

Research mentors

BIDMC Department of Anesthesia,
Critical Care and Pain Medicine



Beth Israel Lahey Health

Cardiac Anesthesia

Feroze Mahmood, MD

Dr. Mahmood and members of his laboratory investigate the use of three-dimensional echocardiography in the context of cardiac valvular surgery and applies advanced analytical techniques to ascertain and describe valvular geometry and its role in pathophysiological circumstances. Most recently Dr. Mahmood began investigating the role of rapid prototyping with the goal of innovating future practices for valve surgery and endovascular aneurysmal repair.

Robina Matyal, MD

Dr. Matyal research interests focus on advanced echocardiographic measurements of valvular surgery, including the design of a multimodal curriculum to teach ultrasonography to trainees, nurses, and faculty and developing an index to measure proficiency in ultrasound. Additionally, basic science in her lab investigates the utility of neuropeptide Y in promoting angiogenesis in ischemic myocardium, the impact of cardiopulmonary bypass on cellular processes in normal and diabetic myocardium, and the genetic basis of cardiac surgical complications such as postoperative atrial fibrillation.

Balachundhar Subramaniam, MD

Dr. Subramaniam's research program is focused in three domains, namely perioperative hemodynamics, postoperative neurocognitive function and wellness resilience. Current hemodynamic studies are aimed at identifying dynamic biomarkers of intraoperative instability and blood pressure complexity indices that can predict surgical risk, evaluating associations between perioperative hypotension and adverse outcomes in patients undergoing vascular surgery and developing light enhanced transesophageal echocardiography. Key neurocognitive investigations in cardiac surgery include the use of intravenous acetaminophen for the prevention of postoperative delirium, the association between intraoperative hypotension and postoperative delirium and the effectiveness of a pecto-intercostal fascial plane block as a therapy for postoperative analgesia. Dr. Subramaniam has a particular interest in evaluating use of meditation in the perioperative setting and beyond and has a significant amount of research in this area.

Critical Care

Brian O'Gara, MD MPH

Dr. O'Gara's research interests involve the conduct of perioperative clinical trials that evaluate the effects of various anesthetic and non-anesthetic interventions on postoperative outcomes. Ongoing investigations study the impact of cognitive prehabilitation on postoperative delirium, the effect of anesthetic choice on lung inflammation after cardiac surgery, and the adjunctive use of virtual reality for surgical procedures. In addition to this work, Dr. O'Gara is involved with retrospective database projects investigating the relationship between exposure to different types of surgery and the subsequent development of depression.

Shahzad Shaefi, MD MPH

Dr. Shaefi research interests focus on translational and clinical areas of research that investigate the most appropriate perioperative administration and titration of oxygen. His current areas of research interest include hyperoxia and its neurocognitive effects in cardiac anesthesia, as well as the role of more titrated oxygen therapy in critical illness. The translational aspect of investigations in the Shaefi lab aim to further delineate aspects of the mechanisms underlying the benefit observed with the administration of low dose exogenous carbon monoxide. These effects are being more fully elucidated in preclinical models and form the basis for subsequent stepwise clinical investigations in healthy volunteers, patients undergoing major cardiac and non-cardiac procedures as well as critically ill patient populations.

Daniel Talmor, MD MPH

The focus of Dr. Talmor's research career has been the early identification and treatment of critical illness, and in particular optimal care for respiratory failure and delivery of mechanical ventilation. In particular, Dr. Talmor has extensive experience in esophageal manometry and evaluation of optimal ventilator settings guided by transpulmonary pressures. As the Chair of the Anesthesia Department, Dr. Talmor supports many investigators in fields spanning intensive care outcomes, perioperative outcomes, anesthetic management and echocardiography, all while maintaining his own active portfolio of critical care studies. Dr. Talmor also brings an interest in the application

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of data and analytics to the improvement of patient outcomes.

Obstetrics

Philip Hess, MD

Dr. Hess' primary research interests focus on pain management during labor and delivery and span several aspects of obstetric care. In previous investigations Dr. Hess has identified an association between labor pain and dysfunctional labor, and confirmed that quality of labor affects success of pain control. His ongoing research interests also address innovative techniques to improve labor pain control, as well as methods for pain control after cesarean delivery. Ongoing investigations in Dr. Hess' lab include evaluation of CSF in pregnancy, assessment of thromboelastography in patients with a Factor XI deficiency, efficacy of dexmedetomidine administration in the prevention of symptoms after cesarean delivery, effectiveness of two different epidural catheters, as well as cardiac function among pregnant women.

Yunping Li, MD

Dr. Li's basic research portfolio includes investigations that evaluate the role of Src signaling, in which she has observed that it is required for myometrial activation and contractile phenotype switch before labor onset. In addition to her basic science research, Dr. Li is also pursuing clinical research that demonstrates that epidural analgesia will not prolong the second stage of labor and that epidural use can lower the concentration of local anesthetics. Dr. Li is currently involved in prospective research in China in which she evaluates gastric emptying during labor and optimal post cesarean delivery pain control, as well as the relationship between antenatal platelet counts and obstetric outcomes in retrospective evaluations.

Pain

Jatinder Gill, MD

Dr. Gill's research interests span pain medicine, with a particular focus on the effectiveness of percutaneous spinal cord stimulator devices. In addition, Dr. Gill has conducted a retrospective cohort study to analyze long term outcomes of an epidural blood patch, as well as several investigations to develop radio-anatomic landmarks for the posterior lumbar and cervical epidural spaces. Recently Dr. Gill started several prospective randomized clinical evaluations, both of neuroanatomical lead position in the treatment of chronic back and leg pain, as well as investigations of safety and efficacy of clonidine micro-pellets for the treatment of pain associated with lumbosacral radiculopathy.

