

Matthew S. Shotwell

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Department of Biostatistics
Vanderbilt University Medical Center
2525 West End Avenue
Suite 11000
Nashville, TN 37203

Office: (615) 875-3397
<https://biostat.app.vumc.org/wiki/Main/MattShotwell>
Matt.Shotwell@VUMC.org
Matt.Shotwell@Vanderbilt.edu

Education

East Tennessee State University (Johnson City, TN), B.S., 2004. *Magna Cum Laude*

East Tennessee State University (Johnson City, TN), M.S., 2006.

Fluctuating Asymmetry and its Relationship to Established Indicators of Environmental Stress (Advisor: Thomas F. Laughlin, Ph.D.)

Medical University of South Carolina (Charleston, SC), Ph.D., 2010.

Partition Modeling and Inference for Biomedical Research (Advisor: Elizabeth H. Slate, Ph.D.)

Academic Appointments

Associate Professor (tenured) Department of Biostatistics	Jan. 2018–Present Vanderbilt University
Associate Professor (tenured) Department of Anesthesiology	Jan. 2018–Present Vanderbilt University
Assistant Professor Department of Biostatistics	Jan. 2011–Dec. 2017 Vanderbilt University
Assistant Professor Department of Anesthesiology	Jan. 2017–Dec. 2017 Vanderbilt University

Professional Organizations

American Statistical Association, 2008–Present

- Officer, Chapter Representative, Middle Tennessee Chapter, 2011–2016
- Member, JSM Program Committee, Section on Statistical Graphics, 2015
- Member, CSP Steering Committee, 2021

International Society for Computational Biology, 2014–Present

Institute of Mathematical Statistics, 2008–2011

Professional Activities

Intramural

Vanderbilt Institute for Clinical and Translational Research, Studio expert, 2011–Present

Vanderbilt Institute for Clinical and Translational Research, Edge for Scholars (grant review) expert, 2019–Present

Member, Vanderbilt Anesthesiology Clinical Research Advisory Committee, 2011–Present

Member, Anesthesia Research Executive Committee, 2011–Present

Member, Vanderbilt Institute for Integrative Biosystems Research, 2012–Present
 Member, Center for Research and Innovation in Systems Safety, 2012–Present
 Member, Vanderbilt University Data Science Institute, 2019–Present
 Member, Graduate admissions committee, Department of Biostatistics, 2014–Present
 Seminar Series Coordinator, Department of Biostatistics, 2015–2018
 Member, Publication awards committee, Department of Biostatistics, 2016–Present
 Member, DSMB, Serial, Non-Invasive Molecular Analysis of Exhaled Breath Condensate to Define the Pulmonary Flora in Critically Injured, Ventilated Adults: The Clinical Trial, PI: Addison K. May

Extramural

Member, Recovering Master Protocol Subcommittee and the Recovering Host Tissue Response Appendix Working Group, Collaborating Network of Networks for Evaluating COVID-19 and Therapeutic Strategies (CONNECTs)

Associate Statistical Editor, Anesthesia & Analgesia, Editor-in-Chief: Jean-Francois Pittet; 2019–Present

Associate Editor-in-chief for Statistics, Regional Anesthesia and Pain Medicine, Editor-in-Chief: Marc A. Huntoon, MD; 2012–2017

Member, CSP 2021 Organizing Committee

Member, DSMB, Brain-Safe, PI: Rich Holden, 2019–Present

Member, DSMB, R2-D2, PI: Noll Campbell, 2019–Present

Chair, *useR!* 2012 Program Committee

Member, *useR!* 2013 Program Committee

Member, JSM 2015 Program Committee

Statistical Reviewer for NASA Translational Research Institute (study section), 2017, 2018, 2019

Ad-hoc Reviewer/Referee

- JAMA Network Open, 2020 – Present
- Journal of Clinical and Translational Science (2020: 1)
- Anesthesia & Analgesia (2016: 1; 2017: 17; 2018: 22, 2019: 32)
- Regional Anesthesia and Pain Medicine (2012: 2; 2013: 14; 2014: 11; 2015: 12; 2016: 7; 2017: 2)
- Statistics and its Interface (2018: 1, 2019: 2, 2020: 1)
- Journal of Critical Care (2017: 1)
- Journal of the American Geriatrics Society (2017: 1)
- Science Translational Medicine (2016: 1; 2017: 3)
- Biometrics (2016: 1, 2017: 1)
- Statistics in Medicine (2016: 2; 2017: 1)
- Communications in Statistics (2016: 1)
- Clinical Medicine & Research (2015: 1, 2016: 1)
- BMC Research Notes (2015: 1)
- IEEE Transactions on Pattern Analysis and Machine Intelligence (2014: 1)
- Cognitive Neurodynamics (2013: 1)
- BMC Medical Informatics and Decision Making (2013: 1)
- ICONIP (2012: 1)

