

Curriculum Vitae

Name: Christina Hayhurst
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Training

2000 - 2004 B.S. in Physiology, minor in Chemistry & Art History, Summa Cum Laude from University of Arizona, Tucson, AZ
2005 - 2009 M.D. from University of Arizona, AZ United States
2009 - 2010 Internship in Internal Medicine from University of Virginia, Charlottesville, Virginia
2010 - 2013 Residency in Anesthesiology from University of Virginia, Charlottesville, VA
2014 - 2015 Fellowship in Critical Care from Vanderbilt University, Nashville, TN

Licensure and Certification

2014 - 2024 Certification, Specialty Certification in Anesthesiology United States
2015 - 2017 License, Tennessee Medical License of Tennessee United States (MD52832)
2015 - 2025 Certification, Subspecialty Certification in Critical Care United States (51832)

Academic Appointments

07/2013 - 07/2014 Assistant Professor, Anesthesiology, University of Virginia (Charlottesville, Virginia)
07/2015 - Present Assistant Professor of Anesthesiology, Vanderbilt University (Nashville, Tennessee)

Professional Organizations

2008 American Society of Anesthesiologists, Member
2014 Society of Critical Care Anesthesiologists
2014 International Anesthesia Research Society
2018 American Burn Association

Professional Activities

Intramural

04/2015 - Present ACCM Program Evaluation Committee, Anesthesiology, Faculty Member, Evaluate Critical Care fellowship for ACGME compliance and fellow satisfaction
10/2015 - Present ACCM Fellowship Interview Committee, Anesthesiology, Faculty Interviewer, Part of the core group that interviews, evaluates and selects candidates for the CCM fellowship
12/2015 - Present Standardization of Practice Workgroup, Critical Care Division, Anesthesiology, Member, Create protocols for the critical care division
12/2016 - Present Clinical Competency Committee, Anesthesiology, Member
12/2016 - 02/2020 P&T Committee, Anesthesiology, Member
2018 - Present Early Career Task Force, Anesthesiology, Elected as 1 of 2 representatives from the division by our faculty.
07/2020 - Present ACCM Fellowship Director, Anesthesiology, Fellowship Director for 10 ACCM fellows per year., Director
11/2020 - Present GMEC, Anesthesiology

Extramural

2017 - Present Reviewer for A&A Case Reports
01/2017 - Present Reviewer for Critical Care Nurse
11/2017 - Present Anesthesia & Analgesia
2018 - Present Program Directors Advisory Council, Anesthesiology, Member
2018 - Present Reviewer for South African Journal of Anaesthesia and Analgesia
11/2018 - Present Reviewer for American Thoracic Society

2019 - 2020	ICU Liberation Second Edition Book Revision Task Force, Anesthesiology, Member
05/2019 - Present	Journal of Critical Care Medicine
06/2019 - Present	Reviewer for PLOS One
08/2019 - Present	Journal of Medicine, Ethics and Law
12/2019 - Present	Reviewer for Pain Medicine
08/2020 - Present	Reviewer for Critical Care Medicine
09/2020 - Present	Reviewer for Critical Care Explorations