Thomas Simopoulos, MD

Dr. Simopoulos' research is focused primarily in interventional pain management. In specific, his focus is on outcomes of patients receiving percutaneous disc decompression and radiofrequency lesioning. In addition, most of his current work is on improving the outcomes

of patients undergoing spinal cord stimulation for pain by studying complications and developing strategies for potential mitigation.

Quality and Innovation

Cullen Jackson, PhD

Dr. Jackson works on identifying and implementing methods for improving quality and patient safety in the healthcare environment. His research currently focuses on applying cognitive science and human factors engineering theories and methods to challenges in the surgical setting with particular focus on individual, team, and system performance assessment and augmentation, including simulation-based training. Prior to joining Beth Israel Deaconess Medical Center, Dr. Jackson led various defense-related research and development efforts to design systems and techniques for measuring the impact of technology on operator performance for training and technology evaluation, and for conveying information to aid in decision-making.

Satya Krishna Ramachandran, MD

Dr. Ramachandran's research is focused on patient safety and perioperative healthcare quality. In his current role he has developed several programs, including a unique quality tool that connects clinician medication management behaviors with patient and efficiency outcomes. He also led anesthesia clinical change management and surveillance of safety in response to the shortage of intravenous opioids. Outcome research from Dr. Ramachandran focuses on prediction and prevention of perioperative cardio-respiratory complications, as well as prediction and mechanisms of sleep apnea-related adverse events. In addition, Dr. Ramachandran has several previous and ongoing clinical studies that evaluate the influence of lung volume reduction on perioperative sleep related breathing disorders, the relationship between pain sensitivity and opioid induced respiratory depression in patients with sleep apnea and trials aimed at forecasting adverse events using real-time analysis of time series data.

Education

John Mitchell, MD

Dr. Mitchell's research interests investigate the provision of feedback, development of non-technical skills such as professionalism and interpersonal communication, and support for resident wellness as part of the development of trainees. Dr. Mitchell and members of the Education lab are currently pursuing several initiatives aimed at improving feedback quantity, quality, and utility, including an ambulatory surgical patient survey that allowed assessment of residents' professionalism and communication skills. Data from this tool is being used to construct and evaluate a curriculum for trainees that evaluates whether providing residents individualized feedback from ambulatory surgical patients and performing targeted reflective work can improve resident performance.

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Perioperative Outcomes

Matthias Eikermann, MD PhD

Dr. Eikermann's laboratory utilizes an electronic database to investigate the effects of patient characteristics and intraoperative factors on postoperative outcomes. They investigate highly granular pharmaco-physiological patient data to understand the effects of new treatments in vulnerable patients recovering from surgery. Dr. Eikermann's laboratory is also involved in several prospective clinical studies that verify and improve effectiveness and implementation of treatment strategies identified as promising in retrospective database studies.

Basic / Translational

Rami Burstein, PhD

Dr. Burstein's research is currently focused on understanding the complex sensory, affective, autonomic and cognitive experiences described by patients before, during and after headache attacks. In pre-clinical studies, he attempts to unravel the neural basis of migraine-associated symptoms and the physiological and molecular events that mediate the development of neuronal plasticity. Several clinical studies are aimed at documenting novel aspects of migraine-associated neurological symptoms as it guides pre-clinical studies. Members of Dr. Burstein's lab are currently investigating the neurobiology behind migraine triggers and have examined in recent years the physiological basis of light and touch sensitivity in some migraine sufferers.

Dan Levy, PhD

Dr. Levy's research seeks to define the mechanisms underlying the onset of headaches - vital information that is required for the development of better evidence-based therapeutic approaches that can prevent their onset, in cases such as migraine. To decipher the triggering mechanisms of headache, studies combine these neural recording approaches as well as behavioral studies in rodent models with pharmacological tools to investigate key cellular and molecular processes that modulate the ongoing activity and mechano-sensitivity of meningeal afferents in responses to endogenous and exogenous conditions that can be linked to headache genesis.

Maria Serena Longhi, MD PhD

Dr. Longhi's research focuses on the immune mechanisms modulating the balance between effector and regulatory cells in acute and chronic inflammatory conditions of the liver and intestine, specifically autoimmune hepatitis and inflammatory bowel disease. Current investigations evaluate the mechanisms leading to CD39 impairment to define how this is impacted by interactions between the hydrocarbon and the oxygen related pathways. Her studies aim at dissecting the role on unconjugated bilirubin, the regulation of aryl hydrocarbon receptor signaling in human autoimmune liver diseases, and the transcriptional and post-transcriptional regulation of CD39 in inflammatory bowel disease. Dr. Longhi is also studying how alterations of the purinergic signaling impact predisposition to pneumonia in animal models of liver trauma and in human trauma patients.

Simon Robson, MD PhD

Dr. Robson's research involves innovative work in vascular biology, immunity, immunometabolism and purinergic signaling. His focus over the past several decades has been on the discovery, characterization and investigations of mammalian ectonucleotidases such as CD39 and CD73. The ectonucleotidases are ectoenzymes expressed by vascular, myeloid and regulatory lymphoid cell, which hydrolyze extracellular nucleotides (e.g. ATP, ADP) to adenosine and derivatives. CD39 and other gene family members are crucial in the maintenance of homeostasis and in the control of inflammation and immune responses. These proteins are highly relevant to the control of inflammation in human disease and provide innovative therapeutic targets in inflammatory diseases and cancer.