

Alan C. Heffner, MD, FCCM

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Alan C. Heffner, MD, is board certified in adult critical care and emergency medicine and practices at Atrium Health Carolinas Medical Center in Charlotte, NC, where he is Co-Director of Adult Critical Care, Medical Director of ECMO Services, and Professor and Faculty in the Departments of Internal Medicine and Emergency Medicine. In addition to clinical practice, Dr. Heffner has extensive experience in hospital leadership, quality improvement and clinical optimization. His healthcare system leadership in sepsis earned the 2015 Sepsis Heroes Award. Dr. Heffner is well published to include authorship in UpToDate and leading emergency medicine and critical care journals and textbooks. Dr. Heffner is an instructor and speaker on acute critical illness, with numerous teaching awards. He is a Fellow in the American Academy of Critical Care Medicine. Within the field of critical illness, Dr. Heffner's special areas of expertise include severe infection, sepsis, shock, pulmonary embolus (PE), cardiac arrest, cardiovascular emergencies, ECMO, respiratory failure, and emergency airway management and intubation. Dr. Heffner has been retained as an expert medical reviewer in more than 75 cases since 2008.

Current Medical Practice Appointment

Atrium Health
Carolinas Medical Center, Charlotte, NC
Medical-Surgical Intensivist
Virtual ICU physician
Emergency Medicine Physician

- Co-Director of Adult Critical Care
- Medical Director of ECMO Services
- ICU Medical Director
- Professor and Faculty; Departments of Internal Medicine and Emergency Medicine

Certification and Licensure

ABEM Internal Medicine – Critical Care Medicine Certification	2013
American Board of Emergency Medicine (ABEM) #200314 Recertification	2011
Neurocritical Care Certificate United Council for Neurologic Subspecialties (UCNS)	2010

European Society of Intensive Care Medicine (ESICM) Diploma in Intensive Care Medicine (EDIC)	2009
American Board of Emergency Medicine (ABEM) #200314	2001

North Carolina Medical License #9800898
 South Carolina Medical License #37389
 Georgia Composite Medical Board License #87881

Education

Fellowship	University of Pittsburgh Medical Center Pittsburgh, PA Department of Critical Care Medicine Multidisciplinary Critical Care Training Program	2005-2007
	NIH National Research Service Award (T-32) Fellowship University of Pittsburgh Medical Center Department of Critical Care Medicine	
Internship Residency	Carolinas Medical Center Charlotte, NC Department of Emergency Medicine <ul style="list-style-type: none"> • Chief Resident 	1997-2000
Medical	Medical College of Virginia Virginia Commonwealth University, Richmond, VA <ul style="list-style-type: none"> • Alpha Omega Alpha Honor Medical Society • Student President, Brown-Sequard Chapter 	1993-1997

Individual Honors and Awards Highlights

Fellow of Critical Care Medicine (FCCM) American Academy of Critical Care Medicine Society of Critical Care Medicine	2016
Lecturer of the Year Award Integrated Simulation Curriculum Program UNC School of Medicine – Charlotte Campus	2015
American Academy of Family Physicians (AAFP) Teaching Award Resident selection for exemplary teaching	2015
Vanguard Award for medical education Edwards Lifesciences	2010
Top Doctors in Charlotte Charlotte Magazine, Peer selected	2020, 2018, 2017, 2016, 2014, 2012, 2011, 2010
Best Doctors in North Carolina, Best Doctors in America Best Doctor Inc. Published in <i>Business North Carolina</i>	2020, 2019, 2018