Teaching Activities

2013 - 2013	Weekly Conference: The bottom right of the airway algorithm: emergency invasive airways, Faculty Instructor, Charlottesville
2013 - 2013	Weekly conference: Malignant hyperthermia Preparedness, Faculty Instructor, Charlottesville
2013 - 2013	Weekly Conference: Geriatric Anesthesia, Faculty Instructor, Charlottesville
2014 - 2014	Board Review: Renal, Electrolyte and Fluids: basic board review, Faculty Instructor, Charlottesville
2015 - 2015	ANCP Bootcamp: Ventilator Work Shop, Faculty Instructor, Nashville, Advanced Ventilator Management instruction and demonstration
2015 - 2015	Critical Care Skills Week: Burn and Trauma, Instructor, Nashville, Burn and trauma simulations.
06/2015 - 06/2015	Central Line Workshop, Instructor
09/2015 - 09/2015	Critical Care Skills Week: Trauma/Burn/Fluid Management, Faculty Instructor
2016 - 2016	Critical Care Skills Week: Cardiopulmonary Cerebral Resuscitation, Faculty Instructor
2016 - 2016	CCSW: Diagnosis and Treatment of Shock - lecture and simulation, Faculty Instructor
2016 - 2016	Critical Care Skills Week: Diagnosis and Treatment of Shock, Faculty Instructor
05/2016 - 05/2016	Perioperative Opioid Induced Hyperalgesia, Faculty Instructor
06/2016 - 06/2016	Resident Bootcamp: Opioids, Faculty Instructor
08/2016 - 08/2016	Acetaminophen, NSAIDs and COX2 Inhibitors, Faculty Instructor
09/2016 - 09/2016	FCCS Course: Recognition and Assessment of the Seriously Ill, Faculty Instructor
09/2016 - 09/2016	ACNP Bootcamp: Advanced Airway Management in the ICU, Invited Speaker
09/2016 - 09/2016	Perioperative Diabetes Management, Faculty Instructor
09/2016 - 09/2016	Amputation Anesthesia and Phantom Limb Pain, Faculty Instructor
09/2016 - 09/2016	Perioperative Opioid Induced Hyperalgesia, Faculty Instructor
10/2016 - 10/2016	Opioid Induced Hyperalgesia, Faculty Instructor
11/2016 - 11/2016	Critical Illness Associated Brain Dysfunction, Faculty Instructor
11/2016 - 11/2016	Long Term Cognitive Impairment Journal Club, Faculty Instructor
11/2016 - 11/2016	Amputation Anesthesia and Phantom Limb Pain, Faculty Instructor
11/2016 - 11/2016	Acetaminophen, NSAIDs and COX 2 Inhibitors, Faculty Instructor
02/2017 - 02/2017	Critical Care Immersion: Critical Illness Electrolytes, Faculty Instructor
02/2017 - 02/2017	Critical Care Immersion: Diagnosis and Treatment of Shock - lecture and simulation, Faculty Instructor
02/2017 - 02/2017	Opioid Induced Hyperalgesia, Faculty Instructor
04/2017 - 04/2017	ABA Advanced Lecture Series: Anesthesia and the Allergic Response, Faculty Instructor, Nashville
07/2017 - 07/2017	Periop Rotation Lecture: Epidural Follow Up and Troubleshooting, Faculty Instructor
07/2017 - 07/2017	Periop Daily Lecture: Pre-operative Cardiac Evaluation, Faculty Instructor
09/2017 - 09/2017	Critical Care Immersion Course: Critical Illness Electrolytes, Faculty Instructor
09/2017 - 09/2017	ACNP/PA Bootcamp: Advanced Airway Management, Faculty Instructor, CELA
11/2017 - 11/2017	Opioid Induced Hyperalgesia, Faculty Instructor
12/2017 - 12/2017	Periop Daily Lecture: Acetaminophen, NSAIDs and COX-2 Inhibitors, Faculty Instructor
12/2017 - 12/2017	Periop Daily Lecture: Amputation and Phantom Limb Pain, Faculty Instructor
01/2018 - 01/2018	Periop Daily Lecture Series: Epidural Follow-up and Troubleshooting, Faculty Instructor
01/2018 - 01/2018	Periop Daily Lecture Series: Pre-operative Cardiac Evaluation, Faculty Instructor
02/2018 - 02/2018	ICU Cognitive Dysfunction, Faculty Instructor

