



Facility Spotlight

Advancing Anesthesia Care, Education, and Research – A UCSF Tradition

Chuck Holt

From developing inhaled anesthetics to defining minimum alveolar concentration (MAC), it is hard to overstate the impact that the University of California, San Francisco Department of Anesthesia and Perioperative Care has had on the specialty over the past six decades.

The department is perennially in the top 10 departments in National Institutes of Health (NIH)-funded research, helping make UCSF the largest clinical trial entity in the U.S. The highly selective UCSF anesthesia residency program is ranked No. 1 in the U.S. by Doximity, for the fourth consecutive year, and the department repeatedly sits atop U.S. News & World Report's annual rankings.

Much of the credit for the national recognition goes to the faculty, said professor and chair Michael Gropper, MD, PhD. "We have a culture in our department at UCSF where there is a willingness among the faculty to have shared contribution of their clinical work so that research and education can be supported. And that is, in many ways, the secret sauce that makes it all work."

In return, UCSF leadership has helped change how medical education is valued. Dr. Gropper explained that UCSF was one of the first academic medical centers to provide clinician-educators with a viable career pathway.

Of course, the prospect of living and working in San Francisco helps with recruiting both faculty and residents, who also recognize the value of training under national leaders in anesthesiology.

"When our residents leave the program, they have been superbly trained based on the three pillars of our mission – clinical care, education, and research," Dr. Gropper said.

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Michael Gropper, MD, PhD

Once upon a pandemic

At the onset of the COVID-19 pandemic, anesthesia faculty (and later residents as well) served on the front lines of patient care staffing UCSF's intensive care units 24/7, something that normally would be mostly handled by the department of medicine, Dr. Gropper said.

All in-person educational events were moved online. And a decrease in surgeries that meant some residents had smaller case volumes than in normal years presented another new challenge. Fortunately, COVID-19 mortality rates in San Francisco were low for a major city, allowing UCSF anesthesiologists to help at hard-hit New York-Presbyterian Hospital and the Navajo Nation.

The Bay Area benefitted from relationships UCSF faculty established with underserved populations during the HIV/AIDS crisis decades earlier. Programs like "Getting to Zero," and Unidos en Salud had established strong public health infrastructure.

"Because of these networks of trust, we are able to go into underserved areas with COVID-19 testing, and then also minimize vaccine hesitancy," said Dr. Gropper, a native San Franciscan who began working as an intern at UCSF on an AIDS ward in 1989.

Recognizing the stress of the pandemic and social unrest after the killings of Black men by police on faculty and residents, UCSF Anesthesia created two new roles: Associate Chair of Wellness and Professionalism, and Vice-Chair for Diversity, Equity and Inclusion.

UCSF anesthesiologists also invented a simple oxygen supply calculator for hospitals and clinics in underdeveloped countries during the pandemic. "It's very difficult to handle a surge of extremely sick patients who are supported by ventilators without knowing when the oxygen in your pipeline is going to run out," Dr. Gropper said.

UCSF is currently working with the World Health Organization and the U.S. Agency for International Development, creating training tools for doctors and others in countries that received excess mechanical ventilators from the U.S. but have nobody trained to use them, including in Sub-Saharan Africa, where UCSF is training high school students to operate the machines due to a clinician shortage.

Legacy of research

Formally established in 1958, UCSF Anesthesia has grown to more than 250 faculty, 80 residents, and 20-plus research trainees and fellows.

Important discoveries span the department's history, including, among many others, the first demonstration of intraoperative transesophageal echocardiography and the first-ever use of CPAP in premature infants. Former faculty include many pioneers of the specialty such as legendary clinician-educators George Gregory, MD, Edmund "Ted" Eger, MD, and Ron Miller, MD.

Dr. Eger pioneered the development of inhaled anesthetics now administered to more than 300 million patients every year. He also introduced the concept of minimum alveolar concentration of anesthetic required to prevent movement in patients during surgery, which remains the standard dosing unit.

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The seminal anesthesiology textbook *Miller's Anesthesia* was published in 1981. Dr. Miller is also credited with anesthesiologists entering preoperative evaluation, recovery, and critical care; securing leadership roles for the department; envisioning an outpatient pain management clinic; and recognizing the promise of molecular biology. Dr. Gropper is editor of the ninth edition of *Miller's Anesthesia*.

Today, pain management is among several areas driving research at UCSF. One current multi-department study is an investigation of an overlap between inflammation and pain, and the potential benefits of a class of molecules found in cannabinoids.

These studies are a good example of how UCSF researchers often pool their talent and resources, Dr. Gropper said.

"You don't always find that willingness to collaborate with other departments at major medical centers."

A successful system

Dedicated entirely to health sciences, UCSF has long been a leader in incorporating advances in medical care and technology into clinical care and training. "We are very fortunate at UCSF to have leadership that understands the value of anesthesia and appreciates what we do," Dr. Gropper acknowledged.

Anesthesiology residents, for example, have competency in both regional anesthetics and point-of-care ultrasound to help guide in injections and assist with diagnoses in the chest or abdomen. Ultrasound has now been integrated into the UCSF training program.

Artificial intelligence, particularly a subset of machine-learning called "deep-learning," also portends significant changes to the specialty. UCSF Anesthesia currently is developing a version of online deep-learning designed to assist clinicians with patient management decision-making in the ICU and eventually the OR.

Advances in pain management and regional anesthesia also are changing practice, Dr. Gropper said. Patients with knee and hip replacements receive effective analgesia with regional anesthetics during the first few days of recovery, which are the most painful, he noted, adding that this helps them cut back on opioid prescriptions. In addition, these surgeries can on occasion be done on an outpatient basis.

Dr. Gropper hopes to see anesthesiologists become more involved in public health. He pointed to the pain management clinic for the underserved at UCSF's new Zuckerberg San Francisco General Hospital as an example of much-needed change. "Many of these pain treatments are usually only available to well-insured people, but we are ensuring everybody has access to them," he said.

Meanwhile, a trend toward more complex surgeries in outpatient settings seems likely to continue. "We are already doing increasingly complex things, particularly in neurosurgery and transplant surgery, where we are able to help patients in many ways we couldn't in the past," stated Dr. Gropper. "It's a very exciting time, certainly, for us as a department, and also for our specialty." ■