgery, MIS)

The School of Medicine is a pilot center for a new entrustable evaluation process for Advanced GI/MIS fellowships. “This higher level of evaluation allows us to assess the level of autonomy or entrustment of a trainee’s ability to carry out patient care and surgical procedures,” says Michael Brunt, MD, MIS section chief and fellowship program director. MIS is a leader in surgical education. Surgeons Michael Awad, MD, PhD; Jeffrey Blatnik, MD; and Bethany Sacks, MD, Med, serve as general surgery associate program directors. Sacks is the director of the Integrated Medical Student Surgical Clerkship, and Brunt is president-elect of the Fellowship Council. This Fellowship Council pilot evaluation process marks a new milestone in advanced training of future surgeons.

The Future of Fellowship Interviews (General Surgery, MIS)

A novel study of remote virtual interviews during the COVID-19 pandemic, conducted by Minimally Invasive Surgery (MIS) faculty and published in the *Journal of the American College of Surgeons (JACS)*, reveals a high degree of candidate satisfaction with the virtual process.

COVID-19 triggered rapid changes in medicine, including alterations to the interview process for surgical training. The Fellowship Council, which oversees the application and match process for all Advanced GI/MIS fellowships, issued an advisory in March 2020, stating that fellowship interviews should be conducted via alternative methods due to the pandemic. The Washington University Advanced GI/MIS Fellowship quickly pivoted from in-person interviews—scheduled for later that month—to Zoom virtual interviews.

Twenty total applicants—nine women and eleven men—were invited for interviews.

The JACS study, led by Arnab Majumder, MD; Shaina Eckhouse, MD; Michael Brunt, MD; and senior author Jeffery Blatnik, MD, describes the interview process, which includes the use of breakout rooms for one-on-one interviews and is one of the first pieces of research on virtual platforms for fellowship interviews.

“Our experience can serve as a template for other programs moving forward,” says Brunt.

Of the many adaptations that have taken place in response to COVID-19, Brunt, president-elect of the Fellowship Council, anticipates that use of remote teleconferencing as an alternative to in-person interactions will likely endure.

Applicant responses to an anonymous voluntary survey suggest that remote virtual interviews are a feasible and favorable alternative or adjunct to traditional in-person interviews.

The majority of interviewees rated their interaction with the program director, faculty surgeons, and current fellow using Zoom as being easy. Nearly 90 percent of candidates reported that the experience met or exceeded their expectations, and 70 percent noted little or no impact of not being able to conduct the interview in person.

The Advanced GI/MIS Fellowship had to rapidly shift to this virtual platform, but many other training programs in the department, School of Medicine, and across the country have since followed suit. By sharing their experience and results, the MIS section exhibits a model for training programs to provide an experience comparable in most respects to the traditional interview setting.

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Research Highlight (General Surgery, MIS)

Section Chief Michael Brunt, MD, led a three-year effort to develop evidence-based recommendations for safe cholecystectomy and prevention of bile duct injury (BDI). A 2018 conference assembled experts from five surgical societies to develop a consensus guideline. The results, recently published in the *Annals of Surgery* and *Surgical Endoscopy*, make strong recommendations for use of intraoperative biliary imaging for uncertainty of anatomy or suspicion of BDI, and referral of patients with confirmed or suspected BDI to an experienced surgeon or multidisciplinary team. Brunt, president of the Central Surgical Association, collaborated with a team of experts including HPB-GI surgeons Steven Strasberg, MD, and Chet Hammill, MD, to develop this guideline.

Clinical Highlight (Cardiothoracic Surgery, Peds CT)

Pediatric cardiothoracic surgeons at St. Louis Children's Hospital are pioneers in pediatric lung and heart-lung transplant, as well as the Potts shunt procedure for pulmonary hypertension—high blood pressure in the arteries of the lung. For some children with pulmonary hypertension who might otherwise require transplantation, surgeons in the Section of Pediatric Cardiothoracic Surgery have found the Potts shunt procedure to be an effective palliative treatment. An upcoming *Journal of Thoracic and Cardiovascular Surgery* study from Washington University School of Medicine surgeons, cardiologists, and pulmonologists found the midterm outcomes of the Potts shunt for pediatric pulmonary hypertension to be similar to those of lung transplant.

Clinical Story (Cardiothoracic Surgery, Peds CT)

Helping Families, One Innovation at a Time

Patients with congenital heart disease often have rare, complex heart defects. These conditions present challenges for preoperative planning, trainee education, and patient counseling. It can be difficult to describe a heart defect to a patient or their family. Cases of rare congenital cardiac problems may not arise during a fellow's training. Developing innovative methods of treating these conditions requires a simulated environment for surgeons to practice new techniques outside of the operating room.

Surgeons in the Section of Pediatric Cardiothoracic Surgery have found 3D printing to be a transformative technology for preoperative planning and surgical simulation in congenital heart disease. Printing models of the heart allows the surgeon to plan for a procedure, teach trainees in a safe simulated environment, and—importantly—educate patients and families.

"It's quite helpful," says Section Chief and Cardiothoracic Surgeon-in-Chief at St. Louis Children's Hospital Pirooz Eghtesady, MD, PhD. "Some of the hearts we're working with are the size of a strawberry. When you talk to the family and you can show them why this is a complex operation, I think it helps them have a better understanding of what we are doing."

Eghtesady describes congenital heart surgery as being like rebuilding a house. With 3D-printed hearts, surgeons can move pieces to practice this process, connecting arteries and vessels, rebuilding valves.

3D models have also played a role in surgical training. In addition to allowing practice on highly accurate simulators, the 3D models expose trainees to pathological features they may rarely encounter. Future congenital cardiac surgery fellows will have the opportunity to practice an

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index of rare, complex operations on 3D-printed hearts, preparing them to help a wider spectrum of cardiac patients after training.

"This technology also allows us to think differently and develop new operations for some of the most complex congenital problems," Eghtesady says. "The cornerstone of our section has been innovation. My mission statement is to make it a better world of families that need our help, one innovation at a time."

Education Highlight (Cardiothoracic Surgery, Peds CT)

Before an operation, Section Chief Pirooz Eghtesady, MD, PhD, writes a pre-brief: an account of the patient's history, details of the upcoming procedure, and plans for postoperative management, for the patient care team. The pre-brief has become a didactic tool for the congenital cardiac surgery fellows, who now write the brief. The brief encourages the fellows to think proactively about the conditions they treat and the way they communicate with a multidisciplinary team. "It is a very active learning technique," current fellow Jacob Miller, MD, says. "It opens the forum to other members of the team and creates a record of how I would approach a lesion set. I have my own record for future surgeries."

Education Story (Cardiothoracic Surgery, Peds CT)

Congenital Cardiac Surgery Fellowship

The Section of Pediatric Cardiothoracic Surgery now offers a Congenital Cardiac Surgery Fellowship. The fellowship received accreditation from the American Council of General Medical Education (ACGME), making it one of just eleven such programs in the country. The two-year fellowship trains surgeons in the diagnosis and treatment of patients with congenital heart defects. In recent years, fellowship training has become a requirement for congenital heart surgeons at most hospitals.

Pediatric Cardiothoracic Surgery Section Chief Pirooz Eghtesady, MD, PhD, serves as program director for the fellowship. Eghtesady, the Emerson Chair in Pediatric Cardiothoracic Surgery at St. Louis Children's Hospital, has over twenty years of experience in congenital cardiac surgery, including more than a decade at Washington University School of Medicine in St. Louis and St. Louis Children's Hospital. The breadth and depth of the program's cases—including pediatric heart and lung transplantation, surgical management of children with pulmonary hypertension, and use of ventricular-assist devices in the management of pediatric patients with heart failure—provides a unique level of training for fellows.

Jacob Miller, MD, is the program's inaugural fellow. Miller completed both a general surgery residency and a thoracic surgery fellowship at the School of Medicine prior to joining the congenital fellowship.

"The program has provided a wide breadth of training in the entire field of pediatric cardiac surgery," Miller says. "At the same time, Dr. Eghtesady has been an excellent mentor outside of the operating room. The didactic training has allowed me to learn about many more lesion sets and cardiac problems than any one surgeon could treat during fellowship."

Miller participates in numerous meetings and conferences as part of his training. The adult congenital heart disease meeting, fetal case conference, transplant meetings, and weekly

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conferences provide training in a wide spectrum of clinical cases, as well as experience in multidisciplinary congenital cardiac care.

"I am delighted to have Jacob as our first congenital fellow," Eghtesady says. "He has certainly already made a name for himself in pediatric surgery. Last year, he was named co-chair of the Communications and Publications Committee of the American Academy of Pediatrics Section of Cardiology and Cardiac Surgery. This is a first for an individual during their training."

Research Highlight (Cardiothoracic Surgery, Peds CT)

Research in the Section of Pediatric Cardiothoracic Surgery is at the forefront of innovation for children with congenital heart and lung conditions. In the past year, researchers from the section, in collaboration with colleagues from across the School of Medicine, have published several peer-reviewed articles covering the breadth of pediatric cardiothoracic surgery. The Section is highly active in research studies involving ventricular-assist devices in bridging children to lung transplantation. Researchers recently received an Innovative Project Award from the American Heart Association for research related to the role of maternal gut virome in the development of congenital heart defects.

