Follow the Evidence: Scientific Studies Support Replacing Animals for Emergency Medical Training

When learning to perform lifesaving emergency procedures, scientific studies reveal that physicians learn as well or better on devices that replicate *human* anatomy. **Whether learning specific procedures, building confidence, preparing for real-world stress, or managing complicated airways like those of obese patients, animals are unnecessary.** In fact, many experts point out that the anatomical differences between pigs and humans can impair learning and, thus, harm patients. Most of the following studies specifically examined the single procedure (surgical airway) taught on pigs in the emergency medicine residency run by Brown University and Rhode Island Hospital.

Military Studies

"Medics who were tested on [surgical airway] on simulators during the battlefield scenario were more likely to pass the assessment because they were more likely to be able to insert the tracheotomy tube into the trachea, compared with those medics tested on the animal model."
Savage E., et al. (2015) *A Comparison of Live Tissue Training and High-Fidelity Patient Simulator: A Pilot Study in Battlefield Trauma Training*. Trauma Acute Care Surg.

"There was **no statistically significant, objective difference** in any metric between animal- and simulator-trained groups after [surgical airway] training. For initial training, there is no objective benefit of animal training."
Iverson K., et al. (2015) *Objective Comparison of Animal Training Versus Artificial Simulation for Initial Cricothyroidotomy Training*. The American Surgeon.

"Measured performance was not different between subjects trained to perform surgical [airway] on an animal model or a high-fidelity manikin…**The similarities in the outcome measures between the two training approaches suggests that preferential use of high-fidelity manikins for emergency surgical airway training may reduce both costs and ethical harm to animals."**
Pandian V., et al. (2020) *Comparison of Surgical Cricothyroidotomy Training: A Randomized Controlled Trial of a Swine Model Versus an Animated Robotic Manikin Model*. Trauma Surg Acute Care Open.

"We believe that currently available simulation technology has the potential to vastly improve the training of both military and civilian medics to perform surgical [airway] when compared with currently used 'gold standard' of animal or cadaveric tissue training….an anesthetized, non-wounded, non-moving animal, with non-human anatomy, in a well-lighted [laboratory], does not truly allow first responders to 'train as they fight.'"
Pandian V. (2022)

"We found no difference in performance between medics trained on simulators versus live tissue models…"
Savage E. (2015)

"Post-training self-efficacy scores were not statistically different between live animal and artificial simulator training for [any procedure, including surgical airway]. **We conclude that artificial simulator and live animal training produce equivalent levels of self-efficacy after initial training.**"
Hall A., Riojas R., Sharon D. (2014) *Comparison of Self-Efficacy and Its Improvement After Artificial Simulator or Live Animal Model Emergency Procedure Training*. Military Medicine.

Studies Using 3D Printers to Replicate Human Airways

"Available animal models, including white rabbits and pigs, do not replicate real patient anatomy."
Weatherall A., et al. (2020) *A Novel 3-Dimensional Printing Fabrication Approach for the Production of Pediatric Airway Models*. Anesthesia & Analgesia.

"[Animals have] untrue human anatomy..."
Chia N., et al. (2022) *Harnessing Power of Simulation Training Effectiveness With Kirkpatrick Model in Emergency Surgical Airway Procedures*. Heliyon.

"A 3D-printed model offers a **viable alternative to pig tracheas for emergency airway simulation** that is inexpensive, reusable, and readily modified to simulate challenging airway anatomy."
Huang J., et al (2021) *A Novel Approach to Emergency Airway Simulation Using a 3D-printed Cricothyrotomy Task Trainer*. Journal of Education in Perioperative Medicine.

"A late adolescent/adult neck and airway simulator was constructed based on CT scans from a cadaver and a live patient...[H]ead and neck surgeons performed tracheostomy...on a [pig] followed by the synthetic simulator...**There was no difference in scores between the synthetic model and the [pig] for any of the steps of any of the surgical procedures...**"
Deonarain A,. et al. (2021) *Synthetic Simulator for Surgical Training in Tracheostomy and Open Airway Surgery*. The Laryngoscope.

"All anatomical structures were modeled based on computed [X-ray] images of a patient with obesity. To mimic the feeling of incision during [surgical airway], the incision site was modeled to distinguish between the skin and fat...The tensile strength of the silicone-cast skin was measured to verify the similarity of the mechanical properties between humans and our model...**Our simulator can provide a realistic simulation experience for trainees through a realistic feeling of incision and audio feedback, which can be used for actual clinical education.**"
Ock J., et al. (2023) *An Interactive and Realistic Phantom for Cricothyroidotomy Simulation of a Patient With Obesity Through a Reusable Design Using 3D-Printing and Arduino*. Computer Methods and Programs in Biomedicine.

"A 3-dimensional–printed tracheal model was developed using rescaled, anatomically accurate dimensions from a computerized [X-ray] scan...Experts in airway management were recruited to rate the realism of the model's characteristics and features...**The ability to practice front-of-neck emergency airway procedures safely and subsequently demonstrate proficiency on a child model has great implications regarding both quality of physician training and patient outcomes.**"
Kovatch K., et al (2020) *Development and Multidisciplinary Preliminary Validation of a 3-Dimensional–Printed Pediatric Airway Model for Emergency Airway Front-of-Neck Access Procedures*. Anesthesia & Analgesia

"Our hybrid manufacturing approach, merging 3D-printed components and 3D-printed molds for silicone casting, **allows a more accurate representation of both the anatomy and functional characteristics of the pediatric airway** for model production."
Weatherall A. (2020)

"The result suggests that application of a **state-of-the-art training tools to advanced surgical skills training could improve training satisfaction, knowledge and skills acquisition**, and personal strengths transferable to clinical practice."
Chia N. (2022)

"Due to its anatomical accuracy, flexibility and durability, this model is great for use in emergency medicine simulation training....Skin has been simulated as well to enhance the realism of the model. The result is an accurate simulation that will provide users with an anatomically correct model to practice important skills used in emergency airway surgery..."
Doucet G., et al. (2017) *Modelling and Manufacturing of a 3D Printed Trachea for Cricothyroidotomy Simulation.* Cureus.

"Our work shows that [surgical airway] skills taught to anesthesia residents...with a 3D printed laryngotracheal model improves knowledge, skills, and confidence. The creation of a low-cost, high-fidelity simulator and a [Cricothryoidotomy Skills Maintenance Program] has the potential to impact patient care and safety world-wide."
Gauger V., et al. (2018) *A Multidisciplinary International Collaborative Implementing Low Cost, High Fidelity 3D Printed Airway Models to Enhance Ethiopian Anesthesia Resident Emergency Cricothyroidotomy Skills.* International Journal of Pediatric Otorhinolaryngology.