Fellow of the Year University of Pittsburgh Medical Center, Department of Critical Care Medicine	2006
Clinical Teaching Recognition Award School of Medicine, University of Pittsburgh	2006
Outstanding Faculty Teaching Award Naval Medical Center Portsmouth, Department of Emergency Medicine	2005
Outstanding Faculty Teaching Award Naval Medical Center Portsmouth, Department of Emergency Medicine	2004
Navy and Marine Corps Commendation Medal For contributions as faculty; Naval Medical Center Portsmouth	2004
Outstanding Faculty Teaching Award Naval Medical Center Portsmouth, Department of Emergency Medicine	2003
SAEM Clinical Pathological Case (CPC) Competition Best Discussant; Regional Semi-Finalist	2003
Combat Action Ribbon and Navy and Marine Corps Achievement Medal Operation Enduring Freedom, Afghanistan	2002
Hospital Physician Teacher of the Year Naval Medical Center Portsmouth	2001
Outstanding Resident Teaching Award Carolinas Medical Center, Department of Emergency Medicine	2000
Alpha Omega Alpha Honor Medical Society	1996
MCV School of Medicine Aesculapian Scholar	1995
Sidney-Barham Scholarship Award	1995
Aubrey H. Straus Microbiology Award	1995
Adolph D. Williams Scholarship Award (highest class rank)	1994

Institutional Honors and Awards Highlights

ELSO Award for Excellence in Life Support - Gold Extracorporeal Life Support Organization (ELSO)	2020
ELSO Award for Excellence in Life Support - Gold	2017
Sepsis Hero Award Sepsis Alliance	2015
ELSO Award for Excellence in Life Support	2014
ELSO Award for Excellence in Life Support	2012

Bibliography – Textbook Chapters

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55. Overview of Central Venous Access
Heffner AC, Androes MP
In: UpToDate. 2021
54. Placement of Subclavian Venous Catheters
Heffner AC, Androes MP
In: UpToDate. 2020
53. Placement of Femoral Venous Catheters
Androes MP, Heffner AC,
In: UpToDate. 2020
52. Placement of Jugular Central Venous Catheters
Heffner AC, Androes MP
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51. Overview of Central Venous Access
Heffner AC, Androes MP
In: UpToDate. 2019
50. Monoarticular Arthritis
Heffner AC
In: The Clinical Practice of Emergency Medicine, 7th Edition
Harwood-Nuss et al. Lippincott Williams & Wilkins. 2020
49. Complicated Skin and Soft Tissue Infections
Carlson CG, Heffner AC
In: Emergency Department Critical Care, 1st Ed
Shiber JS and Weingart SD. Springer Press. 2020
48. Emergency Pericardiocentesis
Heffner AC
In: UpToDate. 2019
47. Acute Posterior Circulation Stroke
Mayer K, Reyner K, Heffner AC
In: Bouncebacks! Critical Care
Weinstock MB Ed. Anadem Publishing. 2020
46. Septic Shock from Urinary Obstruction
Weinstock MB, Hayes BD, Mayer K, Reyner K, Heffner AC
In: Bouncebacks! Critical Care
Weinstock MB Ed. Anadem Publishing. 2020
45. Vascular Access Procedures in the Intensive Care Unit
Przybylski TM, Heffner AC,
In: Cardiac Intensive Care, 3rd Edition
Brown. Elsevier. 2018
44. Overview of Central Venous Access
Heffner AC, Androes MP
In: UpToDate. 2017
43. Placement of Femoral Venous Catheters
Androes MP, Heffner AC,
In: UpToDate. 2016