Teaching Activities

Instruction

Laboratory Instructor Department of Biological Sciences	2004–2006 East Tennessee State University
Teaching Assistant Elizabeth Slate	2008–2009 Medical University of South Carolina
Statistical Collaboration BIOS 351 & 352 Department of Biostatistics, Vanderbilt University Half of course developed by Dr. Shotwell.	Fall & Spring 2012; Fall & Spring 2013 (Graduate school; 6 Lectures)
Statistical (Machine) Learning BIOS 362 Department of Biostatistics, Vanderbilt University This course substantially revised by Dr. Shotwell.	Spring 2015–2021 (Graduate school; 42 Lectures)
Modeling & Machine Learning I DSI 5640 Data Science Institute, Vanderbilt University This course was created by Dr. Shotwell.	Spring 2020–2021 (Graduate school; 42 Lectures)

Research Supervision

Hope Lancaster (PhD graduate), mentorship committee, 2013–2015
Laurie Samuels (PhD graduate), mentorship committee, 2013–2016
Sarah Mercaldo (PhD graduate), mentorship committee, 2013–2017
Nate Mercaldo (PhD graduate), mentorship committee, 2013–2017
Minchun Zhou (PhD candidate), mentorship committee, 2013–2019
Sharidan Parr (MS candidate), mentorship committee, 2016–2019
Allison Hainline (PhD candidate), mentorship committee, 2017–2019
Ryan Jarrett (PhD candidate), mentorship committee, 2016–Present
Hannah Weeks (PhD candidate), mentorship committee, 2016–Present

Research Support

Ongoing Research

Role: Co-Investigator (10% FTE) 1R01 GM112871 – Billings F (PI) Title: Hyper-oxygenation, Oxidative Stress, and Kidney Injury Following Cardiac Surgery	08/01/15–07/31/20 NIH/NIGMS
Role: Co-Investigator (7% FTE) 83573601 – Hutson S (PI) Title: Vanderbilt-Pittsburgh Resource for Organotypic Models for Predictive Toxicology (VPROMPT)	04/30/16–11/30/19 EPA
Role: Co-Investigator (5% FTE) 6R01 HD086792 – France D (PI) Title: The Impact of Non-Routine Events on Neonatal Safety in the Perioperative Environment	04/30/16–01/31/20 NIH/NICHD
Role: Co-Investigator (2% FTE) R01 AG053264 – Simmons S (Co-PI) Title: A Randomized Controlled Trial To Deprescribe For Older Patients With Polypharmacy Transferred From The Hospital To Skilled Nursing Facilities.	09/20/16–04/30/21 NIH/NIA

Role: Co-Investigator (5% FTE)	07/21/17–06/30/22
UG3TR002097 – Bowman A (PI)	NIH/NCATS
Title: Drug Development for Tuberous Sclerosis Complex and Other Pediatric Epileptogenic Diseases Using Neurovascular and Cardiac Microphysiological Models	

Completed Research

Role: Trainee (100% FTE)	07/01/06–12/31/10
1T32 GM074934 – Slate E (PI)	NIH/NIGMS
Title: Biostatistics Training for Basic Biomedical Research	

Role: Co-Investigator (30% FTE)	09/30/09–07/31/13
5R01HS18580-02 – Simmons S (PI)	AHRQ
Title: Cost-Effectiveness of Weight Loss Prevention in Nursing Homes	

Role: Co-Investigator (10% FTE)	04/01/11–03/31/13
VUMC37972 – Simmons, S (PI)	VA HSR & D Merit Review Grant
Title: Prevention of Weight-Loss in Long-Term Care Veterans	

Role: Co-Investigator (5% FTE)	04/01/11–03/31/15
5R18HS020415-03 – Weinger, MB (PI)	AHRQ
Title: Creating Simulation-based Performance Assessment Tools for Practicing Physicians	

Role: Co-Investigator (10% FTE)	08/01/11–07/31/16
1R01 AG33828 – Simmons SF (PI)	NIH/NIA
Title: Cost-Effectiveness of Two Nutrition Interventions in Long-Term Care	