Studies Examining Stress

"Synthetic models can produce a stress response equivalent to that of live tissue during simulation training. This is the largest study to date indicating synthetic models produce a sufficient immersive and realistic experience for trainees."
Keller J., et al. (2018) *The Physiologic Stress Response of Learners During Critical Care Procedures: Live Tissue vs Synthetic Models*. Poster Presentation. CHEST Annual Meeting.

"Physiological arousal suggests that the [emergency medicine] residents developed a sense of urgency and responsibility for managing the simulated patient...We were able to demonstrate that residents adequately 'suspended disbelief' and performed 'as if' it were real."
Kharasch M., et al. (2011) *Physiological Stress Responses of Emergency Medicine Residents During an Immersive Medical Simulation Scenario*. Disease-A-Month.

"Our first hypothesis stated that [live animals] and [simulators] would be associated with different stress levels. This hypothesis was not supported...**These results suggest that [simulators] and [live animals] do not exert varying effects on stress...**"
Vartanian O., et al. (2017) *Battlefield Trauma Training: A Pilot Study Comparing the Effects of Live Tissue vs. High-Fidelity Patient Simulator on Stress, Cognitive Function, and Performance*. Military Psychology.

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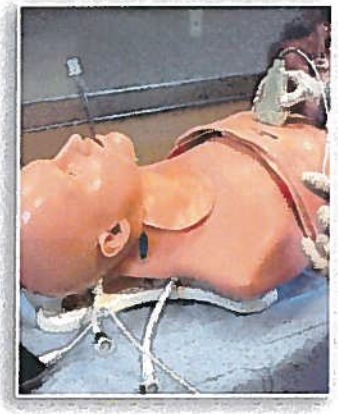
Simulators Based on *Human* Anatomy for Emergency Medicine Training: Examples

Across the United States and Canada, 97% of emergency medicine residency programs have replaced live animals or never used them in the first place. **Harvard, Yale, Columbia, the Mayo Clinic, the Cleveland Clinic, Kent Hospital, and hundreds of other medical centers train emergency physicians without animals.** But Brown University and Rhode Island Hospital continue to require trainees to translate pig anatomy to human patients. The joint emergency medicine residency uses animals to teach a single procedure, called a surgical airway (also known as a cricothyroidotomy). After the training session, the animals are killed. But there are many simulators—which *simulate* human anatomy—that can expertly teach surgical airway. These devices have anatomically correct organs and tissues, they can bleed and breathe, and they can be reused for repetitive practice.



TraumaMan System

Simulab Corporation

The most widely used trauma and surgical simulator in the world, the TraumaMan System is a high-fidelity human-body mannequin with lifelike skin, subcutaneous fat, and muscle. TraumaMan allows trainees to practice a variety of procedures, including surgical airway. Its replaceable tissues provide each trainee with a first-cut experience and make this simulator ideal for team training scenarios.

Surgical Cut Suit

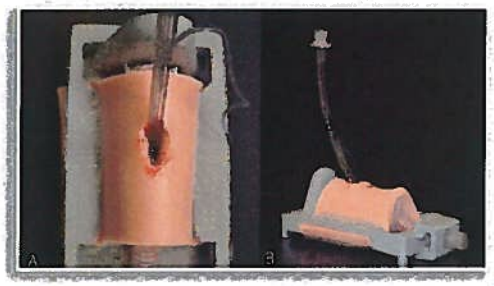
Strategic Operations, Inc.

The Cut Suit is worn by a course participant or actor and features breakable bones, interchangeable organs, and a mechanical heart that pumps warm "blood." It combines the sensation of working on live tissue with the realism of treating a live patient. Wounds are created by the trainees, and the skin and other organs are repairable, allowing for multiple uses and team training opportunities. It is often used by the U.S. military.

Tactical Casualty Care Simulator Plus Pro

Operative Experience, Inc.

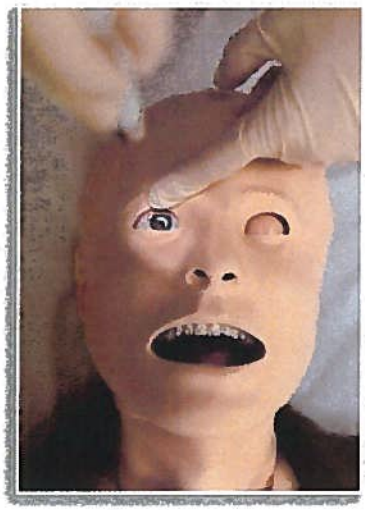
The Tactical Casualty Care Simulator (TCCS) Plus Pro is a high-fidelity, full-body patient simulator designed for prolonged training. With lifelike soft tissue and skin, this simulator can be used to practice surgical airway, difficult airway with tongue swelling, and other procedures. The TCCS also features the ability to assess and treat penetrating woods and amputation and has remote-controlled bleeding and heart rate. It is often used by the U.S. military.



3D-Printed Simulators

(Various)

Around the world, medical centers are creating their own simulators using 3D printers. At left is a device created by emergency medicine faculty at the University of Arizona. It replicates the human airway and bleeds. In a 2018 study involving emergency medicine residents, the 3D-printed model "was rated higher than the previously used models," including pigs, and participants "specifically commented on the realism of the bleeding tissue and texture of the skin" when performing surgical airway.



SimMan 3G

Laerdal

SimMan 3G is a high-fidelity, full-body patient simulator that mimics human physiology. It can be used to teach surgical airway, endotracheal intubation, retrograde intubation, chest tube placement, and many other procedures. It can be programmed to simulate a multitude of scenarios requiring defibrillation, cardiac pacing, and the administration of medications.

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Animal Use in Emergency Medicine Residency Programs in the United States and Canada: An Ongoing Survey

Updated: October 11, 2023

Programs Using Live Animals (8)

- Brooke Army Medical Center/San Antonio Uniformed Services Health Education Consortium (SAUSHEC) – San Antonio, Texas
- Brown University/Rhode Island Hospital – Providence, R.I.
- Darnall Army Medical Center – Fort Cavazos, Texas
- Madigan Army Medical Center – Tacoma, Wash.
- Naval Medical Center (Portsmouth) – Portsmouth, Va.
- University of Missouri-Columbia School of Medicine – Columbia, Mo.
- University of Tennessee College of Medicine at Memphis – Memphis, Tenn.
- Western Michigan University Homer Stryker MD School of Medicine – Kalamazoo, Mich.

