

In Memoriam: Brian Kavanagh, 1962 to 2019

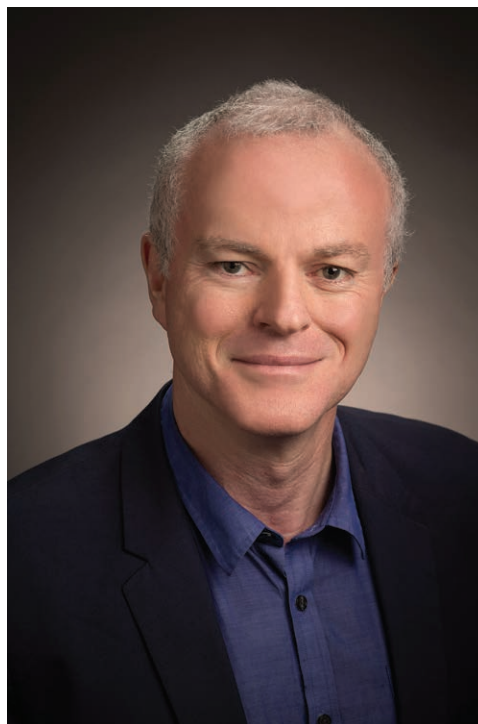
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It is with great sadness that we recognize the passing, on June 15, 2019, of Dr. Brian Patrick Kavanagh: a brilliant scientist, an astute clinician, and a passionate mentor.

Brian was a tireless investigator whose capacity for research excellence was exceptional in the fields of anesthesiology and critical care. He was highly productive as both a preclinical and a clinical investigator, all the while juggling senior administrative roles and major editorial commitments. He had that rare ability to move seamlessly between the bedside and the laboratory, always asking fundamental and difficult questions.

Dr. Kavanagh's prowess as an academic leader was evident early in his career. He graduated in 1985 from University College Dublin in Ireland, receiving the Maginnis Gold Medal in Medicine from St. Vincent's University Hospital (Dublin, Ireland). He obtained his Medical Membership in the Royal College of Physicians (United Kingdom) in 1988. He started residency training in internal medicine in Dublin but then moved to the University of Toronto (Toronto, Ontario, Canada) to begin residency training in anesthesia in 1989. During his postgraduate training, he received several prestigious awards, including a Resident Research Award from the Canadian Anesthesiologists' Society and the Residents Research Essay Contest Award from the American Society of Anesthesiologists. The awards continued to accrue throughout his career, and his research was ultimately recognized by a Fellowship in the Canadian Academy of Health Sciences and Honorary Fellowship in the College of Anaesthesiologists of Ireland. In June 2019, he received a Tier 1 Canada Research Chair, one of the most prestigious sources of support awarded to Canadian scientists.

He started fellowship training in critical care medicine at the University of Toronto and then continued at Stanford University (Stanford, California) under the research supervision of Dr. Ronald Pearl and the mentorship of Dr. H. Barrie Fairley, who was Chair of the Department of Anesthesia at the time. Brian returned to Toronto General Hospital (Toronto, Ontario, Canada) in 1994. He moved to the Hospital for Sick Children (Toronto, Ontario, Canada) in 1999 and worked as a clinician–scientist in the Pediatric Intensive Care Unit at the Department of Critical Care Medicine and the SickKids Research Institute until the end of his life.



Brian's leadership abilities led to his appointment as Chair of the Department of Anesthesia at the University of Toronto, a position in which he served from 2006 to 2017. The department is the largest within this discipline in Canada, encompassing more than 600 faculty members, residents, fellows, and medical students. During his tenure as Chair, Brian initiated the Merit Awards Program, which now provides almost \$1 million of research support annually to faculty members. He was also a successful fundraiser who established seven endowed research chairs. Through his remarkable legacy, the department now ranks as one of the top in the world.