Clinical Highlight (General Surgery, Surgical Oncology)

Katherine Glover-Collins, MD, PhD, brings expertise in breast cancer surgery to Christian Hospital and Siteman Cancer Center North St. Louis County. Glover-Collins is a fellowship-trained breast surgeon with research experience in genetic mutations linked to breast cancer. Many women in North County are diagnosed with late-stage breast cancers due to health disparities in their community. She is addressing these disparities by promoting mammography screening, access to funds for underinsured women, and comprehensive cancer care. "If you are a breast cancer patient, you can receive all of the care that you need," Glover-Collins says. "From surgery to medical oncology and radiation therapy, patients can receive the same excellent care in North County."

Clinical Story (General Surgery, Surgical Oncology)

The Best in Breast Cancer Care

Surgical Oncology faculty lead a multidisciplinary team at the Breast Health Center who diagnose and treat women with breast cancer. Clinical trials advance patient care in breast cancer through innovative technologies, endocrine therapies, and personalized cancer vaccines.

Breast surgeon Julie Margenthaler, MD, professor of surgery, is principal investigator in a clinical trial to improve the visibility of cancer cells at the margin of the tissue removed in breast cancer surgery. The trial, which is a collaborative effort with Professor of Radiology Samuel Achilefu, PhD, from the Mallinckrodt Institute of Radiology, uses Cancer Vision Goggles and a contrast agent called LS301—both developed at the School of Medicine—to obtain real-time intraoperative visualization of breast cancer during surgery.

"The underlying hypothesis is that the accurate detection of all cancer cells highlighted by LS301 during surgery will reduce the number of breast cancer patients with margin positivity to less than 5 percent, compared to the current surgical paradigm of greater than 20 percent," says Margenthaler, president-elect of the American Society of Breast Surgeons. The group hopes to extend this trial into other solid tumors, including melanoma and pancreatic cancer.

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For women ages 70 or older with ER+ tumors and good prognosis (low Ki67 scores), surgery as a definitive treatment may not be necessary. A clinical trial led by Professor of Surgery Rebecca Aft, MD, PhD, investigates whether neoadjuvant endocrine therapies provide adequate local and systemic control of breast cancer for this subpopulation of patients. The trial measures information on patients receiving endocrine therapies using the Functional Assessment of Cancer Therapy–Breast (FACT-B) questionnaire and analyzes archival tissue to measure risk of recurrence. The results of this trial may lead to a new standard of care for elderly women with good prognosis ER+ tumors.

Vice Chair for Research and Professor of Surgery William Gillanders, MD, has initiated clinical trials combining personalized neoantigen vaccines with current treatment options to prevent recurrence of triple negative breast cancer (TNBC). In this National Institutes of Health-funded research, Gillanders studies immune response to these vaccines, hypothesizing that enhancing T cell response to neoantigens can improve outcomes in patients with TNBC.

Cancer vaccine research extends to include clinical trials in pancreas cancer. In collaboration with the SPORE in pancreatic cancer, Gillanders is evaluating the safety and immunogenicity of a neoantigen DNA vaccine strategy in pancreatic cancer patients following surgical resection and adjuvant chemotherapy.

As clinical trials continue to advance treatment in breast and other cancers, surgeons at the School of Medicine are at the forefront of providing the best individualized patient care.

Education Highlight (General Surgery, Surgical Oncology)

Endocrine surgeon T.K. Pandian, MD, MPH, is now site director for surgical oncology medical student education. Pandian is developing new initiatives to increase feedback and evaluation of medical students during rotations, as well as a clinical immersion experience in Surgical Oncology. “This is an opportunity to globally immerse medical students in the clinical environment,” Pandian says. To further his goals as a surgeon-educator, Pandian joined the Teaching Scholars Program, a twelve-month certificate program designed to enhance knowledge and skills and develop future leaders in healthcare education with a focus on educational scholarship and curriculum development.

Research Highlight (General Surgery, Surgical Oncology)

Surgical oncologists are performing novel research to transform cancer care through scientific discovery. Assistant Professor of Surgical Oncology Beth Helmink, MD, PhD, leads a research laboratory focused on immune response to cancer therapies. Immunotherapies are an important form of cancer treatment, but they can trigger an autoimmune response in patients. Helmink’s research aims to target this immune response to fight cancer while reducing its impact on the patient’s overall health. Endocrine surgeon Taylor Brown, MD, researches the deadliest form of thyroid cancer—anaplastic thyroid carcinoma. For his ongoing research, Brown was awarded a research grant from the American Association of Endocrine Surgeons and the Thyroid Cancer Survivors’ Association.

Research Story (General Surgery, Surgical Oncology)

Personalized and Precision-Based Cancer Care

A better understanding of how tumors progress to metastasis could lead to improved methods of diagnosis and treatments of cancer that has spread to other organs, such as the liver or brain.

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Two recently published studies outline colorectal cancer evolution from primary tumor to metastasis. These studies are the culmination of cross-disciplinary research between the labs of co-senior authors, Chief of Surgical Oncology Ryan Fields, MD, and Assistant Director of the McDonnell Genome Institute Christopher Maher, PhD.

The first study, published in *Nature Communications*, led to the discovery of 150 long, noncoding RNAs that may contribute to metastasis.

This study analyzed normal tissue, colon tumors, and metastatic tumors from the same patient, finding that a molecule called RAMS11 was associated with metastatic tumor progression and resistance to chemotherapy. Using CRISPR gene editing technology, the researchers turned off RAMS11 in colorectal cancer cells, which caused the cells to become less aggressive.

"There is a significant unmet need in clinical oncology to identify new markers of cancer that can reliably predict and stratify low- and high-risk patients," Fields says. "This will allow oncologists to move from 'one size fits all' to a 'personalized and precision-based' approach that will reserve aggressive and higher risk treatments to those who need it most, sparing those who do not need it the unnecessary side effects. We hope to explore further the ability of RAMS11 and other biomarkers to do just that."

The second study, published in *Science Advances*, sequences the genome of nearly 100 tumor samples collected from eleven patients with metastatic colorectal cancer who underwent treatments at Siteman Cancer Center. The researchers detailed the heterogeneity of these tumors and reconstructed how the cancer evolved in these patients.

These findings will impact future strategies to target, and ultimately inhibit, the progression of metastases.

"Tumor heterogeneity is a challenge in treatment of advanced colorectal cancer," Fields says. "The more complex the tumors are, the more difficult to treat them."

These two companion studies provide novel insights into the biology of colorectal cancer. The ongoing work of Fields and Maher will further explore and validate these findings and may lead to novel diagnostics and therapeutics in solid tumors.

Clinical Highlight (Cardiothoracic Surgery, Thoracic)

Lung transplant surgeons at Washington University School of Medicine in St. Louis lead one of the most active transplant centers in the world, completing over 1,800 transplants since the program's beginning in 1988. This year, Daniel Kreisel, MD, PhD, becomes the inaugural section chief of Cardiothoracic Transplantation. "I can think of no one more suited to direct this new section than Dr. Kreisel," says Division Chief Ralph Damiano, Jr., MD, Evarts A. Graham Professor of Surgery. Kreisel and Lung Transplant Program Associate Director Varun Puri, MD, MSCI, are stalwarts of the lung transplant program, handling some of the most challenging cases, including patients who may have been turned down at other centers.

Clinical Story (Cardiothoracic Surgery, Thoracic)

Tipping Point

Robotic surgery offers numerous advantages for thoracic surgeons, from smaller incisions to greater freedom of movement and precision during operations. This technical fine-tuning results

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in quicker healing and less pain than open surgery for most patients. The number of robotic cases in the Thoracic Surgery Section has continuously increased in recent years.

Thoracic surgeons at Christian Hospital were among the early adopters of robotic surgery. Professors of Surgery Nabil Munfakh, MD, and Varun Puri, MD, MSCI, have achieved years of clinical success with robotic utilization for lung care in North County. In 2012, they performed the first full lung lobectomy in the St. Louis region through the use of robotic technology.

"This technology gives us the ability to quickly diagnose lung cancer with minimal set back to the patient's life and recovery," Munfakh says.

Pulmonary resections, esophageal surgery, and surgery mediastinal tumors—growths that form in the middle of the chest, between the lungs—are all areas of robotic growth in thoracic surgery.

From its early success at Christian Hospital, Benjamin Kozower, MD, MPH, professor of surgery, has helped to establish a successful robotic practice at Barnes-Jewish Hospital. Thoracic surgeons Ruben Nava, MD, and Shuddhadeb Ray, MD, MPH, joined the section in recent years, expanding the number of thoracic cases handled robotically. Nava sees patients at Barnes-Jewish Hospital, while Ray joins Munfakh and Puri at Christian Hospital. Both Nava and Ray completed fellowship training at Washington University School of Medicine in St. Louis, where they developed the robotic skills they now put into practice.

The addition of surgeons with a background in robotic surgery has been essential to the program's growth. Thoracic Surgery Chief Bryan Meyers, MD, MPH, recognized the enthusiasm around this developing technology early, receiving the necessary training and certification for robotic surgery himself. Now, approximately half of the section's pulmonary resections are performed robotically. Meyers, the Patrick and Joy Williamson Professor of Surgery, expects that number to grow.

"In the last few years, we have reached the tipping point in robotic thoracic surgery," Meyers says. "We have the investment and expertise in place to offer these procedures for an ever-growing number of patients."