Programs Using Only Nonanimal Methods (284)

Alabama (2)

- University of Alabama Medical Center – Birmingham
- University of South Alabama (USA) Health – Mobile

Arizona (5)

- Abrazo Health Network – Goodyear
- Creighton University School of Medicine (Phoenix)/Valleywise Medical Center – Phoenix
- Midwestern University GME Consortium/Kingman Regional Medical Center – Kingman
- University of Arizona College of Medicine-Tucson (South Campus) – Tucson
- University of Arizona College of Medicine-Tucson – Tucson

Arkansas (2)

- Unity Health-White County Medical Center – Searcy
- University of Arkansas for Medical Sciences (UAMS) College of Medicine – Little Rock

California (22)

- Alameda Health System-Highland Hospital – Oakland
- Arrowhead Regional Medical Center – Colton
- Desert Regional Medical Center – Palm Springs
- Eisenhower Medical Center – Rancho Mirage
- HCA Healthcare Riverside/Riverside Community Hospital – Riverside
- Kaiser Permanente Northern California – Modesto
- Kaiser Permanente Southern California – San Diego
- Kaweah Delta Health Care District – Visalia
- Kern Medical Center – Bakersfield
- Loma Linda University Health Education Consortium – Loma Linda

- Los Angeles County-Harbor-UCLA Medical Center – Torrance
- Naval Medical Center (San Diego) – San Diego
- Stanford Health Care-Sponsored Stanford University – Stanford
- St. Joseph's Medical Center – Stockton
- UHS Southern California Medical Education Consortium – Temecula
- University of California Davis Health – Sacramento
- University of California (Irvine) – Orange
- University of California Los Angeles David Geffen School of Medicine/UCLA Medical Center/Olive View – Los Angeles
- University of California (San Diego) Medical Center – San Diego
- University of California (San Francisco)/Fresno – Fresno
- University of California (San Francisco)/San Francisco General Hospital – San Francisco
- University of Southern California/LAC+USC Medical Center – Los Angeles

Colorado (1)

- Denver Health Medical Center – Denver

Connecticut (2)

- University of Connecticut – Hartford
- Yale-New Haven Medical Center – New Haven

Delaware (2)

- Bayhealth Medical Center – Dover
- Christiana Care Health Services – Newark

District of Columbia (2)

- George Washington University – Washington
- MedStar Health/Georgetown-Washington Hospital Center – Washington

Florida (19)

- AdventHealth Florida – Orlando
- Broward Health – Fort Lauderdale
- Florida Atlantic University Charles E. Schmidt College of Medicine – Boynton Beach
- Florida State University College of Medicine – Sarasota
- HCA Florida Healthcare/Aventura Hospital – Aventura
- HCA Florida Healthcare/Kendall Hospital – Miami
- HCA Florida Healthcare/Orange Park Hospital – Orange Park
- HCA Florida Healthcare/St. Lucie Hospital – Port St. Lucie
- HCA Florida Healthcare/USF Morsani College of Medicine GME/Brandon Hospital – Brandon
- HCA Florida Healthcare/USF Morsani College of Medicine GME/Oak Hill Hospital – Brooksville
- Mount Sinai Medical Center of Florida, Inc. – Miami Beach
- Orlando Health – Orlando
- University of Central Florida/HCA Florida Healthcare – Gainesville
- University of Central Florida/HCA Florida Healthcare (Greater Orlando/Osceola) – Orlando
- University of Central Florida/HCA Florida Healthcare – Ocala
- University of Florida College of Medicine Jacksonville – Jacksonville
- University of Florida – Gainesville
- University of Miami/Jackson Health System – Miami
- University of South Florida Morsani – Tampa

Georgia (5)

- Emory University School of Medicine – Atlanta
- Medical College of Georgia – Augusta
- Northeast Georgia Medical Center – Gainesville
- Piedmont Macon Medical Center – Macon

- WellStar Health System/Wellstar Kennestone Regional Medical Center – Marietta

Illinois (12)
- Advocate Health Care/Advocate Christ Medical Center – Oak Lawn
- Ascension Illinois/Resurrection – Chicago
- Cook County Health and Hospitals System – Chicago
- Franciscan Health Olympia Fields – Olympia Fields
- Loyola University Medical Center – Maywood
- McGaw Medical Center of Northwestern University – Chicago
- Rush University Medical Center – Chicago
- Southern Illinois University School of Medicine – Springfield
- Swedish Hospital – Chicago
- University of Chicago – Chicago
- University of Illinois College of Medicine at Chicago – Chicago
- University of Illinois College of Medicine at Peoria – Peoria

Indiana (1)
- Indiana University School of Medicine – Indianapolis

Iowa (2)
- Iowa Methodist Medical Center – Des Moines
- University of Iowa Hospitals and Clinics – Iowa City

Kansas (1)
- University of Kansas School of Medicine – Kansas City

Kentucky (2)
- University of Kentucky College of Medicine – Lexington
- University of Louisville School of Medicine – Louisville

Louisiana (4)
- Louisiana State University School of Medicine (Baton Rouge) – Baton Rouge
- Louisiana State University School of Medicine – New Orleans
- Louisiana State University (Shreveport) – Shreveport
- Ochsner Clinic Foundation – New Orleans

Maine (1)
- Maine Medical Center – Portland

Maryland (2)
- Johns Hopkins University – Baltimore
- University of Maryland – Baltimore

Massachusetts (5)
- Beth Israel Deaconess Medical Center/Harvard Medical School – Boston
- Boston University Medical Center – Boston
- Massachusetts General Hospital/Brigham and Women's Hospital/Harvard Medical School – Boston
- UMass Chan/Baystate Medical Center – Springfield
- UMass Chan Medical School – Worcester

Michigan (24)
- Ascension Genesys Hospital – Grand Blanc
- Ascension Macomb-Oakland Hospital – Warren
- Ascension St. John Hospital – Detroit
- Beaumont Health (Farmington Hills) – Farmington Hills
- Beaumont Health (Royal Oak) – Royal Oak
- Beaumont Health (Trenton and Dearborn) – Trenton
- Central Michigan University College of Medicine – Saginaw
- Detroit Medical Center/Wayne State University (Detroit Receiving Hospital) – Detroit