Brian authored many landmark studies. One of his most frequently cited works was a review of preemptive analgesia and neuroplasticity.¹ His research subsequently transitioned to ways of improving lung function and avoiding ventilator-induced lung injury. His articles were published in the high-impact anesthesiology and critical care journals. His research was always mechanistic, innovative, and insightful

Image: Courtesy of the Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada.

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and often demonstrated that he was “thinking outside the box.” He was a brilliant researcher and physiologist, a dedicated clinician, and a passionate teacher. He loved to take the high view of our practice of medicine, to reflect on issues such as “protocolized” *versus* individualized and physiology-based medicine, and to analyze the ways in which clinical research tends to be performed nowadays.²

Brian played a major role in describing the mechanisms of ventilator-induced lung injury and how mechanical ventilation interacts with the atelectatic lungs of patients with acute respiratory distress syndrome.³ He contributed to identifying the cell signaling pathways and mediators that promote lung injury.⁴ He showed that lung injury occurred only in the part of the lung where ventilation was delivered, whereas bronchiolar injury affected the whole lung. Recently, he showed that spontaneous breathing reopened parts of atelectatic lung and thus could paradoxically worsen lung injury in the most severe cases.⁵ He also discovered that an increase in carbon dioxide was protective against ventilator-induced lung injury.⁶ However, before advocating for the therapeutic use of hypercapnia, he recognized that prolonged exposure to carbon dioxide could reduce antimicrobial activity and that the astute clinician should balance risks and benefits.⁷

More recently, he described new mechanisms of lung injury that may have important clinical implications, mostly related to vascular phenomena.^{8,9} He continued to explore the distribution of ventilation and atelectasis in the lung and invented a technique for generating negative pressure in the abdomen.¹⁰ Researchers are now using this method to recruit the lung in the laboratory, and the first clinical trials will be starting soon (ClinicalTrials.gov No. NCT03425318). He was passionate about the clinical implications and applications of his research, as illustrated by his latest publication, which describes visualizing the distribution of ventilation at the bedside to titrate positive end-expiratory pressure.¹¹ The results of his studies have changed and will continue to change clinical practice and to inspire researchers and clinicians.

In addition to publishing reports of his own research, Brian contributed to the scientific community an editor and peer reviewer. He served as a wise and trusted member of the Editorial Board of the journal *ANESTHESIOLOGY* for many years, including as Executive Editor. At the time of his death, he was successfully leading a major effort to increase the content, richness, and reach of critical care research in *ANESTHESIOLOGY*. He also served as an Associate Editor of *Critical Care*. Even during times of illness, he remained committed to his editorial duties, sending out email correspondence to request article reviews or offer support to authors on their manuscripts.

Brian’s sharp intellect and quick wit were most evident when he was addressing a crowd. His lectures were singularly compelling, often funny, and always profound. He enjoyed rigorous debate and never shied away from controversy. He was also a committed mentor who excited a

generation of young investigators. Many of his mentees now hold senior academic positions around the world. He was always generous with his time, willing to take phone calls at all hours. Without hesitation, he would proof grant applications, correct manuscripts, and freely offer career advice.

Unbeknownst to many, Brian was an accomplished musician who played the uilleann or “elbow” pipes, the national bagpipe of Ireland. He was an avid reader who often cited William Butler Yeats, yet he also had a great fondness for the outdoors. Brian’s close friends certainly knew that he was not “all work and no play.” In the citation for his Honorary Fellowship in the Joint Faculty of Intensive Care Medicine of Ireland, Dr. John Laffey noted that Brian would often travel with his pipes so that he could participate in a session at the local Irish pub. He was something of a fitness fanatic, generally arriving in the gym before 6 o’clock in the morning.

The international community of anesthesiologists and intensivists has lost a giant far too early. We extend our sincere sympathies to his daughters, Dáire and Aifric Kavanagh, and to his extended family, colleagues, and friends.

Competing Interests

The authors are not supported by, nor maintain any financial interest in, any commercial activity that may be associated with the topic of this article.

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