02/2018 - 02/2018	Long Term Cognitive Impairment: Journal Club, Faculty Instructor
03/2018 - 03/2018	Pre-operative Cardiac Evaluation, Faculty Instructor
03/2018 - 03/2018	Perioperative AKI, Faculty Instructor
07/2019 - Present	Care of the Burn Patient in the ICU
07/2019 - Present	Opioid Induced Hyperalgesia, Faculty Instructor
07/2019 - Present	Perioperative Kidney Injury, Faculty Instructor
09/2019 - Present	Diagnosis and Management of Shock, Faculty Instructor
09/2019 - Present	Trauma and Burn Management, Faculty Instructor
09/2019 - Present	Care of the Burn Patient, Faculty Instructor
10/2019 - Present	Pain in the ICU, Faculty Instructor
11/2019 - Present	Ventilator Management and ARDS, Faculty Instructor, Burn ICU lecture series
11/2019 - Present	Delirium in the ICU, Faculty Instructor, BURN ICU resident lecture series
12/2019 - Present	Opioid Induced Hyperalgesia, Faculty Instructor, MCE
01/2020 - Present	Ventilator Management, Faculty Instructor, BICU, Burn ICU lecture series
06/2020 - Present	Epidural troubleshooting, Faculty Instructor
08/2020 - Present	Ventilator Management, Faculty Instructor, BICU resident lecture series
09/2020 - Present	Physics of Ultrasound and Knobology, Faculty Instructor, Periop Lecture Series
10/2020 - Present	ARDS, Faculty Instructor, BICU
11/2020 - Present	Opioid Induced Hyperalgesia: COVID update, Faculty Instructor
02/2021 - Present	Mock Oral Boards, Faculty Instructor
02/2021 - Present	Antispasmodics in the Perioperative Period, Faculty Instructor, Periop Lecture Series
04/2021 - Present	Nutrition in Burns, Faculty Instructor
04/2021 - Present	Inhalation Injury, Faculty Instructor
04/2021 - Present	Care of the Critically Ill Burn Patient, Faculty Instructor
05/2021 - Present	Board Review Prep: Burns, Faculty Instructor
08/2021 - Present	High Yield Burn Care, Faculty Instructor
08/2021 - Present	Pain Management in the ICU, Faculty Instructor

Research Supervision / Mentorship

10/2017 - 2018	Christy Idichandy, M.D. Vanderbilt. (Post-doc Fellow, Research)
08/2019 - 07/2020	Charles Baysinger (Post-doc Fellow, Research)
2020 - Present	Lucille Brunker (Post-doc Fellow, Research)

Other Significant Activities

2018	Interviewed by AP: https://news.medsbla.com/medical-news/anaesthesiology/icu-chronic-pain-common-after-discharge/
2019	Interviewed by Clinical Pain Advisor: https://www.clinicalpainadvisor.com/home/topics/chronic-pain/increasing-interest-in-long-term-negative-consequences-of-critical-care-termed-post-intensive-care-syndrome/2/
09/2019	Interviewed by the New York Times : New York Times reporter Jack Healy interviewed Christina Hayhurst, MD, assistant professor of Anesthesiology and Critical Care Medicine, for a story about fentanyl dosing in a medical ICU. https://www.nytimes.com/2019/10/11/us/ohio-doctor-overdose.html

Honors / Awards

2007	Commitment to Underserved People Leadership Award, University of Arizona College of Medicine, Awarded to medical students that committed a significant portion of their free time to helping underserved populations through various programs.
2008	Outstanding Achievement Award in Medical School, University of Arizona College of Medicine.
2008	Senior AOA, AOA, Awarded to top 10% of graduating medical school class.
2008	Gold Humanism Honor Society Induction, Gold Humanism Honor Society, The Gold Humanism Honor Society recognizes individuals who are exemplars of humanistic patient care and who can serve as role models, mentors, and leaders in medicine.
03/2015	SOCCA Young Investigator's Award, Society of Critical Care Anesthesiologists, Award Presented for outstanding research from a resident or fellow at the SOCCA annual meeting.
05/2017	Finalist for Kosaka Award, International Anesthesia Research Society

