

BIOGRAPHICAL SKETCH

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NAME: Geis, Gary L.

eRA COMMONS USER NAME (credential, e.g., agency login): GAGEIS

POSITION TITLE: Professor of Pediatrics, Division of Emergency Medicine; Medical Director, Center for Simulation and Research; Program Director, Medical Simulation Fellowship

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Cincinnati, College of Engineering, Cincinnati, OH	B.S.	06/1991	Civil and Environmental Engineering
University of Cincinnati, College of Medicine, Cincinnati, OH	M.D.	06/1997	Medicine
Children's Hospital of The King's Daughters, Norfolk, VA	Residency	06/2000	Pediatrics
Children's Hospital of The King's Daughters, Norfolk, VA	Chief Residency	06/2001	Pediatrics
Cincinnati Children's Hospital Medical Center, Cincinnati, OH	Fellowship	06/2004	Pediatric Emergency Medicine

A. Personal Statement

As a board-certified pediatrician (20 years) and board-certified pediatric emergency physician (17 years), I have accumulated a significant amount of clinical experience in the care of acutely injured and ill children. More specifically, I have pursued clinical expertise in the management of pediatric airways.

In the initial years after fellowship I attended multiple airway courses nationally, including the Difficult Airway Course™ and the Practical Emergency Airway Management Course. Additionally, I developed a quarterly rotation in the operating suites here for myself with a small group of anesthesiology attendings. In my third year as faculty, I developed and built the Medical Resuscitation Committee – an interprofessional group of physicians and nurses who took over education, training, quality improvement and research within our emergency department's shock trauma suites (STS). As part of our early work, I instituted a video-review process for resuscitation care, built a monthly medical video review conference and introduced in situ simulation to the shock trauma suites as part of an AHRQ-funded two-year grant to study in situ simulation. Early in program development I co-authored a paper on the frequency, or lack there, of invasive procedures performed by fellows and faculty within the STS. In response, I co-developed a standing airway rotation for all the emergency medicine faculty where they were scheduled into the operating suites twice a year to practice bag-mask ventilation, placement of supraglottic airways and endotracheal intubation. Additionally, I introduced video laryngoscopy into the STS initially using the GlideScope and then transitioning to the Storz C-MAC system.

I was one of our internal investigators who assessed medication-assisted intubations in the STS setting, then developed a quality improvement program to address our first time success rate and complication rate. I am proud to say that the combination of a rapid sequence intubation checklist, co-pilot model for use of the cognitive aid, and video laryngoscopy have improved our 1st-attempt success rate from 52% to almost 80%, reduced desaturation from 33% to less than 15% and almost eliminated esophageal intubations in our setting. Most recently, I have co-led a quality improvement project to eliminate cardiopulmonary arrest during endotracheal intubation. As part of a collaborative working group of emergency department and pediatric

intensive care unit providers, we developed six high-risk criteria that put pediatric patients at risk for cardiopulmonary arrest in the peri-intubation period. We have now published two papers, the first detailing the performance of these criteria in a retrospective review and the second detailing our development of the PICU-ED Team (PET). This novel care team/process identifies at risk patients, mobilizes critical care providers, recommends specific supportive care prior to intubation and provides a collaborative team-level discussion before intubation attempts. Since introduction of the PET we have not had a patient suffer cardiopulmonary arrest in the peri-intubation period in the STS.

Beyond my clinical role, I routinely educate medical students, pediatric and emergency medicine residents, and pediatric emergency fellows as a Professor of Pediatrics at the University of Cincinnati, College of Medicine. In addition to these standard teaching roles, I have been a Pediatric Advanced Life Support (PALS) instructor for 16 years, as well as an Advanced Cardiovascular Life Support (ACLS) and an Advanced Trauma Life Support (ATLS) instructor for 11 years. Eight years ago I became certified as a provider and master trainer for Helping Babies Breathe (HBB). I strongly feel that my status as an instructor in these Life Support courses allows me to be a better clinical, but also forces me to stay up on all of the literature surrounding resuscitative care. Annually, I am responsible for the PALS pages within our residency's handbook, known as "The Pocket." These pages include the PALS algorithms adapted for use in our institution, a page with resuscitation equipment and a page with resuscitative medications. Additionally, I author the PALS algorithms that are used in our STS and on the code carts throughout the institution which I update annually and thoroughly revise every five years based on AHA updates.