Education Highlight (Cardiothoracic Surgery, Thoracic)

Thoracic Surgery Fellowship graduates Matthew Henn, MS, MD; Jacob Miller, MD; and Shuddhadeb Ray, MD, MPH, started their general surgery residencies together at Washington University School of Medicine in St. Louis nearly a decade ago. Henn returns to his home state of Ohio to practice at the Ohio State University; Miller continues his training at the School of Medicine as the first fellow in the new Congenital Cardiac Fellowship; and Ray joins the thoracic surgery faculty at Christian Hospital. "I've known Matt, Shuddie, and Jacob for years, from their general surgery years, through all their cardiothoracic surgery training," says Spencer Melby, MD, Thoracic Surgery Fellowship program director. "These surgeons are remarkable."

Education Story (Cardiothoracic Surgery, Thoracic)

The Future of Thoracic Surgery

In 2020, the cardiothoracic surgery training program at Washington University School of Medicine in St. Louis entered new territory. For the first time, more women than men are training in cardiothoracic surgery at Washington University and Barnes-Jewish Hospital. Six of the program's eleven current trainees are women. This majority will be solidified in July 2021,

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when the program will graduate two men and a woman, replacing them with two incoming women and one man.

"The trend towards training women for cardiothoracic surgery is not a flash in the pan," says Thoracic Surgery Section Chief Bryan Meyers, MD, MPH. "Word has gotten out that we offer exceptional training in an excellent environment. We have been able to attract very talented trainees in thoracic surgery."

The example of past trainees demonstrates the excellence of the program. Christine Lau, MD, MBA, who completed cardiothoracic fellowship training at the School of Medicine in 2005, is now chair of surgery at University of Maryland School of Medicine. Cardiac surgeon Puja Kachroo, MD, was a thoracic surgery fellow prior to joining the cardiac surgery faculty in 2016.

"My mentors in thoracic surgery have been instrumental in my career development," says Kachroo.

Meyers credits his mentor, G. Alexander Patterson, MD, the Joseph Bancroft Professor of Surgery, for setting the tone for thoracic surgery training at the School of Medicine.

"He has always demonstrated exemplary ability to be a supportive mentor to trainees," Meyers says. "It can be tough to transition from being a PGY-5 general surgery trainee to starting a fellowship at a new institution. Dr. Patterson saw that, and I can think of specific examples where he helped fellows get their feet under them and find the resources they needed. He sets the tone for personal interaction and dedication to training that permeates throughout all the faculty, making this an appealing place to train whether you are a man or a woman."

Meyers anticipates that increased gender equity will lead to positive growth and advancements in cardiothoracic surgery training.

"We stand to maintain and improve the quality of our field, because we have the best surgical trainees as candidates," Meyers says. "I think it is fantastic for the future of thoracic surgery."

Research Highlight (Cardiothoracic Surgery, Thoracic)

Surgical Director of Lung Transplantation Daniel Kreisel, MD, PhD, the G. Alexander Patterson, MD/Mid-America Transplant Endowed Distinguished Chair in Lung Transplantation, is principal investigator of two grants from the National Institutes of Health totaling $10 million to study the prevention of organ rejection after transplantation. "Dr. Kreisel is very highly regarded for his surgical skills in organ transplantation and for his research involving immunological mechanisms of transplant rejections," says David H. Perlmutter, MD, executive vice chancellor for medical affairs and the George and Carol Bauer Dean of the School of Medicine. "His determination to improve outcomes for patients drives his work and will continue to have profound impact for transplant patients."

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Letter of Transmittal

To: William Morris

Washington University-St. Louis, Department of Surgery

From: Kallie Reed

Date: February 26, 2021

RE: Annual Report Revision

Dear Mr. Morris,

Please find enclosed a revised copy of the 2020 Annual Report for the Washington University-St. Louis School of Medicine Department of Surgery. Through the full copy and comprehensive edit that I performed on the document, I believe the report is now organized in a more efficient manner, is now user-friendly and easy to navigate, and is visually appealing.

To enhance the document's organization, I organized the information by division (Division of Cardiothoracic Surgery and Division of General Surgery). I then organized the information further by division sections as well. I included headings and a table of contents for easy document navigation and cross-referencing. I chose a color palate that is appealing and calming, but will still draw reader's attention. For page layout, I tried to stick to a consistent format without having each page be the exact same style. I showcases section stories front and center on their pages, and I used the highlights as accents to create a more visual effect. I also used callouts to feature quotations from Washington University personnel.

Thank you for allowing me the opportunity to revise this important document. Please feel free to contact me with any comments or concerns.

Sincerely,

Kallie Reed

ATTN: The revised version of the document follows this page.

ANNUAL REPORT

2020

WASHINGTON UNIVERSITY

School of Medicine

Department of Surgery

Table of Contents

DIVISION OF CARDIOTHORACIC SURGERY

Cardiac

One Step at a Time

Diseases of the aorta are insidious, life-threatening problems that require complex, high-level care. The aorta is the main vessel that sends blood from the heart to the body. Aortic dissection occurs when the wall of the aorta tears, blocking or diverting circulation and reducing the amount of oxygen and nutrients that reach vital organs. An aortic aneurysm is a balloon-like enlargement in the aorta, difficult to detect but deadly when ruptured.

Cardiac Surgery Section Chief Marc Moon, MD, and cardiac surgeon Puja Kachroo, MD, treat patients with even the most complex aortic pathology. These complex conditions are often related to hypertension, inflammatory conditions, familial history, or genetic connective tissue disorders including Marfan syndrome and Loeys-Dietz syndrome.

“Aortic dissection is often fatal when missed,” Moon says. “But with proper education, physicians know what signs to look for. The patient might feel like they are having a heart attack or stroke. Chest pain is the number one symptom for aortic dissection.”

The Department of Surgery has a longstanding history of excellence in the care of patients with aortic disease. Moon, the director of the Center for Diseases of the Thoracic Aorta (CDTA), has performed complex aortic surgery for over 20 years. Kachroo, who joined the faculty after completing a fellowship in the Cardiothoracic Surgery Section in 2016, has expanded the number of cases treated at the CDTA and introduced minimally invasive cardiac procedures for valve replacement and coronary bypass. Moon and Kachroo work closely with vascular surgery colleagues and a multidisciplinary team to coordinate the evaluation and management of patients.

“It takes a lot of experience to deal with high-risk aortic patients,” Kachroo says. “I have been fortunate to have Dr. Moon as a mentor and teacher. His experience has been very helpful in expanding my abilities, one step at a time. He was one of the earliest adopters of valve sparing aortic root replacement, a very complex and difficult-to-learn operation. Luckily, I learned from him as a fellow and can continue to build on this practice. With the two of us doing these complex aortic surgeries, we can truly treat the gamut of aortic disease.”

Clinical

Cardiac Surgery Chief Marc Moon, MD, became president of the American Association of Thoracic Surgeons (AATS) in 2020. Founded in 1917, the AATS is an international organization dedicated to advancing cardiothoracic surgery. At the 100th Annual Meeting of the AATS, held virtually in April, Moon became the seventh Washington University surgeon to lead the AATS. In his President’s Message, Moon calls on cardiothoracic surgeons to address gender and racial inequality in medicine: “Let’s pledge to lead the way in cardiothoracic surgery as Hippocrates outlined 2,400 years ago with beneficence, integrity, respect for patients, mentors, and mentees, and personal and professional virtue in our quest for social justice.”

Ahead of the Curve

In this unprecedented year, surgeons played a critical role in treating patients with COVID-19. Cardiothoracic surgeons typically treat conditions of the heart and lungs, but the pandemic presented a unique problem: a deadly virus that could affect both organs and required extreme caution to protect healthcare workers from infection. Cardiac surgeons Akinobu Itoh, MD, PhD, Kunal Kotkar, MD, and Muhammad Faraz Masood, MD, met this problem head-on, with a commitment to do whatever it takes for their patients.

“The differences between COVID and flu or pneumonia patients start with the preparation,” Masood says. The necessary personal protective equipment and limitations on personnel in a COVID-19 intensive care unit (ICU) changed how this type of care looked from the very beginning. Normally, a team including surgeons, intensivists, infectious disease doctors, and nursing staff would all be in the room with an extracorporeal membrane oxygenation (ECMO) patient. The interactions with COVID-19 patients on ECMO, Masood says, are more critical and intense. This team still provides the same critical care, but surgeons shoulder a significant burden to limit the rest of the team’s exposure.