Publications

Peer Reviewed Publications

Research Articles

1. **Hayhurst CJ**, Jackson JC, Archer KR, Thompson JL, Chandreshaker R, Hughes CG. Pain and Its Long-term Interference in Daily Life after Critical Illness. *Anesthesia and Analgesia* 2018 April.
2. Han JH, **Hayhurst CJ**, Chandrasekhar R, Hughes CG, Vasilevskis EE, Wilson JE, Schnelle JF, Dittus RS, Ely EW. Delirium's Arousal Subtypes and Their Relationship with 6-Month Functional Status and Cognition. *Psychosomatics* 2018 May.
3. Rengel KF, **Hayhurst CJ**, Pandharipande PP, Hughes CG. Long-term Cognitive and Functional Impairments After Critical Illness. *Anesthesia and Analgesia* 2019 April; PMID: 30883422.
4. **Hayhurst CJ**, Patel MB, McNeil JB, Girard TD, Brummel NE, Thompson JL, Chandrasekhar R, Ware LB, Pandharipande PP, Ely EW, Hughes CG. Association of neuronal repair biomarkers with delirium among survivors of critical illness. *Journal of Critical Care* 2019 December; PMID: 31896448.
5. Christina J Hayhurst, Annachiara Marra, Jin H Han, Mayur B Patel, Nathan E Brummel, Jennifer L Thompson, James C Jackson, Rameela Chandrasekhar, E Wesley Ely, Pratik P Pandharipande, Christopher G Hughes. Association of Hypoactive and Hyperactive Delirium With Cognitive Function After Critical Illness . *Critical Care Medicine* 2020 June;48(6) PMID: 32317589.
6. Hughes CG, **Hayhurst CJ**, Pandharipande PP, Shotwell MS, Feng X, Wilson JE, Brummel NE, Girard, TD, Jackson JC, Ely EW, Patel MB. Association of Delirium during Critical Illness With Mortality: Multicenter Prospective Cohort Study. *Anesthesia and Analgesia* 2021 April; PMID: 33929361.
7. Rengel KF, **Hayhurst CJ**, Jackson JC, Boncyk CS, Patel MB, Brummel NE, Shi Y, Shotwell MS, Ely EW, Pandharipande PP, Hughes CG. Motoric Subtypes of Delirium and Long-Term Functional and Mental Health Outcomes in Adults After Critical Illness. *Critical Care Medicine* 2021 May; PMID: 33729717.
8. Li G, Freundlich RE, Gupta RK, **Hayhurst CJ**, Le CH, Martin BJ, Shotwell MS, Wanderer JP. Postoperative Pulmonary Complications' Association with Sugammadex versus Neostigmine: A Retrospective Registry Analysis. *Anesthesiology* 2021 June; PMID: 33730169.

Review Articles

1. **Hayhurst CJ**, Durieux ME. Differential Opioid Tolerance and Opioid-induced Hyperalgesia: A Clinical Reality. *Anesthesiology* 2016 February;483-488. PMID: 26594912.
2. **Hayhurst CJ**, Pandharipande PP, Hughes CG. Intensive Care Unit Delirium: A Review of Diagnosis, Prevention, and Treatment. *Anesthesiology* 2016 September; PMID: 27748656.
3. Annachiara Marra, MD Christina J. Hayhurst, MD Christopher G. Hughes, MD, MS Alessandra Marengoni, MD, PhD Giuseppe Bellelli, MD Pratik Pandharipande, MD, MSCI Alessandro Morandi, MD, MPH. Avoiding Inappropriate Medication Prescription in Older Intensive Care Survivors. *Journal of Clinical Outcomes Management*. 2018 February.
4. Nordness M, **Hayhurst CJ**, Pandharipande PP. Current Perspectives on the Assessment and Management of Pain in the Intensive Care Unit. *Journal Of Pain Research* 2021.

Editorials

1. **Hayhurst, CJ**, Durieux, ME. Enteral Hydration Prior to Surgery: the Benefits are Clear. *Anesthesia & Analgesia* 2014; 118(6):1163-1164.
2. **Hayhurst CJ**, Farrin E, Hughes CG. The effect of ketamine on delirium and opioid-induced hyperalgesia in the Intensive Care Unit. 2018 December; PMID: 30573208.
3. **Hayhurst CJ**, Hughes CG, Pandharipande PP. The Conundrum of Pain, Opiate Use and Delirium: Analgesedation or Analgesia-first approach?. *American Journal of Respiratory Critical Care Medicine* 2021 May; PMID: 33956575.