- Detroit Medical Center/Wayne State University (Sinai-Grace Hospital) – Detroit
- Garden City Hospital – Garden City
- Henry Ford Health/Henry Ford Hospital – Detroit
- Henry Ford Health/Henry Ford Jackson Hospital – Jackson
- Henry Ford Health/Henry Ford Macomb Hospital – Clinton Township
- Henry Ford Health/Henry Ford Wyandotte Hospital – Wyandotte
- McLaren Health Care/Macomb/Michigan State University (MSU) – Mount Clemens
- McLaren Health Care/Oakland/Michigan State University (MSU) – Pontiac
- ProMedica Monroe Regional Hospital – Monroe
- Sparrow Hospital/Michigan State University – Lansing
- Spectrum Health Lakeland – St. Joseph
- Spectrum Health/Michigan State University – Grand Rapids
- Trinity Health Livonia Hospital – Livonia
- Trinity Health Muskegon – Muskegon
- University of Michigan Health-West – Wyoming
- University of Michigan Health System – Ann Arbor

Minnesota (3)

- HealthPartners Institute/Regions Hospital – St. Paul
- Hennepin Healthcare – Minneapolis
- Mayo Clinic College of Medicine and Science (Rochester) – Rochester

Mississippi (3)

- Health Education Services/Merit Health Wesley – Hattiesburg
- Magnolia Regional Health Center – Corinth
- University of Mississippi Medical Center – Jackson

Missouri (4)

- Kansas City University GME Consortium (KCU-GME Consortium)/Freeman – Joplin
- St. Louis University School of Medicine – St. Louis
- University of Missouri Kansas City School of Medicine – Kansas City
- Washington University/Barnes-Jewish Hospital/St. Louis Children's Hospital Consortium – St. Louis

Nebraska (1)

- University of Nebraska Medical Center – Omaha

Nevada (3)

- HCA Healthcare Sunrise Health GME/MountainView – Las Vegas
- Kirk Kerkorian School of Medicine at UNLV – Las Vegas
- Valley Health System – Las Vegas

New Hampshire (1)

- Dartmouth-Hitchcock/Mary Hitchcock Memorial Hospital – Lebanon

New Jersey (11)

- Atlantic Health System/Morristown Medical Center – Morristown
- Capital Health Regional Medical Center – Pennington
- Cooper Medical School of Rowan University/Cooper University Hospital – Camden
- Hackensack University Medical Center – Hackensack
- Inspira Health Network/Inspira Medical Center Vineland – Vineland
- Jefferson Health New Jersey – Stratford
- Rutgers Health/Community Medical Center – Toms River
- Rutgers Health/Newark Beth Israel Medical Center – Newark
- Rutgers Health/New Jersey Medical School – Newark
- Rutgers Health/Robert Wood Johnson Medical School – New Brunswick
- St. Joseph's University Medical Center – Paterson

New Mexico (1)

- University of New Mexico School of Medicine – Albuquerque

New York (29)

- Albany Medical Center – Albany
- Arnot Ogden Medical Center – Elmira
- Brooklyn Hospital Center – Brooklyn
- Garnet Health Medical Center – Middletown
- Good Samaritan Hospital Medical Center – West Islip
- Icahn School of Medicine at Mount Sinai (Morningside/West) – New York
- Lincoln Medical and Mental Health Center – Bronx
- Maimonides Medical Center – Brooklyn
- Montefiore Medical Center/Albert Einstein College of Medicine (Jacobi/ Montefiore) – Bronx
- Nassau University Medical Center – East Meadow
- New York Medical College (Metropolitan/Harlem) – New York
- New York-Presbyterian Brooklyn Methodist Hospital – Brooklyn
- New York Presbyterian Hospital – New York
- New York-Presbyterian/Queens – Flushing
- Nuvance Health – Poughkeepsie
- NYC Health & Hospitals/South Brooklyn Health – Brooklyn
- NYU Grossman School of Medicine – New York
- One Brooklyn Health System/Brookdale University Hospital and Medical Center – Brooklyn
- St. Barnabas Hospital – Bronx
- St. John's Riverside Hospital – Yonkers
- Stony Brook Medicine/University Hospital (SUNY) – Stony Brook
- SUNY Downstate Health Sciences University – Brooklyn
- SUNY Upstate Medical University – Syracuse
- University at Buffalo – Buffalo
- University of Rochester – Rochester
- Wyckoff Heights Medical Center – Brooklyn
- Zucker School of Medicine at Hofstra/ Northwell at South Shore University Hospital – Bayshore
- Zucker School of Medicine at Hofstra/ Northwell – Manhasset
- Zucker School of Medicine at Hofsta/ Northwell at Staten Island University Hospital – Staten Island

North Carolina (7)

- Campbell University/Cape Fear Valley Medical Center – Fayetteville
- Campbell University/Southeastern Regional Medical Center – Lumberton
- Carolinas Medical Center – Charlotte
- Duke University Hospital – Durham
- ECU Health Medical Center/East Carolina University – Greenville
- University of North Carolina Hospitals – Chapel Hill
- Wake Forest University Baptist Medical Center – Winston-Salem

Ohio (17)

- Akron General Medical Center/Northeast Ohio Medical University (NEOMED) – Akron
- Aultman Hospital/Northeast Ohio Medical University (NEOMED) – Canton
- Case Western Reserve University/University Hospitals Cleveland Medical Center – Cleveland
- Kettering Health Network – Dayton
- Memorial Health System – Marietta
- Mercy Health-St. Rita's Medical Center – Lima
- Mercy St. Vincent Medical Center/Mercy Health Partners – Toledo
- OhioHealth/Doctors Hospital – Columbus
- Ohio State University Hospital – Columbus
- St. Elizabeth Boardman Hospital – Youngstown
- Summa Health System – Akron

- The MetroHealth System/Case Western Reserve University – Cleveland
- Trinity Health System – Steubenville
- University Hospitals Community Consortium – Westlake
- University of Cincinnati Medical Center/College of Medicine – Cincinnati
- University of Toledo – Toledo
- Wright State University – Kettering

Oklahoma (5)

- Integris Health – Oklahoma City
- Oklahoma State University Center for Health Sciences (Lawton) – Lawton
- Oklahoma State University Center for Health Sciences (Norman) – Norman
- Oklahoma State University Center for Health Sciences (Tulsa) – Tulsa
- University of Oklahoma School of Community Medicine – Tulsa

Oregon (1)

- Oregon Health & Science University – Portland

Pennsylvania (19)