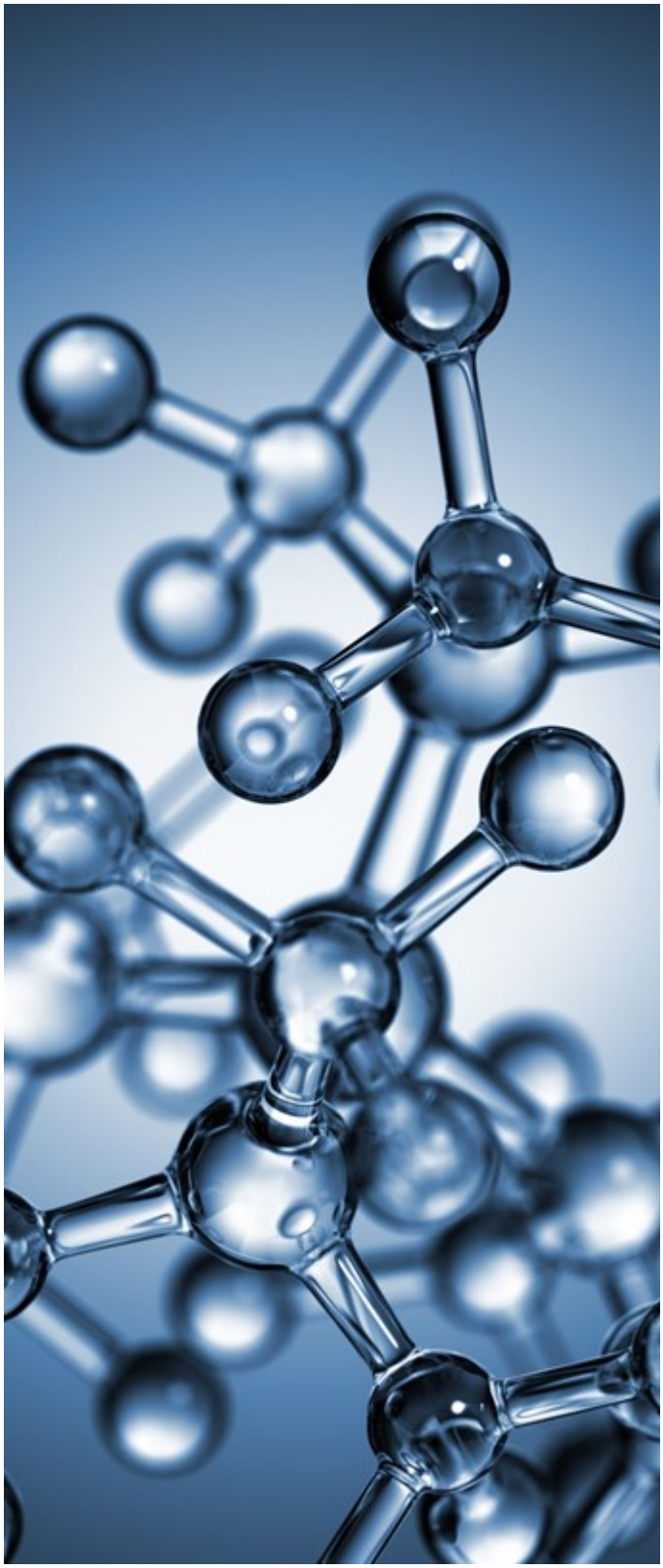
ECMO provides COVID-19 patients the chance to rest their heart and lungs when the organs are failing. ECMO acts as a heart and lung for the patient, taking blood from the body, oxygenating it, and pumping it back into the body at about six to eight liters per minute. ECMO was originally invented to care for pediatric patients with lung failure, but was rapidly adopted for both congenital and adult patients whose organ failure did not improve with traditional methods.

ECMO is an intensive form of therapy that requires a multidisciplinary team and high-level nursing care. Few institutions nationwide have the resources and ability to provide this care. ECMO is considered an evolving field in cardiothoracic surgery, and has seen significant growth at Washington University School of Medicine in St. Louis over the past three years. This year, over 200 people, including COVID-19 and non-COVID-19 patients, were placed on ECMO at the School of Medicine.

“Unlike flu or pneumonia, COVID affects the entire body,” Masood says. “It can have its own effects on the lungs, heart, and immune system.”

COVID-19 affects different patients in different ways. In every case, the emotional toll is significant. A typical flu patient might need ECMO for about two weeks. ECMO times for COVID-19 patients can be much longer. During that time, the team is there for them through the long hours, sometimes late into the night. When the surgeons finally leave the hospital, they have to isolate from their families, living in basements or RVs to protect their loved ones. The willingness of Itoh, Kotkar, and Masood to show up every day, despite the uncertainties and challenges, has been vital to delivering the highest quality care to the sickest of COVID-19 patients.

“The ability of our clinical faculty to pull together, problem solve, and rise to the occasion has resulted in superb patient care,” says Timothy Eberlein, MD, the William K. Bixby Professor and chair of the Department of Surgery. “We have been ahead of the curve in caring for the sickest COVID patients in our ICU thanks to the innovation and commitment of our faculty.”



Education

Richard Schuessler, PhD, director of the Cardiac Surgical Research Laboratory, retires after an accomplished 35-year career at Washington University. Schuessler's research focused on surgical treatment of cardiac arrhythmias, and his contributions were instrumental in the development of the Cox-Maze procedure—the first cure for atrial fibrillation. As laboratory director, Schuessler also served as a teacher and mentor for the many students, residents, and research fellows who have worked in the Cardiothoracic Surgery Research Laboratory over the years. "It's been a wonderful career," Schuessler says. "I hope my legacy is all of the people we have trained over the years. I'll miss the people most of all."

Research

The International Registry of Acute Aortic Dissections (IRAD) is a consortium of research centers, including Washington University School of Medicine in St. Louis, evaluating the current management and outcomes of acute aortic dissection. Cardiac surgeons and cardiovascular physicians are reviewing the database of aortic dissection cases at the School of Medicine, studying dates and times of symptom onset, presentation, diagnosis, hemodynamic signs of aortic dissection, initial and chronic medical therapy, diagnostic imaging chosen, and surgical and medical management. This comprehensive study of IRAD data aims to identify new breakthroughs in diagnosis and treatment of this potentially life-threatening condition.

Pediatric Cardiothoracic

Helping Families, One Innovation at a Time

Patients with congenital heart disease often have rare, complex heart defects. These conditions present challenges for preoperative planning, trainee education, and patient counseling. It can be difficult to describe a heart defect to a patient or their family. Cases of rare congenital cardiac problems may not arise during a fellow's training. Developing innovative methods of treating these conditions requires a simulated environment for surgeons to practice new techniques outside of the operating room.

Surgeons in the Section of Pediatric Cardiothoracic Surgery have found 3D printing to be a transformative technology for preoperative planning and surgical simulation in congenital heart disease. Printing models of the heart allows the surgeon to plan for a procedure, teach trainees in a safe simulated environment, and—importantly—educate patients and families.

"It's quite helpful," says Section Chief and Cardiothoracic Surgeon-in-Chief at St. Louis Children's Hospital Pirooz Eghtesady, MD, PhD. "Some of the hearts we're working with are the size of a strawberry. When you talk to the family and you can show them why this is a complex operation, I think it helps them have a better understanding of what we are doing."

Eghtesady describes congenital heart surgery as being like rebuilding a house. With 3D-printed hearts, surgeons can move pieces to practice this process, connecting arteries and vessels, rebuilding valves.

3D models have also played a role in surgical training. In addition to allowing practice on highly accurate simulators, the 3D models expose trainees to pathological features they may rarely encounter. Future congenital cardiac surgery fellows will have the opportunity to practice an index of rare, complex operations on 3D-printed hearts, preparing them to help a wider spectrum of cardiac patients after training.

"This technology also allows us to think differently and develop new operations for some of the most complex congenital problems," Eghtesady says. "The cornerstone of our section has been innovation. My mission statement is to make it a better world of families that need our help, one innovation at a time."

This technology also allows us to think differently and develop new operations for some of the most complex congenital problems.

Clinical

Pediatric cardiothoracic surgeons at St. Louis Children's Hospital are pioneers in pediatric lung and heart-lung transplant, as well as the Potts shunt procedure for pulmonary hypertension—high blood pressure in the arteries of the lung. For some children with pulmonary hypertension who might otherwise require transplantation, surgeons in the Section of Pediatric Cardiothoracic Surgery have found the Potts shunt procedure to be an effective palliative treatment. An upcoming *Journal of Thoracic and Cardiovascular Surgery* study from Washington University School of Medicine surgeons, cardiologists, and pulmonologists found the midterm outcomes of the Potts shunt for pediatric pulmonary hypertension to be similar to those of lung transplant.

Congenital Cardiac Surgical Fellowship

The Section of Pediatric Cardiothoracic Surgery now offers a Congenital Cardiac Surgery Fellowship. The fellowship received accreditation from the American Council of General Medical Education (ACGME), making it one of just eleven such programs in the country. The two-year fellowship trains surgeons in the diagnosis and treatment of patients with congenital heart defects. In recent years, fellowship training has become a requirement for congenital heart surgeons at most hospitals.

Pediatric Cardiothoracic Surgery Section Chief Pirooz Eghtesady, MD, PhD, serves as program director for the fellowship. Eghtesady, the Emerson Chair in Pediatric Cardiothoracic Surgery at St. Louis Children's Hospital, has over twenty years of experience in congenital cardiac surgery, including more than a decade at Washington University School of Medicine in St. Louis and St. Louis Children's Hospital. The breadth and depth of the program's cases—including pediatric heart and lung transplantation, surgical management of children with pulmonary hypertension, and use of ventricular-assist devices in the management of pediatric patients with heart failure—provides a unique level of training for fellows.

Jacob Miller, MD, is the program's inaugural fellow. Miller completed both a general surgery residency and a thoracic surgery fellowship at the School of Medicine prior to joining the congenital fellowship.

"The program has provided a wide breadth of training in the entire field of pediatric cardiac surgery," Miller says. "At the same time, Dr. Eghtesady has been an excellent mentor outside of the operating room. The didactic training has allowed me to learn about many more lesion sets and cardiac problems than any one surgeon could treat during fellowship."

Miller participates in numerous meetings and conferences as part of his training. The adult congenital heart disease meeting, fetal case conference, transplant meetings, and weekly conferences provide training in a wide spectrum of clinical cases, as well as experience in multidisciplinary congenital cardiac care.

"I am delighted to have Jacob as our first congenital fellow," Eghtesady says. "He has certainly already made a name for himself in pediatric surgery. Last year, he was named co-chair of the Communications and Publications Committee of the American Academy of Pediatrics Section of Cardiology and Cardiac Surgery. This is a first for an individual during their training."

