



Keystone-Integrated Science Courses (KISCs), 2023–2024

M81 705 Introduction to Addiction Medicine

Kevin Baumgartner, MD

Emergency Medicine; Toxicology

David Liss, MD

Emergency Medicine; Toxicology

M81 710 Multidisciplinary Adult Neuro-Oncology

Albert Kim, MD, PHD

Neurosurgery; Neurology

Michelle Miller-Thomas, MD

Radiology; Diagnostic Radiology; Neuroradiology

Sonika Dahiya, MD

Pathology and Immunology; Neuropathology

M81 715 Diabetes Care from A to Z

Linda Pike, PhD

Biochemistry and Molecular Biophysics

Maamoun Salam, MD

Medicine; Endocrinology, Metabolism, and Lipid Research

Alexis McKee, MD

Medicine; Endocrinology, Metabolism, and Lipid Research

M81 720 Comprehensive Approach to Disability

Thy Huskey, MD, FAAPMR

Neurology; Neurorehabilitation

Kerri Morgan, PhD, OTR/L, ATP

Program in Occupational Therapy and Neurology

M81 725 Infectious Diseases and Health Equity

Caline Mattar, MD

Medicine; Infectious Diseases

Darrell Hudson, PhD

Brown School of Social Work; Sociology; Psychiatry

M81 730 Integrated Oncology: Basic, Clinical, and Social Science Perspectives on the Cancer Continuum

Jason Frankel, MD

Surgery; Urology

Erika Waters, PhD, MPH

Surgery; Public Health Sciences

M81 735 Pediatric Neurocritical Care: Onset to Outcomes

Jennifer Griffith, MD, PhD

Neurology; Pediatric Neurology

Mary Hartman, MD, MPH

Pediatrics; Critical Care Medicine

M81 740 Science, Medicine and Societal Effects of Pain

Jordan McCall, PhD

Anesthesiology

Loc Thang, MD, PhD

Anesthesiology; Pain Management

M81 745 Advancing End-of-Life Care

Ellen Binder, MD

Geriatrics

Brian Carpenter, PhD

Psychological and Brain Sciences

Patrick White, MD, HMDC, FACP, FAAHPM

Palliative Medicine

M81 750 Holistic and Interdisciplinary Approach to Surgical Critical Care

Justin Knittel, MD

Anesthesiology

Jessica Nelson, MD

Anesthesiology; Emergency Medicine

M81 755 Precision Medicine: Incorporating Genomics into Cutting-Edge Patient Care

Ian Hagemann, MD, PhD

Pathology and Immunology; Obstetrics and Gynecology

Felicia Gomez, PhD

Medicine; Oncology; Stem Cell Biology

M81 760 Recognizing and Mitigating Maternal and Infant Health Disparities

Colleen Wallace, MD

Hospital Medicine; Pediatric Hospital Medicine

Jeannie Kelly, MD, MS

Maternal-Fetal Medicine; Ultrasound



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M81 705 Introduction to Addiction Medicine

Instructors: Dr. Kevin Baumgartner, Dr. David Liss

Substance use disorders and addiction impact every area of medicine, from primary care and psychiatry to plastic surgery and Physical Medicine & Rehabilitation. The Introduction to Addiction Medicine KISC will introduce students to this important field and equip them with the tools to understand the science and socioeconomics of addiction medicine. The course will also supply students with the practical bedside experience and focused coaching necessary to provide empathetic evidence-based care to patients with substance use disorders in any clinical setting.

Students in this KISC will explore the foundations of addiction in genetics, neuroscience, and psychopharmacology, as well as evidence-based treatment of substance use disorders and systemic and societal barriers to care. Learning will take place through didactics, asynchronous and independent work, team-based learning, patient and expert panels. Clinical experience will occur in a diversity of settings including inpatient addiction medicine consultation services, outpatient clinics, and residential treatment facilities.

M81 710 Multidisciplinary Adult Neuro-Oncology

Instructors: Dr. Albert Kim, Dr. Michelle Miller-Thomas, Dr. Sonika Dahiya

The Multidisciplinary Adult Neuro-Oncology KISC teaches the foundational science behind adult primary central nervous system (CNS) tumors utilizing case-based learning and applies those foundational principles to modern multidisciplinary care of neuro-oncology patients through the lenses of neuroradiology, neuropathology, neurosurgery, medical oncology, and radiation oncology. Students participate in the care of a patient from diagnosis through surgery and characterization of their tumor, culminating in a patient presentation to the multidisciplinary tumor board for subsequent medical and radiation therapy recommendations. Students explore how tumor biomarkers inform individualized treatment plans, how the challenges of providing equitable advanced care to a diverse patient population in the region are addressed, and how bench research and clinical trials are contributing to the rapid advancement of clinical care.