- Albert Einstein Healthcare Network – Philadelphia
- Allegheny Health Network Medical Education Consortium/Allegheny General Hospital – Pittsburgh
- Allegheny Health Network Medical Education Consortium – Erie
- Conemaugh Memorial Medical Center – Johnstown
- Crozer-Chester Medical Center – Upland
- Geisinger Health System – Danville
- Jefferson Health Northeast – Philadelphia
- Lehigh Valley Health Network – Bethlehem
- Nazareth Hospital – Philadelphia
- Penn State Milton S. Hershey Medical Center – Hershey
- Sidney Kimmel Medical College at Thomas Jefferson University Hospital (TJUH) – Philadelphia
- St. Luke's University Hospital – Bethlehem
- Temple University Hospital – Philadelphia
- Tower Health/Reading Hospital – West Reading
- University of Pennsylvania Health System – Philadelphia
- University of Pittsburgh Medical Center (UPMC) Medical Education (Erie) – Erie
- University of Pittsburgh Medical Center (UPMC) Medical Education (Harrisburg) – Harrisburg
- University of Pittsburgh Medical Center (UPMC) Medical Education (Pittsburgh) – Pittsburgh
- Wellspan Health/York Hospital – York

Puerto Rico (2)

- Hospital Episcopal San Lucas/Ponce School of Medicine – Ponce
- University of Puerto Rico – San Juan

Rhode Island (1)

- Kent Hospital – Warwick

South Carolina (4)

- HCA Healthcare/Mercer University School of Medicine/Grand Strand Medical Center – Myrtle Beach
- Medical University of South Carolina – Charleston
- Prisma Health/University of South Carolina School of Medicine (Columbia) – Columbia
- Prisma Health/University of South Carolina School of Medicine (Greenville) – Greenville

Tennessee (3)

- University of Tennessee College of Medicine at Chattanooga – Chattanooga
- University of Tennessee College of Medicine at Murfreesboro – Murfreesboro
- Vanderbilt University Medical Center – Nashville

Texas (10)

- Baylor College of Medicine – Houston
- CHRISTUS Health/Texas A&M College of Medicine/Spohn Hospital – Corpus Christi
- John Peter Smith Hospital (Tarrant County Hospital District) – Fort Worth
- Texas A&M College of Medicine-Scott and White Medical Center – Temple
- Texas Tech University Health Sciences Center at Lubbock – Lubbock
- Texas Tech University Health Sciences Center (El Paso) – El Paso
- University of Texas at Austin Dell Medical School – Austin
- University of Texas Health Science Center at Houston – Houston
- University of Texas Health Science Center San Antonio Joe R. and Teresa Lozano Long School of Medicine – San Antonio
- University of Texas Southwestern Medical School – Dallas

Utah (1)

- University of Utah Health – Salt Lake City

Vermont (1)

- University of Vermont Medical Center – Burlington

Virginia (5)

- Carilion Clinic-Virginia Tech Carilion School of Medicine – Roanoke
- Eastern Virginia Medical School – Norfolk
- Riverside Regional Medical Center – Newport News
- University of Virginia Medical Center – Charlottesville
- Virginia Commonwealth University Health System – Richmond

Washington (1)

- University of Washington – Seattle

West Virginia (2)

- Charleston Area Medical Center/CAMC Institute for Academic Medicine – Charleston
- West Virginia University – Morgantown

Wisconsin (2)

- Medical College of Wisconsin Affiliated Hospitals – Milwaukee
- University of Wisconsin Hospitals and Clinics – Madison

CANADA (31)

Alberta (4)

- University of Alberta (CFPC)* – Edmonton
- University of Alberta (RCPSC)** – Edmonton
- University of Calgary (CFPC) – Calgary
- University of Calgary (RCPSC) – Calgary

British Columbia (2)

- University of British Columbia (CFPC) – Vancouver
- University of British Columbia (RCPSC) – Vancouver

Manitoba (2)

- University of Manitoba (CFPC) – Winnipeg
- University of Manitoba (RCPSC) – Winnipeg

Newfoundland and Labrador (1)

- Memorial University (CFPC) – St. John's

Nova Scotia (2)

- Dalhousie University (CFPC) – Halifax
- Dalhousie University (RCPSC) – Halifax

Ontario (11)

- McMaster University (CFPC) – Hamilton
- McMaster University (RCPSC) – Hamilton

- Northern Ontario School of Medicine (CFPC) – Sudbury
- Queen's University (CFPC) – Kingston
- Queen's University (RCPSC) – Kingston
- University of Ottawa (CFPC) – Ottawa
- University of Ottawa (RCPSC) – Ottawa
- University of Toronto (CFPC) – Toronto
- University of Toronto (RCPSC) – Toronto
- Western University (CFPC) – London
- Western University (RCPSC) – London

Québec (7)

- McGill University (CFPC) – Montréal
- McGill University (RCPSC) – Montréal
- Université de Montréal (CFPC) – Montréal
- Université de Montréal (RCPSC) – Montréal
- Université de Sherbrooke (CFPC) – Sherbrooke
- Université Laval (CFPC) – Québec
- Université Laval (RCPSC) – Québec

Saskatchewan (2)

- University of Saskatchewan (CFPC) – Regina
- University of Saskatchewan (RCPSC) – Regina

**College of Family Physicians of Canada*
***Royal College of Physicians and Surgeons of Canada*

The Boston Globe

EDITORIAL

Time for a humane change at Brown

August 16, 2019

Thanks to technological advances, it's now possible for emergency room doctors to prepare for their life-saving work without the need to train on animals. The use of pigs, goats, and other animals in medicine should be limited to what is strictly necessary, should be reviewed regularly, and should be discontinued whenever and wherever possible. As all but a handful of medical programs have determined, one area where this is now clearly possible without any sacrifice in quality is in emergency-medicine training programs.

The Maine Medical Center, in Portland, recently stopped using live animals in its emergency program, leaving only 11 hospital programs in this country that still use live animals.

The one holdout in New England is run under the auspices of Brown University's Warren Alpert Medical School, at Rhode Island Hospital, in Providence. Until very recently, it was thought that Dartmouth-Hitchcock Medical Center, in Lebanon, N.H., also used animals in its emergency medicine program. But when the Globe inquired, spokesman Rick Adams said, via e-mail, that that was no longer the case.

"With advances in teaching and training technology, we currently use only high-fidelity mannequins and simulation-based training in our Emergency Medicine program," Adams said. In a follow-up e-mail, he said Dartmouth-Hitchcock had ended live animal use in 2017.

Speaking broadly, animals in such training programs are subjected to a variety of invasive procedures, such as cutting through the skin and flesh to relieve or establish an airway, find a vein, or insert a tube to drain blood or fluid.

The animals are anesthetized before the procedures, and euthanized afterward.

The Physicians Committee for Responsible Medicine, which promotes alternatives to animal use in training, has been persuasively making the case that equally good or better alternative are available. These are lifelike models of the human head, neck, and torso, with realistic replications of human anatomy, including skin, muscle, cartilage, and fat. These simulators even bleed when the skin is cut. The most popular model, TraumaMan, is used to train thousands of medical students each year. The committee's work has provoked some annoyance among emergency-medicine program administrators — but also some serious rethinking of those programs.