42. Extracorporeal Life Support
Kerns R, [Heffner AC](#)
In: Critical Care Toxicology, 2nd Edition
Brent J, Hatten B, Burkhart K, et al. Springer Press. 2017
41. The Unstable Patient: Optimization for Emergency Airway Management
Mosier, JM, [Heffner AC](#), Sakles JC
In: Manual of Emergency Airway Management; 5th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2016
40. Anesthesia and Sedation for Awake Intubation
[Heffner AC](#), DeBlieux PMC
In: Manual of Emergency Airway Management; 5th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2016
39. Flexible Endoscopic Intubation
[Heffner AC](#), DeBlieux PMC
In: Manual of Emergency Airway Management; 5th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2016
38. Noninvasive Ventilation
[Heffner AC](#), DeBlieux PMC
In: Manual of Emergency Airway Management; 5th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2016
37. Mechanical Ventilation
[Heffner AC](#), DeBlieux PMC
In: Manual of Emergency Airway Management; 5th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2016
36. Overview of Central Venous Access
[Heffner AC](#), Androes MP
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35. Thoracentesis
Jefferson B, [Heffner AC](#)
In: Interventional Critical Care: A manual for Advanced Care Practitioners
Taylor D et al. Springer International, 1st Ed. 2017
34. Fluid Management in Critical Illness
[Heffner AC](#)
In: Emergency Department Resuscitation of the Critically Ill; 2nd Edition
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33. Severe Sepsis and Septic Shock
[Heffner AC](#)
In: Emergency Department Resuscitation of the Critically Ill; 2nd Edition
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32. Fluid Management of Critical Illness
[Heffner AC](#), Robinson MT
In: Critical Care Emergency Medicine; 2nd Edition
Farcy DA et al. McGraw-Hill Professional. 2016
31. Extracorporeal Life Support
Farcy DA, [Heffner AC](#), Napolitano L
In: Critical Care Emergency Medicine; 2nd Edition
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30. Post-Cardiac Arrest Management
[Heffner AC](#), Pearson DA
In: Critical Care Emergency Medicine; 2nd Edition
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29. Emergency Pericardiocentesis
Heffner AC
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28. Monoarticular Arthritis
Heffner AC
In: The Clinical Practice of Emergency Medicine, 6th Edition
Harwood-Nuss et al. Lippincott Williams & Wilkins. 2014
27. Sepsis and Shock with Infection
Jones AE, Heffner AC
In: Emergency Department Critical Care
Yealy DM and Callaway C. Oxford University Press. 2013
26. Placement of Femoral Venous Catheters
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21. Anesthesia and Sedation for Awake Intubation
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In: Manual of Emergency Airway Management; 4th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2012
20. Oxygen and Carbon Dioxide Monitoring
Heffner AC, Reardon RF
In: Manual of Emergency Airway Management; 4th Edition
Walls RM and Murphy MF. Lippincott Williams & Wilkins. 2012
19. The Patient in Shock
Heffner AC
In: Manual of Emergency Airway Management; 4th Edition
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18. Mechanical Ventilation
DeBlieux PMC, Heffner AC
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17. Acid-Base Disorders
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16. Fluid Management
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15. Severe Sepsis and Septic Shock
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8. Diagnosis and Therapy of Metabolic Alkalosis
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7. Monoarticular Arthritis
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6. Fluid Management
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2. Esophageal Foreign Bodies
Munter D, Heffner A
In: Clinical Procedures in Emergency Medicine, 4th Edition
Roberts JR and Hedges J. W.B. Saunders Company. 2003
1. Monoarticular Arthritis
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Harwood-Nuss et al. Lippincott Williams & Wilkins. 2001