Non-Peer Reviewed Publications

Book Chapters

1. Hughes, CG, **Hayhurst, CJ**, Pandharipande PP. Can IV Sedative Affect Outcome?. Total Intravenous Anesthesia and Target Controlled Infusions. Editors: Anthony R. Absalom and Keira P. Mason. United States: Springer; 2017 February;685-696. ISBN: 978-3-319-47609-4.
2. **Hayhurst CJ**, Alvis B, Girard T. Delirium: Definitions and Subtypes – Etiological Phenotypes and Motoric Subtypes. DELIRIUM: ACUTE BRAIN DYSFUNCTION IN THE CRITCALLY ILL. United States 2019.
3. **Hayhurst CJ**, Nordness, M. Pain Management in Critical Care. Psychology in Critical Care: An Emerging Role in Rehabilitation. United States 2020.

4. Miles MM, **Hayhurst CJ**, Hughes CG. Delirium. Meritt's Neurology 14th Edition. Editors: Loius ED, Mayer SA, Noble JM. Philadelphia, United States: Lippincott Williams and Wilkins; 2020.
5. **Hayhurst CJ**, Pandharipande PP. D: Delirium Assessment, Prevention, and Management. SCCM Liberation. United States2020.

Letters

1. Christina J Hayhurst, MD; Marcel E. Durieux, MD, PhD. You might become resistant to the drugs' pain-killing or euphoric effects, but not to their lethality. Scientific American 2016 August.

Others

1. **Hayhurst, CJ** and Nemergut, EC. Essence of Anesthesia Practice, 3rd ed: A Review. 2012; 244-245.

Presentations

Presentations at Scientific Meetings

1. American Society of Anesthesiology Annual Meeting. Chicago, Illinois. 2011 Oct; Thyroid Storm in the PACU in a Previously Euthyroid Patient.
2. International Anesthesia Research Society. Honolulu, Hawaii. 2015 Mar; Chronic Pain Interference of Daily Life Following Critical Illness.
3. SOCCA annual meeting. Society of Critical Care Anesthesiologists; Honolulu, Hawaii. 2015 Mar; Chronic Pain Interference of Daily Life Following Critical Illness.
4. 11th Annual Anesthesiology Research Symposium. Vanderbilt Department of Anesthesiology; Nashville, Tennessee. 2015 May; Chronic Pain Interference of Daily Life Following Critical Illness.
5. Christina J Hayhurst. IARS 2016 Annual Meeting and International Science Symposium. International Anesthesia Research Society; San Francisco, California. 2016 May; Association Between Plasma UCHL1 and BDNF Levels and Duration of Delirium in the Critically Ill.
6. Christina J Hayhurst. SOCCA 29th Annual Meeting and Critical Care Update. Society of Critical Care Anesthesiologists; San Francisco, California. 2016 May; Association Between Plasma UCHL1 and BDNF Levels and Duration of Delirium in the Critically Ill.
7. Society of Critical Care Anesthesiologists. Washington DC2017 May; Motoric Subtype of Delirium and Global Cognition after Critical Illness.
8. Association of University Anesthesiologists. Washington DC2017 May; Motoric Subtype of Delirium and Global Cognition after Critical Illness.
9. IARS 2017 Annual Meeting and Symposium. Washington DC2017 May; Motoric Subtype of Delirium and Global Cognition after Critical Illness.
10. American Delirium Society Annual Meeting. Nashville, Tennessee. 2017 Jun; Motoric Subtype of Delirium and Global Cognition after Critical Illness.
11. Northwestern Anesthesia Conference Critical Care Update. NWAS; NASHVILLE, Tennessee. 2019 Jun; Care of the Burn Patient in the ICU.
12. Northwestern Anesthesia Conference Critical Care Update. NWAS; Nashville, Tennessee. 2019 Jun; Pain Management in the ICU.
13. IARS. San Francisco, California. 2020 May; Relationship of Delirium during Critical Illness with Hospital and Post-Discharge Mortality.
14. Kelsei Brown. IARS. San Francisco, California. 2020 May; Perioperative assessment of Opioid Induced Hyperalgesia using Quantitative Sensory Testing: A Pilot Study.
15. Hayhurst CJ, Edwards D, Bartels, K. IARS. 2021 May; Perioperative opioid use: opioid sparing strategies that improve outcomes.
16. Hayhurst CJ, Boncyk T, Hughes CG, Jackson JC. International Academy of Law and Mental Health Congress (cancelled from 2021 due to COVID). Lyon, France. 2022 Jul 3; Out of the Frying Pan and into the Fire: Impact of Pain after Critical Illness.