Education

Before an operation, Section Chief Pirooz Eghtesady, MD, PhD, writes a pre-brief: an account of the patient's history, details of the upcoming procedure, and plans for postoperative management, for the patient care team. The pre-brief has become a didactic tool for the congenital cardiac surgery fellows, who now write the brief. The brief encourages the fellows to think proactively about the conditions they treat and the way they communicate with a multidisciplinary team. "It is a very active learning technique," current fellow Jacob Miller, MD, says. "It opens the forum to other members of the team and creates a record of how I would approach a lesion set. I have my own record for future surgeries."

Research

Research in the Section of Pediatric Cardiothoracic Surgery is at the forefront of innovation for children with congenital heart and lung conditions. In the past year, researchers from the section, in collaboration with colleagues from across the School of Medicine, have published several peer-reviewed articles covering the breadth of pediatric cardiothoracic surgery. The Section is highly active in research studies involving ventricular-assist devices in bridging children to lung transplantation. Researchers recently received an Innovative Project Award from the American Heart Association for research related to the role of maternal gut virome in the development of congenital heart defects.

Thoracic

Tipping Point

Robotic surgery offers numerous advantages for thoracic surgeons, from smaller incisions to greater freedom of movement and precision during operations. This technical fine-tuning results in quicker healing and less pain than open surgery for most patients. The number of robotic cases in the Thoracic Surgery Section has continuously increased in recent years.

Thoracic surgeons at Christian Hospital were among the early adopters of robotic surgery. Professors of Surgery Nabil Munfakh, MD, and Varun Puri, MD, MSCI, have achieved years of clinical success with robotic utilization for lung care in North County. In 2012, they performed the first full lung lobectomy in the St. Louis region through the use of robotic technology.

“This technology gives us the ability to quickly diagnose lung cancer with minimal set back to the patient’s life and recovery,” Munfakh says.

Pulmonary resections, esophageal surgery, and surgery mediastinal tumors—growths that form in the middle of the chest, between the lungs—are all areas of robotic growth in thoracic surgery.

From its early success at Christian Hospital, Benjamin Kozower, MD, MPH, professor of surgery, has helped to establish a successful robotic practice at Barnes-Jewish Hospital. Thoracic surgeons Ruben Nava, MD, and Shuddhadeb Ray, MD, MPH, joined the section in recent years, expanding the number of thoracic cases handled robotically. Nava sees patients at Barnes-Jewish Hospital, while Ray joins Munfakh and Puri at Christian Hospital. Both Nava and Ray completed fellowship training at Washington University School of Medicine in St. Louis, where they developed the robotic skills they now put into practice.

The addition of surgeons with a background in robotic surgery has been essential to the program’s growth. Thoracic Surgery Chief Bryan Meyers, MD, MPH, recognized the enthusiasm around this developing technology early, receiving the necessary training and certification for robotic surgery himself. Now, approximately half of the section’s pulmonary resections are performed robotically. Meyers, the Patrick and Joy Williamson Professor of Surgery, expects that number to grow.

“In the last few years, we have reached the tipping point in robotic thoracic surgery,” Meyers says. “We have the investment and expertise in place to offer these procedures for an ever-growing number of patients.”

Clinical

Lung transplant surgeons at Washington University School of Medicine in St. Louis lead one of the most active transplant centers in the world, completing over 1,800 transplants since the program’s beginning in 1988. This year, Daniel Kreisel, MD, PhD, becomes the inaugural section chief of Cardiothoracic Transplantation. “I can think of no one more suited to direct this new section than Dr. Kreisel,” says Division Chief Ralph Damiano, Jr., MD, Evarts A. Graham Professor of Surgery. Kreisel and Lung Transplant Program Associate Director Varun Puri, MD, MSCI, are stalwarts of the lung transplant program, handling some of the most challenging cases, including patients who may have been turned down at other centers.

The Future of Thoracic Surgery

In 2020, the cardiothoracic surgery training program at Washington University School of Medicine in St. Louis entered new territory. For the first time, more women than men are training in cardiothoracic surgery at Washington University and Barnes-Jewish Hospital. Six of the program's eleven current trainees are women. This majority will be solidified in July 2021, when the program will graduate two men and a woman, replacing them with two incoming women and one man.

"The trend towards training women for cardiothoracic surgery is not a flash in the pan," says Thoracic Surgery Section Chief Bryan Meyers, MD, MPH. "Word has gotten out that we offer exceptional training in an excellent environment. We have been able to attract very talented trainees in thoracic surgery."

The example of past trainees demonstrates the excellence of the program. Christine Lau, MD, MBA, who completed cardiothoracic fellowship training at the School of Medicine in 2005, is now chair of surgery at University of Maryland School of Medicine. Cardiac surgeon Puja Kachroo, MD, was a thoracic surgery fellow prior to joining the cardiac surgery faculty in 2016.

"My mentors in thoracic surgery have been instrumental in my career development," says Kachroo.

Meyers credits his mentor, G. Alexander Patterson, MD, the Joseph Bancroft Professor of Surgery, for setting the tone for thoracic surgery training at the School of Medicine.

"He has always demonstrated exemplary ability to be a supportive mentor to trainees," Meyers says. "It can be tough to transition from being a PGY-5 general surgery trainee to starting a fellowship at a new institution. Dr. Patterson saw that, and I can think of specific examples where he helped fellows get their feet under them and find the resources they needed. He sets the tone for personal interaction and dedication to training that permeates throughout all the faculty, making this an appealing place to train whether you are a man or a woman."

Meyers anticipates that increased gender equity will lead to positive growth and advancements in cardiothoracic surgery training.

"We stand to maintain and improve the quality of our field, because we have the best surgical trainees as candidates," Meyers says. "I think it is fantastic for the future of thoracic surgery."

Education

Thoracic Surgery Fellowship graduates Matthew Henn, MS, MD; Jacob Miller, MD; and Shuddhadeb Ray, MD, MPH, started their general surgery residencies together at Washington University School of Medicine in St. Louis nearly a decade ago. Henn returns to his home state of Ohio to practice at the Ohio State University; Miller continues his training at the School of Medicine as the first fellow in the new Congenital Cardiac Fellowship; and Ray joins the thoracic surgery faculty at Christian Hospital. "I've known Matt, Shuddie, and Jacob for years, from their general surgery years, through all their cardiothoracic surgery training," says Spencer Melby, MD, Thoracic Surgery Fellowship program director. "These surgeons are remarkable."

Research

Surgical Director of Lung Transplantation Daniel Kreisel, MD, PhD, the G. Alexander Patterson, MD/Mid-America Transplant Endowed Distinguished Chair in Lung Transplantation, is principal investigator of two grants from the National Institutes of Health totaling $10 million to study the prevention of organ rejection after transplantation. “Dr. Kreisel is very highly regarded for his surgical skills in organ transplantation and for his research involving immunological mechanisms of transplant rejections,” says David H. Perlmutter, MD, executive vice chancellor for medical affairs and the George and Carol Bauer Dean of the School of Medicine. “His determination to improve outcomes for patients drives his work and will continue to have profound impact for transplant patients.”

DIVISION OF GENERAL SURGERY

Acute and Critical Care (ACCS)

All Hands on Deck

Foot and lower extremity care are an important and often overlooked component of diabetes and peripheral vascular disease treatment. People with these conditions are at high risk of vascular problems in the lower extremities, making it more difficult to treat and heal wounds. Wounds and other lower extremity complications can lead to amputation for many people with diabetes or peripheral vascular disease. The Department of Surgery is developing a team-based care program for the treatment of these patients. Acute and critical care surgeons (ACCS) are working in collaboration with vascular and plastic and reconstructive surgeons to coordinate a truly multidisciplinary limb preservation program.

The program began when three chiefs of surgery came together to address a common problem. Section Chief Grant Bochicchio, MD, MPH, met with Chief of Vascular Surgery Luis Sanchez, MD, and Justin Sacks, MD, MBA, Plastic and Reconstructive Surgery division chief, to discuss the need for a coordinated effort. Many of these patients begin with ACCS after traumatic injury or for wound care. They often require vascular procedures to restore blood flow and reconstructive surgery to address wounds that will not heal. The need for a multidisciplinary team was clear.

"To my knowledge, this is the first time that three chiefs have come together with this kind of unity and common vision for the treatment of a diagnosis," says Bochicchio. "We are truly committed to being partners in this treatment, and I think that's extremely important for our patients."

ACCS podiatrists Jerry Liddell, DPM, and Michael Weiss, DPM, bring expertise in foot care to the program, while surgeon John Kirby, MD, leads hyperbaric oxygen therapy and wound care for limb preservation patients.

To ensure success of the program, the three division chiefs are formalizing an algorithm of care with clinical operations staff. Introducing this new algorithm and raising awareness of the program among emergency room faculty and trainees will allow the limb preservation team to provide this patient population the care they need in a timely and effective manner.

Clinical

Since its establishment as a Level II trauma center, Memorial Hospital of Carbondale, Illinois, has brought improved trauma care to Southern Illinois. As part of the BJC Collaborative, Memorial Hospital's trauma center received its Level II designation in 2019. "Before that, if you were in a car crash or had a gunshot wound in Southern Illinois, your options were limited," says Acute and Critical Care Surgery (ACCS) Section Chief and acting Trauma Medical Director for Memorial Hospital Grant Bochicchio, MD, MPH. Bochicchio notes that there have been many great saves in the past year and a half. "This is a story of us collaborating, extending our reach outside the walls of WashU to save peoples' lives in Southern Illinois."