Students spend the first week of the course learning about the basic science and clinical foundations of neuro-oncologic care through lectures, case-based group learning, and independent study. This will include leading edge topics in neuro-oncology diagnosis and treatment include genomics, epigenetics, immunotherapy, molecular pathology, and advanced neuroimaging. During weeks two and three, students will rotate with neuroradiologists, neuropathologists, neurosurgeons, neuro-oncologists, and radiation oncologists to participate in the care of neuro-oncology patients in the radiology department, the pathology department, clinics, and the operating room. The impact of complex cancer care on patients and families, and the healthcare systems in place to equitably deliver this care, will be explored during clinic visits and panel discussions. During week four, students may elect to spend time visiting neuro-oncology research labs at Washington University and/or return to one or more areas for additional clinical time.



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M81 715 Diabetes Care from A to Z

Instructors: Dr. Linda Pike, Dr. Maamoun Salam, Dr. Alexis McKee

The focus of the Diabetes Care from A to Z KISC is to fully understand diabetes mellitus across a continuum from the standpoint of a basic scientist to its translation as a skilled bedside clinician. The course curriculum will explore basic science topics such as normal glucose metabolism in addition to the pathophysiology of type 1 and type 2 diabetes. Students will learn about the exciting landscape of therapies for diabetes including novel oral and injectable medications along with advanced technologies such as continuous glucose monitoring and hybrid closed loop insulin pump therapy. Students will be given the opportunity to assess the output of these devices and learn how to incorporate that information into their management of patients with diabetes. Finally, emphasis will be placed on helping the students understand the need for collaboration among an interdisciplinary team of specialists to provide optimal care for individuals with diabetes.

This elective is four weeks long. The first week is primarily classroom-based and provides the foundation for the subsequent 3 one-week clinical rotations on an in-patient service, an out-patient service, and at a community-based site. This approach will allow the students to cultivate an appreciation for the racial/ethnic disparities in access to diabetes medications and technology and how this impacts outcomes in individuals with type 1 and type 2 diabetes. This will help students to incorporate consideration of the social determinants of health into their patient management strategies. One day during each of the clinical weeks will be set aside for case presentations by students, additional hands-on activities, and seminars on the latest advances in understanding and treating diabetes by Washington University School of Medicine faculty.

M81 720 Comprehensive Approach to Disability

Instructors: Dr. Thy Huskey, Dr. Kerri Morgan

The goal of Comprehensive Approach to Disability - From Bedside to Living Well is to offer students the opportunity to build comfort and confidence working with patients with a disability and to understand the wider context of their lives beyond the healthcare setting. Persons with a disability (mobility, cognitive, sensory, mental health, etc.) make up 25% of the population and are three times more likely than persons without a disability to interact with health care. However, research has shown that most physicians are not confident in their ability to provide quality care to these patients. This contributes to poorer physician-patient relationships and health care disparities. The information offered in this course is useful for any specialty which demands a high degree of patient interactions, and is especially pertinent, but not limited to: Physical Medicine & Rehabilitation, Orthopaedic Surgery, Neurology, Neurosurgery, General Surgery, Internal Medicine, Pediatrics, OBGYN, and Psychiatry.

In this course, medical students will be immersed in the complex and often challenging world of living with a disability. Topics such as models of disability, disability history, community programs and services, environmental modifications, assistive technology, physical activity and adaptive sports, health care access, sexuality and parenting, employment, ableism, and governmental structures and policies will be explored. We will enhance students' ability to answer questions such as, "What will my patient's life look like after discharge?", "How can I help my patients live in a way that is meaningful to them?", "How can I



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practice in a way that is accessible to all patients?”, and “How do I interact effectively with patients with a disability?”. The course will use didactic strategies, such as assigned readings, lectures, videos, and small group discussions, as well as active participation at designated sites, such as the Rehabilitation Institute of St. Louis and Paraquad, a community disability organization.