Peer Refereed Original Publications

37. Empiric aztreonam is associated with increased mortality compared to beta-lactams in septic shock
Raffa RP, Hammer J, Medaris, LA, Anderson WE, Heffner AC, Pillinger KE
Amer J Emerg Med. 2020 Oct; 8(7):255-260.
36. Choosing Wisely for Critical Care: The Next Five
Zimmerman JJ, Harmon LA, Smithburger PL, Chaykosky D, Heffner AC, et al.
Crit Care Med. 2021 Mar 1;49(3):472-481 PMID 33555779
35. Unifying Resident Education: 12 Interdisciplinary Critical Care Stimulation Scenarios.
Bullard MJ, Fox SM, Heffner AC, Bullard CL, Wares CM
MedEdPORTAL. 2020 Oct 28;16:11009. PMID 33150204
34. Trends in False positive code sepsis activations in the emergency department
Taylor SP, Rozario N, Kowalkowski MA, Gunn EC, Ellerman J, McWilliams A, Heffner AC, Gibbs M, Taylor BT
Ann Am Thorac Soc. 2020 April 17(4):520-522. PMID 31825662
33. The effect of outcome selection on the performance of prediction models in patients at risk for sepsis
Taylor SP, Chou SH, McWilliams, AD, Russo M, Heffner AC, Murphy S, Evans SL, et al.
Crit Care Explor. 2020 Jan 29;(2)1. PMID 32166298
32. Presentation and outcomes of end stage liver disease patients presenting with septic shock to the emergency department
Okonkwo E, Rozario, N, Heffner AC
Amer J Emerg Med. 2020 July;38(7):1408-1413. PMID 31839522
31. Simulation-based interdisciplinary education improves intern attitudes and outlook toward colleagues in other disciplines
Bullard MJ, Fox SM, Wares CM, Heffner AC, Stephens C, Rossi L
BMC Med Educ. 2019 Jul 24; 19(1):276. PMID 31340808
30. Predictive accuracy of quick sequential organ failure assessment for hospital mortality decreases with increasing comorbidity burden among patients admitted for suspected infection
Taylor SP, McWilliams A, Taylor BT, Heffner AC, et al.
Crit Care Med. 2019 Aug24;47(8):1081-1088 PMID 31306256
29. A mixed-methods comparison of participant and observer learner roles in simulation education
Bullard MJ, Weekes AJ, Cordle RJ, Fox SM, Wares CM, Heffner AC, Howley LD, Navedo D
AEC Educ Train. 2018 Dec 21; 3(1):20-32. PMID 30680344
28. The impact of continuation or initiation of combination antiretroviral therapy in people living with HIV presenting with acute septic shock
Polk C, Webb S, Rozario N, Moore CG, Heffner AC, Leonard M
AIDS Patient Care STDs. 2018 Sept 32(9):337-339. PMID 30179529

27. Clinical factors and outcomes of dialysis-dependent end-stage renal disease patients with emergency department septic shock
Lowe KM, Heffner AC, Karvetski CH
J Emerg Med. 2017. PMID 29107479
26. Initial fluid resuscitation following adjusted body weight dosing is associated with improved mortality in obese patients with suspected septic shock
Taylor SP, Karvetski CH, Templin, MA, Heffner AC, Taylor BT
J Crit Care. 2017; Aug 15;43:7-12. PMID 28823951
25. Septic Shock
Mahapatra S, Heffner AC
StatPearls 2017 June. PMID 28613689
24. Factors associated with delayed cooling in cardiac arrest patients
Pearson DA, Mayer K, Wares CM, Runyon MS, Studnek JR, Ward SL, Kraft KM, Heffner AC
Ther Hypothermia Temp Manag. 2017 April. PMID 28418788
23. Missed opportunities? An evaluation of potentially preventable poisoning deaths
Srisuma S, Cao D, Kleinschmidt K, Heffner AC, Lavonas EJ
Clin Toxicol. 2016 March 21:1-6. PMID 26998958
22. Early neurologic exam is not reliable for prognostication in post-cardiac arrest patients who undergo therapeutic hypothermia
Merrill MS, Wares CM, Heffner AC, et al
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21. Urinary obstruction is a common and important complication of septic shock due to urinary infection
Reyner K, Heffner AC, Karvetski C
Am J Emerg Med. 2016 April; 34(4):694-6. PMID 26905806
20. Troponin marker for acute coronary occlusion and patient outcome following cardiac arrest
Pearson DA, Wares CM, Mayer KA, Runyon MS, Studnek JR, Kraft KM, Heffner AC
West J Emerg Med. 2015 Dec;16(7):1007-13. PMID 26759645
19. Outcomes in cardiac arrest patients due to toxic exposure treated with therapeutic hypothermia
Modisett KL, Walsh SJ, Heffner AC, et al.
J Med Tox. 2016 Feb 8; Epub ahead of print. PMID 26856349
18. Early treatment of severe acute respiratory distress syndrome
Przybsz TM, Heffner AC
Emerg Med Clin North Am. 2016 Feb;(34)1:1-14. PMID 26614238
17. Part 10: Special Circumstances of Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care
Lavonas EJ, Drennan IR, Gabrielli A, Heffner AC, Hoyte CO, Orkin AM, Sawyer KN, Donnino WM
Circulation. 2015 Nov; 132(18 Suppl 2):S501-18. PMID 26472998
16. Effect of prehospital initiation of therapeutic hypothermia in adults with cardiac arrest on time-to-target temperature
Schenfeld EM, Studnek, J, Heffner AC, et al.
Can J Emerg Med. 2015 May 1;17(3):240-247. PMID 26034909
15. Cardiac arrest with initial rhythm of pulseless electrical activity: do rhythm characteristics correlate with outcome?
Hauck M, Studnek, J, Heffner AC, et al.
Am J Emerg Med. 2015 July 33(7);891-894. PMID 25943040