The fact that New England institutions like Maine Medical Center, Dartmouth-Hitchcock, Bay State Medical Center (in Springfield), Yale-New Haven Hospital, and Beth Israel Deaconess Medical Center have all moved away from live-animal use in the last few years shows the direction of emergency medicine. According to the physicians committee, 95 percent of the 270 such programs nationally do not use animals.

Still, it's a path not taken at Brown. In a forwarded statement from April, Brown University and Rhode Island Hospital said their program uses "fewer than 15 pigs" a year and maintained that viable alternatives to animal use do not exist in all instances.

"Brown EM trains resident physicians using synthetic models and high-fidelity mannequins for a variety of procedures," the two institutions said. "Yet, equally effective synthetic model alternatives simply do not exist for every complex medical procedure that an emergency physician must be prepared to perform." The statement cited only cricothyrotomy, a technique for establishing a patient airway in case of several facial trauma or regular-airway obstruction.

Here's the problem for Brown: Other highly regarded institutions have arrived at the opposite conclusion — that sophisticated, programmable, interactive simulators work just as well. "Why would 96 percent of EM programs use simulation if it isn't better?" says Dr. John Pippin, director of academic affairs at the physicians committee. "It seems to us that Brown-RIH can hardly claim to be right and 260 programs are wrong."

Brown and Rhode Island Hospital noted that their program conducts an annual review "to consider any new technologies that may emerge as alternatives."

In their next review, program administrators and instructors should visit their peers at similar institutions that have come to very different conclusions in the last few years. Or the many other programs that have been animal-free for some time.

There should be a sense of concern in being unique in New England on this matter. It's time for a change at Brown.

H 7234: Saving Patients, Sparing Animals

PhysiciansCommittee for Responsible Medicine

97% of Medical Centers Agree: We Should *Not* Use Animals to Teach Emergency Procedures

Nationwide, the medical community overwhelmingly agrees that animals are unnecessary to teach emergency procedures. **Harvard, Yale, Columbia, the Mayo Clinic, the Cleveland Clinic, Kent Hospital, and hundreds of other medical centers train emergency physicians without animals.** But Brown University and Rhode Island Hospital continue to ask trainees to translate pig anatomy to human patients. The joint emergency medicine residency uses animals to teach a single procedure, called a surgical airway (also known as a cricothyroidotomy). After the training sessions, the animals are killed.

Across the United States and Canada, 97% of emergency medicine training programs have replaced animals with devices modeled on human anatomy. Today, 284 medical centers in North America are producing emergency physicians without killing animals.[1]

What H 7234 Would Do

The bill would prohibit the use of animals for medical training if an equivalent program trains with human-relevant methods or nonanimal methods are available to teach the procedures. It would codify the standard that is already in practice elsewhere across the country.

Scientific Studies Support Replacing Animals in Emergency Medicine Training

Studies conducted by the U.S. Army, U.S. Air Force, Johns Hopkins University, and many others prove there is no educational reason to use animals to teach emergency procedures. **(See accompanying list of studies for more information.)**

> "There was no statistically significant, objective difference in any metric between animal- and simulator-trained groups after [surgical airway] training. For initial training, **there is no objective benefit of animal training."**
>
> Published in *The American Surgeon* (2015)[2]

Myths and Facts

Myth: *The Physicians Committee for Responsible Medicine's claim that 97% of emergency medicine residency programs in the U.S. and Canada forgo the use of live animals is untrue.*

Fact: **The Physicians Committee is the only organization that has meticulously communicated with faculty at every one of the 292 emergency medicine programs in the U.S. and Canada.** The initial data compilation was rigorous and spanned several years, and we continue to update the survey as new information becomes available. In most cases, faculty have answered several questions about how residents are trained. In some cases, we filed public records requests to obtain more information. Brown and Rhode Island Hospital have provided no evidence that any of the programs in our survey are incorrectly categorized.

Myth: *Only by using pigs can Brown and Rhode Island Hospital accurately model the airway of an obese patient.*

Fact: This is untrue. Researchers around the world—at the University of Michigan,[3] in Canada,[4] in South Korea,[5] in Ethiopia,[6] and elsewhere—are using 3D printers to make accurate models of many types of human airways, including those of obese patients. **With 3D printers, they can even recreate the airways of children, which is impossible using a large pig.** The Physicians Committee encourages Brown and Rhode Island Hospital to speak to the experts who have published these studies.

Myth: *Many emergency medicine programs have stopped using animals for reasons other than what is best for training, such as lack of funding.*

Fact: We are glad to hear Brown and Rhode Island Hospital admit that many programs have replaced animals. However, their claim suggests that the directors of highly respected emergency medicine residencies across the country are making curriculum decisions based on factors other than what is best for trainees and patients. **Surely, the leaders of programs affiliated with every other Ivy League institution regularly give careful thought to how best to train their physicians, and none of their programs use live animals.**

Myth: *Only live animals allow trainees to perform under stress as they would in the emergency room.*

Fact: Many scientific studies reveal that simulators modeled on human anatomy mimic real-world stress as well as or better than using animals. For example, the U.S. Army funded a study published in 2018 that compared goats to simulators. More than 200 Army medics performed several emergency procedures, including surgical airway. **The authors concluded: "Synthetic models can produce a stress response equivalent to that of live tissue during simulation training."**[7]

Simulators like this replicate human anatomy and allow trainees to practice repeatedly.

Myth: *Only by using pigs can Brown and Rhode Island Hospital recreate the "dynamic and realistic conditions" encountered in real life.*

Fact: **An unconscious pig is nothing like an injured patient who has been wheeled into the emergency room.** In 2020, authors from Johns Hopkins University and the medical school of the U.S. Department of Defense wrote: "an anesthetized, non-wounded, non-moving animal, with non-human anatomy, in a well-lighted [laboratory], does not truly allow first responders to 'train as they fight.'"[8]

Myth: *The animals used by Brown and Rhode Island Hospital are cared for "humanely" and "respectfully."*

Fact: **Between October 2017 and July 2023, Brown and Rhode Island Hospital accumulated 124 violations of federal animal welfare rules.** Of those violations, 54 resulted in the unexpected deaths of animals, some of whom suffered and then died after days without food or water. Due to weak federal oversight, at no point have the two institutions faced fines or other punishments related to these violations. In addition, pigs are intelligent, emotionally complex animals. Even if the pigs remain under anesthesia during the emergency medicine course, they must endure the stress of transport, caging, and preparation, and they are killed—all just to provide substandard training. The best way to show respect for animals is to replace them in training whenever superior methods exist, as they do in this case.