M81 725 Infectious Diseases and Health Equity

Instructors: Dr. Caline Mattar, Dr. Darrell Hudson

Health inequities place those who are already the most socially and economically marginalized at even greater risk for infection, severe disease and death. The impact of health inequities has been exacerbated by the COVID-19 pandemic. This 4-week KISC will engage learners in identifying determinants and propose solutions to disrupt the systemic health inequities that disproportionately affect disparity populations: patients with fewer socioeconomic resources as well as those from historically marginalized groups. It will blend didactic and experiential learning focusing on the intersection of Health Equity/Social Determinants and key infectious diseases, both at WUSTL, the county and city health departments and the new North County multi-specialty clinic.

Students will have a two-week outpatient focused rotations and two-week of hospital-based learning. Every week, a full day or equivalent, will be dedicated to public health experiential learning and didactics. The students in all their clinical rotations, will be expected to develop a critical, Social Determinants lens and will have the opportunity to learn about the available resources to assist patients. Weekly Social Determinants of Health Rounds, meeting local public health leaders and a simulation are few of the innovative experiences planned for this course. This KISC will also address the Gender dimension and trans health from the perspective of stigma, access to care and infectious diseases.

M81 730 Integrated Oncology: Basic, Clinical, and Social Science Perspectives on the Cancer Continuum

Instructors: Dr. Jason Frankel, Dr. Erika Waters

The Department of Surgery’s Keystone Integrated Science Course (KISC) entitled, Integrated Oncology: Basic, clinical, and social science perspectives on the cancer continuum aims to provide learners with experiences that will foster their ability to gain a broad knowledge base regarding cancer care. The course will take the student on a journey through the spectrum of cancer care, from cutting edge translational science to the impact of cancer and cancer care on the community. The student will be exposed to a diverse array of topics, including strategies for cancer screening and management as well as structural factors influencing the delivery of care. Activities will include lectures from local experts, readings, discussions, and, critically, exposure to clinical and community activities. There will be a strong emphasis on health equity principles (e.g., the equal worth of all human beings, nondiscrimination and equality in opportunities to achieve optimal health). Assignments will include reflective writing and analysis that can be tailored to a specific oncologic interest. Learners will gain a deeper, more meaningful understanding of the rich variety of factors that shape the health and well-being of their patients. This understanding, in turn, will translate into more effective and equitable cancer care.



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M81 735 Pediatric Neurocritical Care: Onset to Outcomes

Instructors: Dr. Jennifer Griffith, Dr. Mary Hartman

Effective delivery of pediatric neurocritical care (PNCC) requires the integration of highly complex, multisystem care in the pediatric intensive care unit (PICU) with cutting-edge science. However, for PNCC patients and their families, the acute experience of and recovery from a devastating neurologic injury is inherently a human experience that also requires a coordinated, compassionate and dedicated approach from their health care team. The goal of the Pediatric Neurocritical Care KISC is to reinforce the relationships between management in the acute care environment, long-term outcomes, and the scientific inquiry that supports both of these endeavors.

In this KISC, students will complete 3-4 modules (each 1-1.5 weeks in duration, organized around a core PNCC condition). Each module consists of reading/independent study and journal club, exposure to patient care and family narratives, exposure to the multiprofessional health care providers within each condition/specialty, and recurring debrief and thematic exploration sessions with the KISC co-directors. For each module, patients are identified (as possible), and students will follow the PNCC patients through multiple clinical environments (PICU, inpatient ward, neurorehabilitation, and outpatient NCFP clinic), evaluating how the healthcare systems change during a patient's care. Students will work with both physicians and non-physician team members, participate in multidisciplinary meetings, and have multiple shadowing opportunities. The key applied activity for the students will center on use of the module curriculum and clinical exposure to develop semi-structured interviews for (at least one) of the PNCC patients and/or families to elucidate a richer understanding of the medical experience. In the journal clubs, students will be led by Wash U investigators who are advancing PNCC basic science in traumatic brain injury (TBI), cardiac arrest, epileptogenesis, stroke/metabolic stress, neuromonitoring, extracorporeal membrane oxygenation (ECMO), neuroplasticity, and post-ICU syndrome. Group debriefs will allow students to compare experiences and reflect on how social determinants of health have impacted care or outcomes. In the final project, students will combine science, health systems, and social factors into a narrative of the patient's illness from onset to outcome.