“When a patient hits the emergency room, there is going to be a clear guideline for how we get them the care they need,” Bochicchio says. “We want everyone, from residents to faculty, to understand that limb preservation is all hands on deck.”

Advancing Critical Care

Acute and critical care research at Washington University School of Medicine in St. Louis, funded by the Department of Defense (DOD), has the potential to revolutionize care for the most critically ill patients.

One in five preventable deaths from trauma occurs because the patient is having difficulty breathing. Typically, emergency medical services (EMS) professionals use one of two methods to help people breathe: an endotracheal tube or a device called a supraglottic airway, which sits over the windpipe. The Prehospital Airway Control Trial (PACT) aims to compare different methods to help people breathe. Washington University is among a group of centers across the nation participating in PACT as part of the DOD’s Linking Investigations in Trauma and Emergency Services (LITES) network.

Patients who are critically ill or have significant injuries can develop acute respiratory distress syndrome (ARDS)—a fatal condition causing severe shortness of breath. ARDS patients are sometimes unable to breathe without ventilator support. ACCS surgeons are participating in a national, multicenter DOD clinical trial introducing sigh breaths to usual ventilation of trauma victims at risk of developing ARDS. Sigh breaths are longer and deeper than regular breaths, and they may help patients breathe more normally on their own. The study will evaluate whether adding sigh breaths to ventilation leads to more ventilator-free days, ICU-free days, fewer complications, and lower mortality.

ACCS faculty are also studying new options to address excessive bleeding in trauma. Bleeding is the most avoidable cause of death in trauma patients, though current treatments for blood loss are sometimes ineffective. The Tranexamic Acid Mechanisms and Pharmacokinetics in Traumatic Injury (TAMPITI) trial at the School of Medicine studied the effects of tranexamic acid (TXA) on the immune system and the body’s ability to absorb and break down the medicine, as well as TXA’s safety and effectiveness in severely injured trauma patients. Researchers are in the process of evaluating study results from the TAMPITI trial, which has the potential to change care for trauma patients suffering blood loss.

By working closely with representatives from government agencies, industries, and foundations on research projects, ACCS faculty are committed to improving patient care and making advancements in critical care medicine as a whole.

Research

High blood sugar in critically ill patients, resulting from metabolic and hormonal responses to injury and stress, is associated with poor clinical outcomes, including infections and other complications, increased length of hospital stays, and death. In 2017, ACCS Section Chief Grant Bochicchio, MD, MPH, reported the findings of a clinical trial using a bedside near-continuous glucose monitor in the Surgical Intensive Care Unit (SICU). The first person in this multicenter trial to be attached to the monitor was a patient at Washington University. The device has since received FDA clearance, allowing SICU physicians to monitor blood sugar without waiting for lab results.

Education

The Surgical Critical Care Fellowship offers multidisciplinary clinical training at the Barnes-Jewish Hospital Level I trauma center in partnership with colleagues from anesthesiology. The Fellowship offers training opportunities in the Surgery/Burn/Trauma Intensive Care Unit (ICU), Cardiothoracic ICU, Neurology and Neurosurgery ICU, Medical ICU, Coronary Care Unit, and Pediatric ICU. Fellows also have the opportunity to train at Christian Hospital, extending the section's mission of providing outstanding quality care to disadvantaged and underserved patient populations in North County. "Our focus is on training outstanding physicians with a high level of expertise in caring for the most critically ill patients," says Fellowship Director Sara Buckman, MD, PharmD.

Colon and Rectal

New Standard of Care for Rectal Cancer

Colon and Rectal Surgery Section Chief Matthew Mutch, MD, and surgeon Steven Hunt, MD, have introduced a new standard of care for the treatment of locally advanced rectal cancer (LARC). This new regimen utilizes total neoadjuvant therapy to reduce the length of care, improve disease-free survival, and increase the chance of complete pathologic response in rectal cancer patients.

This new treatment administers five days of short-course radiotherapy, delivering the same biologic dose of radiation as the current standard of treatment in the United States in a shorter time. Systemic chemotherapy is then administered preoperatively. For patients with complete pathologic response to these therapies, nonoperative management can replace surgery if there is no residual tumor. Close surveillance ensures that, if the tumor grows back, it will be identified and treated with surgery.

The regimen is the result of an international multicenter clinical trial to study the impact of neoadjuvant therapies on disease-free survival of patients with LARC. Researchers at Washington University School of Medicine in St. Louis and Siteman Cancer Center were the only participants from North America involved in this phase 3 clinical trial.

The Rectal Cancer And Pre-operative Induction Therapy Followed by Dedicated Operation Trial (RAPIDO) compared conventional treatment of rectal cancer with an experimental treatment involving more preoperative therapy and shorter overall treatment time. The results of the RAPIDO Trial were published in the Journal of *Clinical Oncology* in May 2020.

The RAPIDO Trial is the first trial to demonstrate an improvement in a lower rate of distant metastases in high-risk LARC patients, meaning the new treatment regimen reduced the rate of disease-related treatment failure and increased the rate of survival. Colorectal surgeons at Washington University have found that systemic chemotherapy is better tolerated before surgery than after, patients receive more systemic chemotherapy when given before than after surgery, and more total patients receive systemic chemotherapy—and their rectal cancers are more likely to shrink—with total neoadjuvant therapy.

Clinical

Colon and rectal surgeons from the School of Medicine are addressing disparities in health care by expanding access to screening and treatment throughout the St. Louis area. The section has secured grants to provide funding for patients who cannot pay for routine colorectal cancer screenings. Surgeons from the section see patients at a growing number of clinical locations. Kerri Ohman, MD, joins the section, extending care to Christian Hospital and Siteman Cancer Center North County. Ohman completed a Colorectal Surgery fellowship and General Surgery residency at Washington University School of Medicine. Her specialty areas include colon and rectal cancer, anal cancer, inflammatory bowel disease, ulcerative colitis, and Crohn's Disease.

Surgeons in the section continue to participate in further clinical trials researching the impact of total neoadjuvant therapy on rectal cancer treatment.

At the School of Medicine, surgeons, radiologists, and oncologists take a truly multidisciplinary approach to managing rectal cancer, ensuring the most effective diagnosis, staging, and treatment.

"Patients with rectal cancer will receive multidisciplinary care every step of the way, including diagnosis, staging, and treatment," Mutch says. "We work closely with our colleagues in radiation oncology and medical

oncology to ensure that patients see all of the physicians they need in a timely fashion and receive the best possible care."

Decreasing Opioid Prescriptions

Surgeons and researchers at Washington University School of Medicine in St. Louis are working to reduce opioid use and prescriptions following surgical procedures. Practices of opioid prescribing vary widely across general surgery providers in the United States. The Section of Colon and Rectal Surgery is participating in a number of studies to assess opioid use and prescription practices after surgery.

A recent study led by general surgery resident Bradley Kushner, MD, in partnership with surgical oncologists, minimally invasive surgeons and colon and rectal surgeons, used a text-based platform called Epharmix to assess patients' post-discharge opioid utilization. The study, published in *Surgery*, sent text messages to enrolled patients after discharge inquiring about the number of opioid pills taken since discharge as well as pain medication refills. The study, which was funded by the Barnes-Jewish Hospital Foundation, found that all patients consumed 25 percent or less of their total prescribed pills.

In response to these findings, colon and rectal surgeons have decreased the number of pills they prescribe after abdominal and anorectal surgery. Reducing the prescription has not been found to have an impact on patient utilization, and surgeons did not see any significant increase in requests for refills.

Surgeons have also developed an updated patient journey guide and preoperative opioid practice education. The patient journey guide is meant to educate patients, families, staff nurses, and home care nurses on proper care of a colorectal surgery patient, while the opioid practice education informs patients about safe use of prescription medication following surgery.

"We then asked how we can decrease narcotic use in the postoperative period, while the patient is still in the hospital?" Colon and Rectal Surgery Section Chief Matthew Mutch, MD, says.

Surgeons in the section collaborated with colleagues in anesthesia to utilize the pain service for ileostomy closures and laparoscopic right colectomies. By providing preoperative adjunct pain control—such as a TAP block—and not administering patient-controlled analgesia in the postoperative period, the team has minimized narcotic use for these patients while still providing pain control. The section has since expanded this practice to all laparoscopic cases.

The Section of Colon and Rectal Surgery has long been committed to patient safety initiatives with the goal of providing up-to-the-minute care in all aspects of colon and rectal surgery.

By providing preoperative adjunct pain control… and not administering patient-controlled analgesia in the postoperative period, the team has minimized narcotic use for these patients while still providing pain control

Education

Residents are making critical contributions to research in colon and rectal surgery under the mentorship of Matthew Silviera, MD, MS. Lab resident Ebun Otegbeye, MD, is researching ways to identify patients at increased risk of postoperative complications. Using the National Institutes of Health (NIH)-validated Patient-Reported Outcomes Measurement Information System (PROMIS) tool, Otegbeye studied patient-reported outcomes related to overall function, physical ability, and gastrointestinal symptoms. These PROMIS scores provide an opportunity for physicians to intervene in the preoperative period to reduce a patient's risk of complications by engaging the patient in physical therapy, addressing medical issues, or providing other forms of rehabilitation prior to surgery.