14. ED prognostication of comatose cardiac arrest patients undergoing therapeutic hypothermia is unreliable
Wares CM, Heffner AC, Ward SL, et al.
Am J Emerg Med. Jun 33(6):802-806. PMID 25858162
13. Incidence and factors associated with cardiac arrest complicating emergency airway management
Heffner AC, Swords DS, Neale MN, et al.
Resuscitation. 2013 Nov; 84(11):1500-1504. PMID 23911630
12. Practical Aspects of Post Cardiac Arrest Therapeutic Hypothermia
Pearson DA, Heffner AC
EM Critical Care 2013 June; 3(3).
11. Whole blood lactate kinetics in patients undergoing quantitative resuscitation for severe sepsis and septic shock
Puskarich MA, Trzeciak S, Shapiro NI, et al. (#5)
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10. Regionalization of Post-Cardiac Arrest Care: Implementation of a Cardiac Resuscitation Center
Heffner AC, Pearson DA, Nussbaum M, Jones AE
Amer Heart Journal. 2012 Oct; 164(4):493-501. PMID 23067906
9. Predictors of the complication of post-intubation hypotension during emergency airway management
Heffner AC, Swords D, Nussbaum M, Kline JA, Jones AE
J Crit Care. 2012 July; 27(6):587-593. PMID 22762924
8. Prognostic value and agreement of achieving lactate clearance or central venous oxygen saturation goals during early sepsis resuscitation
Puskarich MA, Trzeciak S, Shapiro NI, et al (#5)
Acad Emergency Med. 2012; 19(3):252-258. PMID 22435856
7. The frequency and significance of post-intubation hypotension during emergency airway management
Heffner AC, Swords, D, Kline JA, Jones AE
J Crit Care. 2012 Aug; 27(4):417.e9-13. PMID 22033053
6. Outcomes of patients undergoing early sepsis resuscitation for cryptic shock compared to overt shock
Puskarich MA, Trzeciak S, Shapiro NI, et al (#4)
Resuscitation. 2011;(82):1289-1293. PMID 21752522
5. The association between intra-arrest therapeutic hypothermia and return of spontaneous circulation among individuals experiencing out of hospital cardiac arrest.
Garrett JS, Studnek JR, Blackwell T, et al (#6)
Resuscitation. 2011;82(1):21-25.
4. Etiology of illness in patients admitted to the hospital from the emergency department with severe sepsis.
Heffner AC, Horton JM, Marchick MR, Jones AE
Clin Infect Dis. 2010 Mar 15;50(6):814-20.
3. The effects of a quantitative resuscitation strategy on mortality in patients with sepsis: A meta-analysis.
Jones AE, Brown M, Trzeciak S, et al (#6)
Crit Care Med. 2008;36(10):2734-9.
2. Characteristics of Women with Fetal Loss in Symptomatic First Trimester Pregnancies with Documented Fetal Cardiac Activity
Juliano M, Dabulis S, Heffner A
Ann Emerg Med. 2008 Aug; 52(2):143-7.