M81 740 Science, Medicine and Societal Effects of Pain

Instructors: Dr. Jordan McCall, Dr. Loc Thang

According to a recent systemic literature review, the average United States medical school graduate receives only 11 hours of pain education. This brief exposure is discordant with the impact of pain on clinical medicine and is not enough to adequately respond to societal needs for pain treatment. The prevalence of pain, the negative consequences of untreated pain, disparities in access to pain treatment, and the potential for misuse and abuse of commonly-prescribed analgesics makes pain management a critical public health challenge. The Science, Medicine, and Societal Effects of Pain KISC will use the Learn-Apply-Consolidate-Explore (LACE) pedagogy to introduce students to the neuroscience, sociology, and psychology of pain. Students will learn about the neurocircuitry of pain perception, modulation, and related psychological phenomena. They will understand fundamental basic science behind preclinical pain research and begin to be able to interpret these types of studies. They will investigate how social determinants of health affect pain. Students will apply these neuroscience principles and their understanding of social determinants of health into the practice of pain medicine, and learn how to



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assess, measure, examine, and treat patients with various pain conditions including acute pain, chronic and cancer pain. At the end of the course, the students will consolidate these aspects of pain medicine into a multidimensional biopsychosocial model.

Concurrently throughout the course, students are immersed into the cutting-edge science of basic and clinical pain research. They will explore basic preclinical pain modeling to help understand the neurobiology underlying this disease and how this translates into clinical pain research including what the critical limitations to each branch of research. This course uses a variety of instructional methods including didactics, case-based discussions, clinical care of patients in and out of the hospital settings, self-learning through research, reflective project completion, laboratory discovery, and scientific journal club presentation. Together we expect this course to more properly prepare future physicians to tackle the important public health challenge that improper pain management presents.

M81 745 Holistic and Interdisciplinary Approach to Surgical Critical Care

Instructors: Dr. Justin Knittel, Dr. Jessica Nelson

This KISC aims to provide learners with the skills needed to excel in the unique and challenging environment of the Surgical Intensive Care Unit. This course is a combination of education and instruction on critical care concepts, hands-on skills sessions, and case-based discussions, revolving around longitudinal, clinical care of critically ill patients. Students will integrate into one of the ICU teams, participating in rounds each morning by formulating a care plan for each of their patients. Afternoon education sessions will revolve around core concepts in critical care medicine, such as mechanical ventilation, shock, and transfusions, while also exploring more holistic topics, such as leading a medical team, family meetings, and post-ICU placement.

Students will examine the question of how health equity, race, and ethnicity play significant roles in outcomes for critically ill patients through interactions with the ICU social workers, who are an integral part of the ICU team and help address some of the profound barriers to health that critically ill patients can experience. In addition, time will be spent exploring some of the cutting-edge areas in critical care, including telemedicine, the digitization of healthcare, and the role of artificial intelligence. Multiple hands-on skill sessions led by faculty and fellows that cover the basics of line placement, airway management, ICU monitoring, and ultrasound assessment will also be established using simulation and 3D models. Upon completion of this rotation, students will have a greater grasp of the complex, multi-faceted approach needed to treat these complicated and critically ill patients.

M81 750 Advancing End-of-Life Care

Instructors: Dr. Ellen Binder, Dr. Brian Carpenter, Dr. Patrick White

Medical professionals from across specialties need specific knowledge and skills to help patients and their care partners navigate the challenges of serious and end-stage illness. The goal of the Advancing End-of-Life Care KISC is to immerse students into contemporary issues surrounding serious illness and end-of-life care. Care for people at the end of life involves not only aggressive symptom management, but also attention to psychological, social, and spiritual issues, all of which contribute to the quality of life up to



the moment of death. Therefore, the KISC takes a multilevel and interprofessional perspective. Students will gain foundational knowledge about basic physiological processes in serious illness, how they influence the illness trajectory and experience, and how they are managed clinically. In parallel, students will learn about working with an interprofessional team to address quality of life across domains, with information about evidence-based interventions from psychological-social-spiritual perspectives. Students will learn and demonstrate ways to effectively communicate bad news to patients and family members experiencing end-of-life care issues and related medical decisions, including strategies that are respectful of patient's and family member's cultural and ethnic backgrounds in discussions of goals of care and advanced care planning. Finally, students will learn about legal and ethical principles governing the physician-patient relationship in the context of end-of-life and terminal illness care, and the larger healthcare system in which end-of-life care unfolds, with attention to issues of equity and justice.