I have been actively involved in simulation-based training and research for over 20 years; served as the Assistant Medical Director at our Center for Simulation and Research (CSR) for four years; and have been the Medical Director since July 2011. Since 2004, I have worked within our institution to develop, implement and assess simulation-based training curriculum for physician and non-physician staff across lab, in situ and outreach settings. During the initial years, I leveraged simulation to improve teamwork and communication behaviors, and assessed clinical units for latent safety threats and team-level knowledge deficits. Over the last 10 years, while continuing work on team training and systems integration, I have developed and implemented multiple simulation-based training programs surrounding procedural skill training, team leadership, recognition of sepsis and medical decision making. I have built a three-room lab focused on procedural skills, including an airway lab that allows deliberate practice of bag-mask ventilation, supraglottic airways, orotracheal intubation, nasotracheal intubation, and fiberoptic intubation. Additionally, I have personally built training to allow for practice in managing airways complicated by tonsillar hemorrhage, airway hemorrhage and foreign body airway obstruction, including training on needle and surgical cricothyrotomy. I currently directly oversee the development, medical content, delivery and facilitation of 110-plus courses annually at the CSR.

Relevant to this proposal, over the last decade I have worked within the institution to identify and support expertise within technology-based immersive training platforms. This included both recruiting and retaining the high-level application development team we have within the CSR, while pairing them with talented educational researchers such as Dr. Zackoff. Our Center not only employs these developers, but we have dedicated an education specialist to help implement their novel platforms within our clinical workforce. Most specific to this proposal, I have mentored faculty and fellows within Emergency Medicine, Critical Care, Anesthesiology and Neonatology through funded studies focused on procedural training, including bag-mask ventilation, endotracheal intubation, placement of supraglottic devices, and placement of intraosseous catheters. In the last year alone, I have mentored an emergency medicine fellow on the use of virtual reality and artificial intelligence for training residents to perform and verbalize their circulatory assessment on critically ill patients and a medical simulation fellow on the use of virtual reality for training staff physicians and advanced practice providers to perform digital blocks for local anesthesia. Dr. Zackoff was part of our study team for both projects demonstrating our high-level of active and productive collaboration.

In summary, this accrued level of clinical, educational, research and administrative expertise allows me to serve as a co-investigator for this current proposal, "Maintaining and Enhancing Advanced Skills Through Experiential and Realistic Virtual Reality: An Efficacy and Validation Study of iMASTER-VR."

B. Positions, Scientific Appointments, and Honors

Positions:

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| 2019-present | Professor of Pediatrics, Division of Emergency Medicine, Cincinnati Children's Hospital Medical Center, University of Cincinnati, College of Medicine, Cincinnati, OH |
| 2010-2019 | Associate Professor of Pediatrics, Division of Emergency Medicine, Cincinnati Children's |

2004-2010 Hospital Medical Center, University of Cincinnati, College of Medicine, Cincinnati, OH
 Assistant Professor of Pediatrics, Division of Emergency Medicine, Cincinnati Children's
 Hospital Medical Center, University of Cincinnati, College of Medicine, Cincinnati, OH
 2000-2001 Instructor of Pediatrics, Division of Emergency Medicine, Children's Hospital of The King's
 Daughters, Eastern Virginia Medical School, Norfolk, VA

Honors:

1998 Intern of the Year, Children's Hospital of The King's Daughters, Norfolk, VA
 2000 Senior Resident of the Year, Children's Hospital of The King's Daughters, Norfolk, VA
 2004 Fellow Teaching Award, Department of Pediatrics, Cincinnati Children's Hospital Medical
 Center, Cincinnati, OH
 2005 Golden Apple (Teaching) Award, Department of Emergency Medicine, University of Cincinnati,
 College of Medicine, Cincinnati, OH
 2006 Faculty Teaching Award, Department of Pediatrics, Cincinnati Children's Hospital Medical
 Center, Cincinnati, OH
 2006 Golden Apple (Teaching) Award, Department of Emergency Medicine, University of Cincinnati
 College of Medicine, Cincinnati, OH
 2007 Golden Apple (Teaching) Award, Department of Emergency Medicine, University of Cincinnati
 College of Medicine, Cincinnati, OH
 2008 Golden Apple (Teaching) Award, Department of Family Practice, University of Cincinnati
 College of Medicine and The Christ Hospital, Cincinnati, OH
 2011 Golden Apple (Teaching) Award, Department of Emergency Medicine, University of Cincinnati
 College of Medicine, Cincinnati, OH
 2015 Educational Achievement Award, Department of Pediatrics, Cincinnati Children's Hospital
 Medical Center, Cincinnati, OH
 2017 Named an "All Star" attending physician by the graduating class of residents from 2007 as part
 of their 10-year reunion at Cincinnati Children's Hospital Medical Center
 2019 Named one of the top reviewers for Simulation in Healthcare: Journal of the Society for
 Simulation in Healthcare®. Honored at the January 2020 IMSH in San Diego.

Memberships in Professional Organizations, Licensing and Certifications:

1997-present American Academy of Pediatrics
 2001-present State of Ohio Medical License
 2001-present Specialty Board Certification: General Pediatrics, American Board of Pediatrics
 2004-present Subspecialty Board Certification: Pediatric Emergency Medicine, American Board of
 Pediatrics
 2008-present Society for Simulation in Healthcare

C. Contributions to Science

One area of scientific focus/contribution has been pediatric airway management. This area of interest grew out of my clinical practice in the emergency department, where airway emergencies and procedural intervention are the most frequent and high-risk situation we face. Although common in adult emergency departments, the need for emergent intubation is relatively uncommon in the pediatric ED setting. A working group (Medical Resuscitation Committee) that I developed and continue to mentor has made significant strides identifying the frequency and complications of intubations in the pediatric ED setting, implementing quality improvement interventions surrounding rapid sequence intubation, and measuring effect of those interventions. Publications most specific to this area include:

Kerrey BT, Rinderknecht AS, **Geis GL**, Nigrovic LE, Mittiga MR. Rapid Sequence Intubation for Pediatric Emergency Patients: Higher Frequency of Failed Attempts and Adverse Effects Found by Video Review. *Ann Emerg Med*. 2012 Sept;60(3):251-9. PMID: 22424653

Rinderknecht AS, Mittiga MR, Meinen-Derr J, **Geis GL**, Kerrey BT. Factors associated with oxyhemoglobin desaturation during rapid sequence intubation in a pediatric emergency department: findings from multivariable analyses of video review data. *Acad Emerg Med*. 2015 Apr;22(4):431-40. PMID: 25779855

Kerrey BT, Mittiga MR, Rinderknecht AS, Varadarajan KR, Dyas JR, **Geis GL**, Luria JW, Frey ME, Jablonski TE, Iyer SB. Reducing the incidence of oxyhaemoglobin desaturation during rapid sequence intubation in a paediatric emergency department. *BMJ Qual Saf*. 2015 Nov;24(11):709-17. PMID: 26183713

Kerrey BT, Mittiga MR, Boyd S, Frey M, **Geis GL**, Rinderknecht AS, Ahaus K, Varadarajan KR, Luria JW, Iyer SB. Sustained Improvement in the Performance of Rapid Sequence Intubation Five Years after a Quality Improvement Initiative. *Pediatr Qual Saf*. 2021 March/April; 6 (2);e385 (PMID pending).