1. Role of the Peripheral Intravenous Catheter in False-Positive D-Dimer Testing
Heffner A, Kline J
Acad Emerg Med. 2001 Feb;8(2):103-6.

Original Publications – Case Reports, Peer reviewed

5. Successful use of intra-arrest thrombolysis for electrical storm due to acute myocardial infarction
 Reyner K, Heffner AC, Garvey L, Tayal V
Am J Emerg Med. July;33(7):990.e5-8. PMID 25797864
4. Major hemorrhage from hepatic laceration after cardiopulmonary resuscitation
 Zahn G, Haugk M Pearson DA, Heffner AC
Am J Emerg Med. July;33(7):990.e3-4. PMID 25680562
3. Successful outcome utilizing hypothermia after cardiac arrest in pregnancy
 Rittenberger JC, Kelly E, Jang D, Greer K, Heffner A
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2. A Case of Lactation “Bovine” Ketoacidosis
Heffner AC, Johnson DP
J Emerg Med. 2007 Nov;35(4):385-7.
1. Treatment of severe carbon monoxide poisoning using a portable hyperbaric oxygen chamber
 Lueken RJ, Heffner AC, Parks PD
Ann Emerg Med. 2006 Sep;48(3):319-22.

Teaching Record Highlights

Common Critical Care Curriculum (4C) Simulation Program Carolinas HealthCare System, Charlotte, NC	2014-present
Critical Points™ Early Impact Critical Care National Course Instructor	2009-present
Difficult Airway Course - Emergency™ and Critical Care™ National Course Instructor	2007-present

Professional Activities and Services Highlights

North Carolina Medical Board Independent standard of care reviewer Emergency medicine and critical care medicine	
Society of Critical Care Medicine (SCCM) Annual Congress Abstract Reviewer Annual Congress Presentation Moderator Annual Congress Faculty Airway Guideline Committee Quality and Safety Committee – Choose Wisely Campaign Emergency Medicine Section Member at Large Carolinas / Virginias Chapter Board of Directors	 2019 2019 2012-2015 2009-2014

American College of Emergency Physicians (ACEP)
Scientific Assembly Faculty
Scientific Assembly Oral Presentation Moderator
Scientific Assembly Abstract Reviewer

American Heart Association (AHA)
2015 Guidelines Writing Committee

2014-2015

Professional Reviewer Highlights

19. *Resuscitation*
18. *Circulation* AHA Focused Update on Advanced Life Support
17. *Circulation*
16. *Canadian Journal of Emergency Medicine*
15. *Journal of Critical Care*
14. The Advisory Board Company
13. *American Journal of Emergency Medicine*
12. *Circulation: Cardiovascular Interventions*
11. *Analgesia and Resuscitation: Current Research*
10. *Airway Management SciTechnol*
9. *International Journal of General Medicine*
8. *Risk Management and Healthcare Policy*
7. Elsevier *First Consult*
6. *Critical Care Nurse*
5. *Journal of Medical Toxicology*
4. *Journal of Emergency Medicine*
3. *Hospital Practice*
2. *Academic Emergency Medicine*
1. *Critical Care Medicine*

Atrium Health / Carolinas HealthCare System Committee Activity Highlights

Atrium Health (formerly Carolinas HealthCare System)

- Critical Care Quality Assurance Committee
- Resuscitation Committee Co-Leader
- Sepsis Collaborative Chair
- Sepsis Specialty Medical Director
- Code PE Committee

Carolinas Medical Center

- Medical Executive Committee
- Critical Care Executive Committee
- Critical Care Co-Director
- Director of ECMO Services
- ICU Medical Director
- Code Sepsis Committee Leader
- Comprehensive Stroke Certification Committee
- Neurology & Neurosurgery Quality Improvement Committee
- Sentinel Event Leadership Team

Infection Prevention Committee
Code Blue Committee Chair
Rapid Response Team Director
Surgical Critical Care Outcomes Committee
Trauma Outcomes Committee

Expert Not Retained