Medically Challenging Cases

1. Jason Quevreaux. IARS 2016 Annual Meeting and International Science Symposium. International Anesthesia Research Society; San Francisco, California. 2016 May; Airway Management in a Patient with a Tracheal-Cutaneous-Esophageal Fistula.
2. Brad Kook. IARS 2017 Annual Meeting and International Science Symposium. Washington DC2017 May; Prone Positioning in a Patient with a VAD in Interventional Radiology.

Internal Grand Rounds

1. Vanderbilt University Medical Center; Nashville, Tennessee. 2017 Jul; Perioperative Opioid Induced Hyperalgesia.

2. Vanderbilt University Medical Center; Nashville, Tennessee. 2019 Jul; Care of the Burn Patient in the ICU.

Invited Presentation - Local

1. The Multimodal Approach to Peri-operative Pain: How To Decrease Our Dependence Upon Opiates. University of Virginia; Charlottesville, Virginia. 2013 Oct; Opioid –Induced Hyperalgesia.
2. Turning the Tide: Collaborating to Prevent Opioid Abuse.. Tennessee Department of Health; Franklin, Tennessee. 2017 Nov; Invited as content expert on Opioids.

Invited Presentation - Regional

1. The Multimodal Approach to Pain: How to Decrease our Dependence on Opiates. University of Virginia; Charlottesville, Virginia. 2016 Nov; Perioperative Opioid Induced Hyperalgesia.
2. Middle Tennessee Chapter of the TSRC 2018 Respiratory Care Seminar. Tennessee Society of Respiratory Care; Nashville, Tennessee. 2018 Aug 24; Physiology of Inhalation Injury and Ventilatory Strategies.

Podcasts / Webinar

1. The PM&R Podcast. UCLA; 2018 Jan; Podcast presentation on Opioid-Induced hyperalgesia and opioid reduction in the perioperative period.
2. Hayhurst CJ, Edwards D, Bartels, K. IARS. 2021; Perioperative opioid use: opioid sparing strategies that improve outcomes.
3. Hayhurst CJ. Continulus Global Classroom. 465 people listened to the podcast from over 8 countries. 100% of listeners rated they enjoyed it.; 2021 Feb; Assessment, Management and Outcome of Pain in the ICU.
4. Hayhurst CJ. Continulus Global Classroom. (Invited back to speak in the fall of 2021 after my first Webinar); 2021 Nov; Care of the Critically Ill Burn Patient.

Problem based learning discussion

1. Nashville, Tennessee. 2018 Jan; Center for Biomedical Ethics Case Conference.

Visiting Professor

1. Hayhurst, CJ and Durieux, ME. Queen Elizabeth Community Hospital Anesthesiology Faculty Refresher Course. Queen Elizabeth Community Hospital, Society for Education in Anesthesia and Health Volunteers Overseas; Blantyre, Malawi. 2013 Jan; Multiple Lectures.
2. University of Pittsburg Medical Center; Pittsburg2020 Oct 29; Perioperative Opioid Induced Hyperalgesia.

Panel Presentation

1. Hayhurst CJ, Hughes CG, Rengel K. ASA Annual Meeting. Orlando2019 Oct; Pain After Critical Illness.
2. Hayhurst CJ, Anders M, Weavind L, Lane-Fall M, Pai-Cole S. SOCCA. 2021 May; Leadership Beyond the Bedside in the ICU.