Myth: *The pigs used by Brown and Rhode Island Hospital would be slaughtered for food if not used for this training, so proposed legislation would not save any animals.*

Fact: This is false. **Companies that sell animals for use in training or research increase breeding depending on anticipated sales.** Brown and Rhode Island Hospital understand this, so their claim is disingenuous at best.

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Bad Medicine:

Violations of Federal Animal Welfare Rules by Brown University and Rhode Island Hospital

Recently disclosed public records reveal that Brown University and Rhode Island Hospital (RIH) habitually violate the minimum standards set by federal animal welfare rules. Between October 2017 and July 2023, the institutions accumulated **124 violations** of the Animal Welfare Act and Public Health Service Policy on Humane Care and Use of Laboratory Animals. Of those violations, **54 resulted in the unexpected deaths of animals**, some of whom suffered and then died after days without food or water. At no point has Brown or RIH faced fines or other punishments related to these violations. Also, despite clear evidence to the contrary, representatives of the institutions have repeatedly told state legislators that they treat animals "humanely" and "respectfully."[1,2] Such statements were made in committee testimonies as recently as March 2023 when Brown and RIH defended their use of pigs to train emergency medicine physicians. As a starting point, the institutions should eliminate that unnecessary, inferior practice, and the General Assembly should ensure they do so.

Controversy at Brown and RIH: Using Pigs to Train Physicians

Since the 1990s, there has been a monumental shift away from the use of nonhuman animals to train medical students and physicians. As of 2016, not a single medical school in the United States or Canada was using live animals to train students.[3] Residency programs—where physicians go after medical school to acquire a specialty—have also replaced animals at a rapid rate. Pediatrics residencies in the U.S. and Canada no longer use live animals.[4] Among surgery residencies, where invasive and critical procedures are taught, 80 percent of those surveyed in the U.S. have replaced animals.[5]

When it comes to the teaching of emergency medical procedures, the trend is also clear. Among the 385 Advanced Trauma Life Support programs in the U.S. and Canada, *384* of them do not use animals.[6] For emergency medicine residency programs the numbers are almost as high: 97 percent have replaced animals.[7] Yet Brown and RIH have continued to be extreme outliers, performing an invasive procedure known as a cricothyroidotomy (or "surgical airway") on otherwise healthy pigs and then killing the animals.

Since 2018, when the Physicians Committee for Responsible Medicine began appealing to Brown faculty to replace animals, 10 emergency medicine programs have replaced animals, including those at Baystate Medical Center in Massachusetts, Maine Medical Center, Vanderbilt University, Dartmouth College, and the Mayo Clinic. As of the publication of this report, 284 medical centers across North America were producing emergency physicians without killing animals.[8] Among the eight members of the Ivy League, Brown is the only one still using animals for this purpose.

Rhode Island state legislators have grown increasingly concerned about emergency medicine training at Brown and RIH. Most recently, H 5357, which was introduced in February 2023 by Rep. Brandon Potter, would have required that an institution training healthcare providers replace animals if a nonanimal method exists for the procedure being taught or another accredited program in the state in the same discipline was training without animals. In this case, both are true—Kent Hospital in Warwick replaced the use of animals in its emergency medicine program more than a decade ago.

Educators elsewhere have made the decision to replace animals after careful consideration of what is best for patients and an evaluation of devices called simulators, which accurately model human anatomy. In 2016, the University of South Carolina announced that it would no longer use animals to train emergency medicine residents, stating: "Continued advances in simulation technology make it possible for us to make this change at this time. In doing so, we affirm our belief that preparing healthcare providers for the preservation of human life is our greatest responsibility and we are confident that this change will not adversely affect the quality of our training programs."[9]

Among the eight members of the Ivy League, **Brown is the only one still using animals** to train emergency medicine physicians.

Scientific Studies Support the Replacement of Animals

The number of scientific studies supporting the replacement of animals for emergency medicine training generally and surgical airway training specifically continues to grow.

Previously, emergency medicine faculty at the University of Arizona developed a 3D-printed bleeding model for teaching surgical airway and in 2018 published the results of using it to train residents. Nearly half (46.5%) of all study participants had previously trained on pigs while some had practiced on cadavers and/or simulators. Overall, the 3D-printed model "was rated higher than the previously used models," and participants "specifically commented on the realism of the bleeding tissue and texture of the skin."[10]

In 2020, authors from Johns Hopkins University and the U.S. Department of Defense compared animals to a simulator for teaching surgical airway and found no difference in performance between the two groups. They concluded: "We believe that currently available simulation technology has the potential to vastly improve the training of both military and civilian medics to perform surgical cricothyroidotomy when compared with [animals]."[11]

Several other military studies have revealed the effectiveness of using simulators for teaching surgical airway. A 2015 study involving 559 U.S. Army medics investigated simulators versus animals "for training and assessing performance on lifesaving airway, breathing and hemorrhage procedures." The study found "there was no significant difference" in failure rates between medics trained on simulators and those trained on animals for performing surgical airway.[12]

A Canadian Armed Forces study found that simulators were superior to animals in a crucial way. The authors wrote: "Medics who were tested on [surgical airway] on simulators during the battlefield scenario were more likely to pass the assessment because they were more likely to be able to insert the tracheotomy tube into the trachea, compared with those medics tested on the animal model."[13]

Medical simulators like this one allow physicians to train on models that replicate human anatomy.

An important element of medical training is the need to train as you will practice, which means recreating real-world stress. A significant body of evidence reveals that courses built around simulators modeled on human anatomy do this as well as or better than those involving animals. The U.S. Army funded a study published in 2018 that compared goats to simulators. More than 200 Army medics performed several emergency procedures, including surgical airway. The authors concluded: "Synthetic models can produce a stress response equivalent to that of live tissue during simulation training. This is the largest study to date indicating synthetic models produce a sufficient immersive and realistic experience for trainees."[14]

In another study, emergency medicine residents' heart rate and systolic blood pressure were monitored as they re-

sponded to a "patient" (a simulator) whose health was deteriorating. On average, the residents experienced significant increases in heart rate and blood pressure, and the authors concluded: "Physiological arousal suggests that the [emergency medicine] residents developed a sense of urgency and responsibility for managing the simulated patient ... We were able to demonstrate that residents adequately 'suspended disbelief' and performed 'as if' it were real ... Simulations provide invaluable opportunities for medical trainees to practice their critical care and thinking skills under very real stress. The obvious difference is also a critical one: a trainee can learn to harness their own stress response without placing patients' lives at risk."[15]