A second area of scientific focus/contribution has been team-based training of healthcare providers using medical simulation to improve communication within teams, increase teamwork behaviors, identify and mitigate latent threats, and ultimately reduce serious safety events in the clinical setting. This area of interest grew out of my interest in pediatric resuscitation and my exposure to team-based care in our resuscitation bays. Serious safety or sentinel events have been described in the healthcare and risk management literature as frequently due to errors in communication and teamwork. Our simulation center, which I currently direct, has been on the cutting edge in leveraging medical simulation to improve safety within our institution since 2005. Publications most specific to this area include:

Geis GL, Pio BL, Pendergrass TL, Moyer MR, Patterson MD. Simulation to Assess the Safety of New Healthcare Teams and New Facilities. *Simul Healthc*. 2011 Jun; 6(3):125-133. PMID 21383646

Patterson MD, **Geis GL**, Lemaster T, Wears RL. Impact of multidisciplinary simulation-based training on patient safety in a paediatric emergency department. *BMJ Qual Saf*. 2013 May;22(5):383-93. PMID: 23258388

Couto TB, Kerrey BT, Taylor RG, FitzGerald M, **Geis GL**. Teamwork skills in actual, in situ, and in-center pediatric emergencies: performance levels across settings and perceptions of comparative educational impact. *Simul Healthc*. 2015 Apr;10(2):76-84.

Geis GL, Wheeler DS, Bunger A, Militello LG, Taylor RG, Bauer JP, Byczkowski TL, Kerrey BT, Patterson MD. A Validation Argument for a Simulation-Based Training Course Centered on Assessment, Recognition, and Early Management of Pediatric Sepsis. *Simul Healthc*. 2018;13(1):16-26. PMID: 29346221

A third area of scientific focus/contribution has been the development of new care processes within our shock trauma suites. I have partnered my clinical and simulation interests to (a) identify areas of need within our shock trauma suites, (b) use in situ simulation to best understand opportunities and develop solutions for improvement and (c) leverage simulation to implement and maintain developed processes. Publications most specific to this area include:

Johnson K, **Geis G**, Oehler J, Meinen-Derr J, Bauer J, Myer c, Kerrey B. Simulation to implement a novel system of care for pediatric critical airway obstruction. *Arch Otolaryngol Head Neck Surg*. 2012 Oct 1;138(10):907-11. PMID: 23069820

Hoehn EF, Cabrera-Thurman MK, Oehler J, Vukovic A, Frey M, Helton M, **Geis G**, Kerrey B. Enhancing CPR During Transition from Prehospital to Emergency Department: A QI Initiative. *Pediatrics*. May 2020;145(5) e20192908. Epub 2020 Apr 16. PMID: 32299822

Dean PN, Hoehn EF, **Geis GL**, Frey ME, Cabrera-Thurman MK, Kerrey BT, Zhang Y, Stalets EL, Zackoff MW, Maxwell AR, Pham TM, Lautz AJ. Identification of the Physiologically Difficult Airway in the Pediatric Emergency Department. *Acad Emerg Med*. 2020 Dec;27(12):1241-1248. PMID: 32896033

A fourth area of scientific focus/contribution has been the use of technology-based simulation, including motion capture, virtual reality and augmented reality. While these technology-based assessment and training strategies provide a wide amount of opportunities, I have been able to focus my collaborative work to resuscitative care for pediatric-aged patients. Publications most specific to this area include:

Kerrey BT, Boyd S, **Geis G**, Macpherson R, Cooper E, Kiefer A. Developing a Profile of Procedural

Expertise - a Simulation Study of Tracheal Intubation using 3D Motion Capture. *Simul Healthc.* 2020 Aug;15(4):251-258. PMID: 32168289

Zackoff MW, Cruse B, Sahay RD, Fei L, Saupe J, Schwartz J, Klein M, **Geis GL**, Tegtmeyer K. Development and Implementation of Augmented Reality Enhanced High-Fidelity Simulation for Recognition of Patient Decompensation. *Simul Healthc.* 2020 Sep 8. [Online ahead of print] PMID: 32910102

Complete List of Published Work in My Bibliography:
<http://www.ncbi.nlm.nih.gov/pubmed/?term=geis+gary>