Research

Colorectal cancer is the third most common cancer and cause of cancer death globally, according to the American Cancer Society. Surgical resident William Chapman, Jr., MD, MPHS, is collaborating with a team of biomedical engineers, pathologists, radiation oncologists, and radiologists at the School of Medicine to improve diagnostic and surveillance imaging for colorectal cancer patients. The results of a pilot study using a real-time co-registered photoacoustic and ultrasound tomography system to image ex vivo samples indicate the potential of using this system for future cancer screening and post-treatment surveillance of the colon and rectum. Chapman continues this research in the section with in vivo imaging, and continues to obtain funding for the project.

Hepatobiliary-Pancreatic and Gastrointestinal (HPB)

A Sentinel Career in HPB Surgery

Steven Strasberg, MD, retires from Washington University School of Medicine in St. Louis after a 50-year career in hepatobiliary-pancreatic and gastrointestinal (HPB-GI) surgery.

Strasberg joined the Department of Surgery faculty in 1992 and founded the Section of HPB-GI Surgery, of which he was the Chief until 2007. He is the Pruett Family Professor of Surgery and Carl Moyer Departmental Teaching Coordinator.

Strasberg's many prestigious honors include the American Surgical Association Medallion for the Advancement of Surgical Care and the Distinguished Service Award of the Americas Hepato-Pancreato-Biliary Association (AHPBA). He is a past president of the AHPBA and has published over 250 peer-reviewed papers and 50 book chapters.

In 2019, Barnes-Jewish Hospital recognized Strasberg's career with the Lifetime Achievement "Master Physician" Award. The annual award honors physicians for superlative service and commitment for 25 years or more at Barnes-Jewish Hospital and its predecessor institutions.

"Steve Strasberg has made sentinel contributions to the field of HPB surgery," says Section Chief William Hawkins, MD. "He was a leader in the development of the Brisbane Classification of Liver Anatomy. He was among the first to develop methods for how to grade surgical complications and classify bile duct injuries during cholecystectomy. Steve Strasberg's career has truly shaped our field."

He is perhaps best known for developing the Critical View of Safety method of identifying anatomic structures during cholecystectomy. This method has been internationally adopted by surgeons and endorsed by numerous surgical societies. Recently, as part of the Safe Cholecystectomy initiative by the Society of American Gastrointestinal and Endoscopic Surgeons, the method was highlighted as a key component of the national initiative to reduce injuries to the bile duct.

Strasberg has also served on the editorial boards of numerous journals, including the *Journal of the American College of Surgeons*, *Journal of Gastrointestinal Surgery*, and *Annals of Surgery*.

Throughout his career, Strasberg served as a mentor and colleague to many of today's leading experts in HPB-GI surgery, including David Linehan, MD; Nathaniel Soper, MD; Jeffrey Drebin, MD; and Pierre Clavien, MD, PhD.

As a resident at University of Toronto in the 1960s, Strasberg became very interested in studying the liver. He was seeing things in patients that had not yet been studied in depth, which piqued his curiosity.

"There was no specialty in surgery of the liver, pancreas, and biliatry," Strasberg recalls. Rather than seeing this as a problem, Strasberg saw an opportunity. He spent two years researching in Boston, then returned to Toronto where he took as many cases as he could in the field of HPB-GI and established a lab of his own.

Clinical

For patients with chronic pancreatitis, pain is almost constant and treatment options are limited. HPB surgeon Chet Hammill, MD, has introduced a procedure new to the School of Medicine to treat pancreatitis patients early in the disease progression. Total pancreatectomy and islet auto-transplant (TP-IAT) removes the pancreas while also harvesting islet cells and returning them to the patient. By giving the patient their own islet cells, TP-IAT reduces the risk of developing severe diabetes after pancreatectomy. This procedure is most suited to younger patients with a genetic predisposition who are most likely to have more functional islet cells at the time of pancreatectomy.

With this wealth of knowledge and experience, Strasberg then came to Washington University, where he has practiced and researched in the Department of Surgery ever since.

SPORE Supports the Future of Pancreatic Cancer Research

Through the National Cancer Institute-funded Specialized Programs of Research Excellence (SPORE) in Pancreatic Cancer, Siteman Cancer Center and Washington University School of Medicine have developed the Career Enhancement Program (CEP).

The primary objective of the CEP is to enhance pancreatic cancer research by providing financial support and mentoring for investigators who are new to the field to help build translational research careers in pancreatic cancer. Research initiatives funded by the CEP have a major translational component, focusing on etiology, prevention, diagnosis, early detection, treatment, or population science in pancreatic cancer.

One of the main objectives of the program is to promote participation of women and under-represented minorities in pancreatic cancer research. The CEP specifically seeks to increase the diversity of those participating in pancreatic cancer research through outreach, recruitment, training, and retention activities.

The CEP selects awardees from collaborating SPORE institutions and other qualified institutions. Financial support—including salary, research supplies, and tuition—is provided for awardees for up to two years. The CEP facilitates interactions between awardees and all members of the SPORE, emphasizing the basic and clinical science cross-fertilization that is essential to translational research.

Siteman, Washington University, and collaborating SPORE institutions provide outstanding opportunities for career development in translational pancreatic cancer research. The program has established intra-SPORE collaborations with the University of North Carolina, University of Rochester, and Johns Hopkins University, broadening the CEP applicant pool and helping to match the interests of junior investigators with local expertise and need.

The CEP has funded projects leading to clinical trials in pancreatic cancer, and CEP-funded investigators have published in top-tier journals, including *Cancer Discover*, *Clinical Cancer Research*, and *Cancer Immunology Research*.

Education

The Washington University Hepatobiliary-Pancreatic Surgery Fellowship is a two-year program that includes both clinical surgical training and a clinical research component. The program expanded to two years in 2020 to accommodate additional training in robotic and laparoscopic HPB surgery. The fellow works with Program Director William Hawkins, MD; Associate Program Director Chet Hammill, MD, MCR; HPB surgeons Ryan Fields, MD; Dominic Sanford, MD; and Steven Strasberg, MD; and is involved in treating a broad array and high volume of surgical patients with complex HPB conditions. The HPB fellow also rotates for up to three months on the Liver Transplant Service.

Research

HPB Section Chief William Hawkins, MD; David DeNardo, PhD; and Ryan Fields, MD, are examining how neoantigen expression shapes tumor immunity and progression in pancreatic and lung cancer. Their research, published in *Cancer Cell*, is a collaboration with researchers from across the medical school. Chief Resident Roheena Panni, MD, MPHS, has identified a molecule that, when activated in pancreatic ductal adenocarcinoma, may help address limitations of clinical strategies to overcome resistance to immunotherapy. Additionally, the section is a leading contributor to the CHOLECOVID Collaborative, an international multi-center appraisal of the management of acute cholecystitis during the COVID-19 pandemic.

Minimally Invasive Surgery (MIS)

All About the Patient

Minimally invasive surgery (MIS) provides opportunities for improved patient care with fewer and smaller incisions, reduced healthcare costs, and shorter recovery times than open procedures. In the past year, MIS surgeons at the School of Medicine have advanced patient care in robotic, laparoscopic, and endoscopic procedures.

Jeffrey Blatnik, MD; Sara Holden, MD; and Arnab Majumder, MD, are leaders in treating abdominal wall hernias with robotic surgery. Blatnik, whose contributions were instrumental in developing the metrics of the Abdominal Core Health Quality Collaborative, is focused on providing the best care and education for patients in this nascent, growing field. In a study published in *Surgical Endoscopy*, Blatnik found that nearly all patients learned about procedures and devices, such as surgical mesh, through Internet and media sources. This media exposure impacted patients' decision-making, emphasizing the importance of providing unbiased information for patients to help them make informed decisions and feel comfortable with their choices at the time of surgery.

Bariatric surgeons J. Chris Eagon, MD; Shaina Eckhouse, MD; and Francesca Dimou, MD, MS, offer laparoscopic procedures at the Weight Loss Surgery Program. Dimou has expanded the program's offerings to include robotic gastric bypass and sleeve gastrectomy. Benefits of robotic weight loss surgery include enhanced visualization, access to targeted anatomy, and improved ergonomics for surgeons when working with patients with high body mass index. Bariatric surgeons have further improved patient care through participation in the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program's Bariatric Surgery Targeting Opioid Prescriptions (BSTOP) initiative. BSTOP enhances patient recovery and pain management while reducing reliance on opioids.

Clinical

Minimally invasive surgeon Shaina Eckhouse, MD, is now Surgery Liaison for the Perioperative Services Leadership Team. Eckhouse leads a gender task force, working with members of each division and section to enhance and improve operating room (OR) culture and develop a peer advocate system for healthcare workers. This system will create more supportive channels for members of the OR team to communicate their concerns to a peer advocate in a supportive and non-confrontational environment. "Ultimately, the process has the potential to help everyone in the operating room come together," Eckhouse says. "We are all here to take care of the patient in the best way possible."

Since 2012, Michael Awad, MD, PhD, has offered therapeutic endoscopic procedures for conditions that affect a patient's ability to eat and drink, such as achalasia. Procedures including peroral endoscopic myotomy (POEM), flexible endoscopic Zenker's diverticulectomy, and the G-POEM procedure for gastroparesis restore normalcy to these patients' lives. Awad and Blatnik have performed over 250 POEM procedures to date, providing relief to patients across the region. In an upcoming publication, Awad reports on longstanding patient outcomes with achalasia to ensure that all patients receive the best treatment.

"That's what this is really about," says Awad, "our patients and their experience."

That's what this is really about…our patients and their experience.

The Future of Fellowship Interviews

A novel study of remote virtual interviews during the COVID-19 pandemic, conducted by Minimally Invasive Surgery (MIS) faculty and published in the *Journal of the American College of Surgeons (JACS)*, reveals a high degree of candidate satisfaction with the virtual process.