During the KISC, students rotate through four different clinical settings, each for one week, including a residential hospice, inpatient palliative care consult service, outpatient geriatrics clinic, and inpatient pediatric palliative care service. The KISC makes use of several learning methods, including self-directed readings and videos, case-based learning, group discussions, and reflective writing. By the close of the KISC, students will leave with a comprehensive knowledge about the end-of-life care landscape and skills in navigating serious illness care.

M81 755 Precision Medicine: Incorporating Genomics into Cutting-Edge Patient Care

Instructors: Dr. Ian Hagemann, Dr. Felicia Gomez

This KISC will expose learners to the many facets of precision medicine, provide an opportunity for experiential learning, and create a space to discuss the benefits and harms of precision medicine. Some students will choose this course in preparation for a career in pediatrics, medical genetics, hematology/oncology, nephrology, cardiology, or pathology—all fields in which precision medicine will play a role. Others will choose it to gain hands-on experience using the tools of precision medicine, which are dual purposed as tools for biomedical research. Finally, for some students the course will be valuable as a window into social issues including advocacy, communication, diversity, equity, and medical ethics, and systems issues including health economics and biomedical innovation.

Students will initially engage in interactive small group didactics to understand basic and clinical foundations of precision medicine as well as relevant social and systems issues. In wet-laboratory sessions, students will apply what they learned in class to extract DNA from tissue samples, create a sequencing library and generate genomic data. Through dry-lab exercises, they will then analyze the resulting data using bioinformatics tools. Students will spend three half-days during the rotation in a clinical setting where they will observe the clinical practice of precision medicine. Anticipated assignments include a reflective writing assignment, patient presentation, and group presentation of wet and dry lab experiences. This KISC will provide a comprehensive experience of precision medicine from the perspective of the physician, the laboratory, and the patient. This multi-level appreciation will allow the learner to approach further interactions with precision medicine with the confidence that comes from firsthand experiences.



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M81 760 Recognizing and Mitigating Maternal and Infant Health Disparities

Instructors: Dr. Colleen Wallace, Dr. Jeannie Kelly

Disparities in maternal and infant health are a significant problem in the St. Louis region, and in the nation overall. The Recognizing and Mitigating Maternal and Infant Health Disparities KISC will explore the many factors contributing to these disparities, including historical trauma, structural racism, and barriers to accessing to care. Specific topics include opioid use disorder, mental health, diabetes, cardiac disease, intimate partner violence, breastfeeding and infant nutrition, and infant safe sleep practices. Additionally, a significant amount of time will be spent in advocacy activities and with community care partners where students will experience alternative models of providing prenatal care with an interprofessional focus. Students will gain a strong understanding of the factors contributing to disparities in maternal and infant health and develop strategies to improve health outcome equity for mothers and children.

This KISC will incorporate individual pre-work, active classroom-based pedagogies, and experiential learning. Students will be provided time for Required Preparation, such as the biologic basis for opioid use disorder and impact on exposed infants, best practices in supporting women who are victims of violence, and background readings such as “For the Sake of All Report” and “Setting the Standard for Holistic Care of and for Black Women – Black Mamas Matter Alliance.” Classroom-based learning will include interactive discussions with guest speakers and experts from all the fields represented, which will prepare students to fully engage in the experiential learning elements of the KISC. The experiential learning component of this KISC will include participation in a variety of clinical settings and with several community partners committed to improving maternal/ infant health in the St. Louis region. Clinical sites include Affinia Health Care, the CARE Clinic for pregnant women with substance use disorders, the My HEART prenatal clinic for women with cardiac disease, Psychiatry clinics for pregnant and post-partum women, the Barnes-Jewish Hospital Labor & Delivery and post-partum units, the Barnes-Jewish newborn nursery, and the St. Louis Children’s Hospital Newborn ICU. Experiential learning will also include multiple interprofessional care partners including nurses, social workers, psychologists, dieticians, and lactation specialists. The final week of the KISC, students will utilize what they have learned from the current literature and resources to present a topic of their choosing related to maternal and infant health disparities. Students will also reflect on how the KISC has impacted their professional identity formation and future career plans.