> **"We believe that currently available simulation technology has the potential to vastly improve the training of both military and civilian medics...when compared with [animals]."**
>
> – Authors of a study conducted by Johns Hopkins University and the Department of Defense

A study conducted by Defence Research and Development Canada compared biomarkers of stress (the adrenal hormones cortisol and dehydroepiandrosterone) found in the saliva of medics before, during, and after they conducted a Tactical Medicine course using either live pigs or simulators. They concluded: "Our first hypothesis stated that [live animals] and [simulators] would be associated with different stress levels. This hypothesis was not supported ... These results suggest that [simulators] and [live animals] do not exert varying effects on stress..."[16]

Animal Welfare Violations at Brown and Rhode Island Hospital

Federal rules related to the welfare of animals in laboratories are weak and limited, but Brown and RIH habitually fail to meet even those minimum standards. Despite its name, the federal Animal Welfare Act allows all forms of animal experiments—including those that inflict pain. The law—primarily a husbandry statute that regulates the size of cages, cleanliness, food, and water—covers fewer than five percent of animals used in laboratories. In addition, the U.S. Department of Agriculture (USDA), which is supposed to enforce the law, was cited by its own inspector general for closing investigations involving animal deaths and serious repeat violations and for unnecessarily reducing fines by an average of 86%.[17] In 2022, Harvard Law School sued USDA for "offloading the burden of inspecting animal research sites to a private third party, resulting in a system that the lawsuit describes as largely self-policing and less rigorous."[18]

In addition, USDA has a well-documented history of creating policies that wipe violations from publicly available records. In February 2019, *The Washington Post* reported, "USDA inspectors documented 60 percent fewer violations at animal facilities in 2018 from the previous year.... The drop in citations is one illustration of a shift—or what critics call a gutting—in USDA's oversight of animal industries."[19] Therefore, the violations discussed in this report may only be the tip of the iceberg.

The U.S. National Institutes of Health (NIH) has its own rules related to the conduct of animal experiments, but they are mostly recommendations and never appear to result in fines or other punishments—even in cases of animal deaths or severe negligence. NIH's method of "enforcement" is written correspondence between a violating institution and the agency's Office of Laboratory Animal Welfare (OLAW). NIH does not conduct animal welfare inspections.

The Physicians Committee obtained correspondence between NIH and Brown and NIH and RIH covering the period of October 2017 to July 2023 using the federal Freedom of Information Act. We also accessed reports of inspections conducted by USDA during the same time period using the agency's online Animal Care Public Search Tool.[20] The documents discuss violations involving primates, pigs, rabbits, mice, rats, bats, fish, and turkeys. On two occasions, Brown reported violations but did not specify the species.

Here are key takeaways from the documents:

- Brown reported **80 violations** of federal animal welfare rules. RIH reported **44 violations**.
- **54 of the combined 124 violations clearly resulted in unexpected animal deaths.**[21,22] In reports related to another 24 violations, Brown and RIH did not make clear whether the incidents resulted in unexpected deaths.[23,24]
- 20 violations—all at Brown—stemmed from **failing to provide animals with proper food and/or water**—for days, in some cases.[25] In every instance, the animals were found dead, or staff euthanized them because their health had so significantly deteriorated.

- 12 violations related to the euthanasia of animals.[26,27] Most disturbingly, **seven of those incidents resulted in animals likely suffering for prolonged periods when staff failed to properly euthanize them**—including multiple cases where living animals were found in a carcass freezer.
- **On 10 separate occasions, staff were suspended or put on probation due to violations**—including one lab manager and two principal investigators (i.e., individuals in charge of research projects). In two incidents, research projects were temporarily suspended. In another incident, an entire laboratory was put on probation for 6 months.[28,29]

Specific incidents include:

- In November 2021, a pig at RIH developed an infection at a surgical site. **While lab staff were directed to clean the incision over the weekend, they did not**. Upon review of veterinary records, four other past incidents were found in which staff involved in this project failed to properly care for animals following surgery. In addition, there was "one other instance where the veterinary staff's directives to laboratory staff were not followed."[30] These were violations of both NIH rules and the Animal Welfare Act. While USDA (and thus our report) counted them as a single violation, they could have been counted as *six* violations. This is particularly noteworthy as the emergency medicine training lab involving pigs takes place at RIH.
- In January and February 2021, Brown discovered six different violations in one laboratory, including **"[c]ages with soaked and soiled bedding,"** "[l]ack of cleanliness in the animal use area," and "[r]emnants of long-standing mouse remains within one cage."[31]
- In April 2022 at RIH, "a member of the animal facility staff found a bag of mice in the carcass freezer that contained 12 live (still moving) neonates."[32] They were then euthanized. It is unclear how long the newborn mice were suffering in the bag. **No staff faced punishment following the incident.**
- In September 2017, Brown reported **"continuing" violations by a lab manager who repeatedly failed to follow internal policies and federal regulations** related to administering anesthesia and post-surgical care.[33] An internal Brown committee temporarily suspended the manager from performing certain tasks, but they also approved changing the protocol governing the manager's project in order to "reduce post-operative monitoring to once per day"—as if the staff member's failures were caused by too much work.
- In May 2020, two experimenters at RIH surgically implanted tumors in 16 mice. The next day, one animal was found dead and the other 15 were "moribund" or in "poor health." An internal committee found that **the experimenters had not been cleared to independently perform surgery, they had failed to "follow the approved surgical procedures," they had not provided pain relief to the animals**, and they did not monitor the animals following surgery. [34]

54 of the combined 124 violations at Brown and RIH clearly resulted in unexpected animal deaths.

Each time Brown reported a violation to NIH, its letters closed with this statement: "Brown University Is committed to protecting the welfare of animals used in research and appreciates the guidance and assistance provided by OLAW in this regard." Considering the reports detailed above, there appears to be no such commitment, and the university's view of NIH as a *guide* and *assistant* rather than enforcer of rules is clear from the correspondence.

Oversight Is Needed From the Rhode Island General Assembly

As two of Rhode Island's most prominent medical institutions, Brown University and Rhode Island Hospital should be held to a high standard. The welfare of animals used in experiments is of serious public concern, and the replacement of animals with nonanimal methods is the only way to properly ensure they are not harmed. In at least one area, Brown and RIH have a clear opportunity. Immediately, the institutions should follow nearly every other medical center in the country by replacing pigs in its emergency medicine training program. In doing so, at least in that one area, they would be treating animals "humanely" and "respectfully." If they continue to refuse to do so, the Rhode Island General Assembly should pass legislation that would replace animals and provide patients with modern, human-relevant care.

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