COVID-19 triggered rapid changes in medicine, including alterations to the interview process for surgical training. The Fellowship Council, which oversees the application and match process for all Advanced GI/MIS fellowships, issued an advisory in March 2020, stating that fellowship interviews should be conducted via alternative methods due to the pandemic. The Washington University Advanced GI/MIS Fellowship quickly pivoted from in-person interviews—scheduled for later that month—to Zoom virtual interviews.

Twenty total applicants—nine women and eleven men—were invited for interviews.

The JACS study, led by Arnab Majumder, MD; Shaina Eckhouse, MD; Michael Brunt, MD; and senior author Jeffery Blatnik, MD, describes the interview process, which includes the use of breakout rooms for one-on-one interviews and is one of the first pieces of research on virtual platforms for fellowship interviews.

“Our experience can serve as a template for other programs moving forward,” says Brunt.

Of the many adaptations that have taken place in response to COVID-19, Brunt, president-elect of the Fellowship Council, anticipates that use of remote teleconferencing as an alternative to in-person interactions will likely endure.

Applicant responses to an anonymous voluntary survey suggest that remote virtual interviews are a feasible and favorable alternative or adjunct to traditional in-person interviews.

The majority of interviewees rated their interaction with the program director, faculty surgeons, and current fellow using Zoom as being easy. Nearly 90 percent of candidates reported that the experience met or exceeded their expectations, and 70 percent noted little or no impact of not being able to conduct the interview in person.

The Advanced GI/MIS Fellowship had to rapidly shift to this virtual platform, but many other training programs in the department, School of Medicine, and across the country have since followed suit. By sharing their experience and results, the MIS section exhibits a model for training programs to provide an experience comparable in most respects to the traditional interview setting.

Education

The School of Medicine is a pilot center for a new entrustable evaluation process for Advanced GI/MIS fellowships. “This higher level of evaluation allows us to assess the level of autonomy or entrustment of a trainee’s ability to carry out patient care and surgical procedures,” says Michael Brunt, MD, MIS section chief and fellowship program director. MIS is a leader in surgical education. Surgeons Michael Awad, MD, PhD; Jeffrey Blatnik, MD; and Bethany Sacks, MD, Med, serve as general surgery associate program directors. Sacks is the director of the Integrated Medical Student Surgical Clerkship, and Brunt is president-elect of the Fellowship Council. This Fellowship Council pilot evaluation process marks a new milestone in advanced training of future surgeons.

Research

Section Chief Michael Brunt**,** MD, led a three-year effort to develop evidence-based recommendations for safe cholecystectomy and prevention of bile duct injury (BDI). A 2018 conference assembled experts from five surgical societies to develop a consensus guideline. The results, recently published in the *Annals of Surgery* and *Surgical Endoscopy*, make strong recommendations for use of intraoperative biliary imaging for uncertainty of anatomy or suspicion of BDI, and referral of patients with confirmed or suspected BDI to an experienced surgeon or multidisciplinary team. Brunt, president of the Central Surgical Association, collaborated with a team of experts including HPB-GI surgeons Steven Strasberg, MD, and Chet Hammill, MD, to develop this guideline.

Surgical Oncology

The Best in Breast Cancer Care

Surgical Oncology faculty lead a multidisciplinary team at the Breast Health Center who diagnose and treat women with breast cancer. Clinical trials advance patient care in breast cancer through innovative technologies, endocrine therapies, and personalized cancer vaccines.

Breast surgeon Julie Margenthaler, MD, professor of surgery, is principal investigator in a clinical trial to improve the visibility of cancer cells at the margin of the tissue removed in breast cancer surgery. The trial, which is a collaborative effort with Professor of Radiology Samuel Achilefu, PhD, from the Mallinckrodt Institute of Radiology, uses Cancer Vision Goggles and a contrast agent called LS301—both developed at the School of Medicine—to obtain real-time intraoperative visualization of breast cancer during surgery.

"The underlying hypothesis is that the accurate detection of all cancer cells highlighted by LS301 during surgery will reduce the number of breast cancer patients with margin positivity to less than 5 percent, compared to the current surgical paradigm of greater than 20 percent," says Margenthaler, president-elect of the American Society of Breast Surgeons. The group hopes to extend this trial into other solid tumors, including melanoma and pancreatic cancer.

For women ages 70 or older with ER+ tumors and good prognosis (low Ki67 scores), surgery as a definitive treatment may not be necessary. A clinical trial led by Professor of Surgery Rebecca Aft, MD, PhD, investigates whether neoadjuvant endocrine therapies provide adequate local and systemic control of breast cancer for this subpopulation of patients. The trial measures information on patients receiving endocrine therapies using the Functional Assessment of Cancer Therapy-Breast (FACT-B) questionnaire and analyzes archival tissue to measure risk of recurrence. The results of this trial may lead to a new standard of care for elderly women with good prognosis ER+ tumors.

Vice Chair for Research and Professor of Surgery William Gillanders, MD, has initiated clinical trials combining personalized neoantigen vaccines with current treatment options to prevent recurrence of triple negative breast cancer (TNBC). In this National Institutes of Health-funded research, Gillanders studies immune response to these vaccines, hypothesizing that enhancing T cell response to neoantigens can improve outcomes in patients with TNBC.

Cancer vaccine research extends to include clinical trials in pancreas cancer. In collaboration with the SPORE in pancreatic cancer, Gillanders is evaluating the safety and immunogenicity of a neoantigen DNA vaccine strategy in pancreatic cancer patients following surgical resection and adjuvant chemotherapy.

As clinical trials continue to advance treatment in breast and other cancers, surgeons at the School of Medicine are at the forefront of providing the best individualized patient care.

Clinical

Katherine Glover-Collins, MD, PhD, brings expertise in breast cancer surgery to Christian Hospital and Siteman Cancer Center North St. Louis County. Glover-Collins is a fellowship-trained breast surgeon with research experience in genetic mutations linked to breast cancer. Many women in North County are diagnosed with late-stage breast cancers due to health disparities in their community. She is addressing these disparities by promoting mammography screening, access to funds for underinsured women, and comprehensive cancer care. "If you are a breast cancer patient, you can receive all of the care that you need," Glover-Collins says. "From surgery to medical oncology and radiation therapy, patients can receive the same excellent care in North County."

Personalized and Precision-Based Cancer Care

A better understanding of how tumors progress to metastasis could lead to improved methods of diagnosis and treatments of cancer that has spread to other organs, such as the liver or brain.

Two recently published studies outline colorectal cancer evolution from primary tumor to metastasis. These studies are the culmination of cross-disciplinary research between the labs of co-senior authors, Chief of Surgical Oncology Ryan Fields, MD, and Assistant Director of the McDonnell Genome Institute Christopher Maher, PhD.

The first study, published in *Nature Communications*, led to the discovery of 150 long, noncoding RNAs that may contribute to metastasis.

This study analyzed normal tissue, colon tumors, and metastatic tumors from the same patient, finding that a molecule called RAMS11 was associated with metastatic tumor progression and resistance to chemotherapy. Using CRISPR gene editing technology, the researchers turned off RAMS11 in colorectal cancer cells, which caused the cells to become less aggressive.

“There is a significant unmet need in clinical oncology to identify new markers of cancer that can reliably predict and stratify low- and high-risk patients,” Fields says. “This will allow oncologists to move from ‘one size fits all’ to a ‘personalized and precision-based’ approach that will reserve aggressive and higher risk treatments to those who need it most, sparing those who do not need it the unnecessary side effects. We hope to explore further the ability of RAMS11 and other biomarkers to do just that.”

The second study, published in *Science Advances*, sequences the genome of nearly 100 tumor samples collected from eleven patients with metastatic colorectal cancer who underwent treatments at Siteman Cancer Center. The researchers detailed the heterogeneity of these tumors and reconstructed how the cancer evolved in these patients.

These findings will impact future strategies to target, and ultimately inhibit, the progression of metastases.

“Tumor heterogeneity is a challenge in treatment of advanced colorectal cancer,” Fields says. “The more complex the tumors are, the more difficult to treat them.”

These two companion studies provide novel insights into the biology of colorectal cancer. The ongoing work of Fields and Maher will further explore and validate these findings and may lead to novel diagnostics and therapeutics in solid tumors.

Research

Surgical oncologists are performing novel research to transform cancer care through scientific discovery. Assistant Professor of Surgical Oncology Beth Helmink, MD, PhD, leads a research laboratory focused on immune response to cancer therapies. Immunotherapies are an important form of cancer treatment, but they can trigger an autoimmune response in patients. Helmink's research aims to target this immune response to fight cancer while reducing its impact on the patient's overall health. Endocrine surgeon Taylor Brown, MD, researches the deadliest form of thyroid cancer—anaplastic thyroid carcinoma. For his ongoing research, Brown was awarded a research grant from the American Association of Endocrine Surgeons and the Thyroid Cancer Survivors' Association.

Education

Endocrine surgeon T.K. Pandian, MD, MPH, is now site director for surgical oncology medical student education. Pandian is developing new initiatives to increase feedback and evaluation of medical students during rotations, as well as a clinical immersion experience in Surgical Oncology. "This is an opportunity to globally immerse medical students in the clinical environment," Pandian says. To further his goals as a surgeon-educator, Pandian joined the Teaching Scholars Program, a twelve-month certificate program designed to enhance knowledge and skills and develop future leaders in healthcare education with a focus on educational scholarship and curriculum development.