Role: Co-Investigator (5% FTE)	07/01/2012–06/30/2015
REG-2/15/2012 – Banerjee, A (PI)	FAER
Title: Factors Contributing to Global Subjective Clinical Assessment	

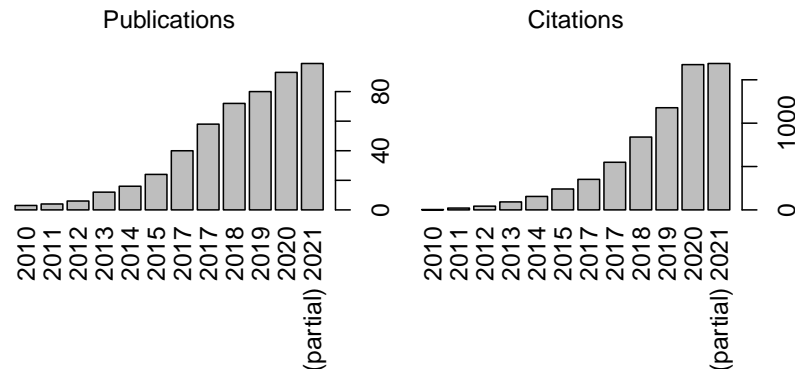
Role: Co-Investigator (5% FTE)	08/01/2012–12/31/2014
1IP2 PI000072-01 – Weinger, MB (PI)	PCORI
Title: Patient-Centered Non-routine Events (PGNRE) to Identify Risks to Best Patient Outcomes.	

Role: Co-Investigator (10% FTE)	07/01/2013–06/30/2015
1C1CMS331006-03 – Schnelle, JF (PI)	CMS
Title: Reducing Hospitalizations in Medicare Beneficiaries: A Collaboration between Acute and Post-Acute Care	

Role: Co-Investigator (5–10% FTE)	07/01/15–06/30/16
Powers, JS (PI)	CMS
Title: Reducing Antipsychotic Drug Use in Skilled Nursing Facilities Through a Web-Based Staff Intervention Training	

Role: Principal Investigator (30–40% FTE)	09/01/2013–08/31/2018
5R01 HL118392 – Shotwell M (PI)	NIH/NHLBI
Title: Optimal Design of Challenge-Response Experiments in Cardiac Electrophysiology	

Refereed Publications



1. Yeun H, **Shotwell MS**, and Slate E (2009) Factors Associated with Oral Problems among Adults with Spinal Cord Injury. *The Journal of Spinal Cord Medicine*, 32(4), 408–415.
2. Cowart LA, **Shotwell MS**, Worley M, Richards AJ, Montefusco D, Hannun Y, and Lu X (2010) Revealing a Signaling Role of PHS1P in Yeast Using Integrative Systems Approaches. *Molecular Systems Biology*, 6(349), 408–415. PMCID: PMC2830680
3. Richards AJ, Muller B, **Shotwell MS**, Cowart LA, Rohrer B, and Lu X (2010) Assessing the Functional Coherence of Gene Sets with Metrics Based on the Gene Ontology Graph. *Bioinformatics*, 26(12), 79–87. PMCID: PMC2881388
4. **Shotwell MS** and Slate EH (2010) Bayesian Modeling of Footrace Finishing Times. *Journal of Quantitative Analysis in Sports*, 6(3).
5. **Shotwell MS** and Slate EH (2011) Bayesian Outlier Detection with Dirichlet Process Mixtures. *Bayesian Analysis*, 6(2), 1–22.
6. Gebregziabher M, **Shotwell MS**, Charles J, and Nicholas J (2012) Comparison of Methods For Identifying Phenotype Subgroups Using Categorical Features Data With Application To Autism Spectrum Disorder. *Computational Statistics & Data Analysis*, 56(1), 114–125. PMCID: PMC3171740
7. Bernard ML, **Shotwell MS**, Nietert PJ, and Gold MR (2012) Meta-analysis of Bleeding Complications Associated with Cardiac Rhythm Device Implantation. *Circulation: Arrhythmia and Electrophysiology* 5(3):468–474.
8. Silver HJ, Wall R, Hollingsworth E, Pruitt A, **Shotwell MS**, and Simmons S (2013) Simple Kcal/kg Formula is Comparable to Prediction Equations for Estimating Resting Energy Expenditure in Older Cognitively Impaired Long Term Care Residents. *Journal of Nutrition Health and Aging*, 17(1), 39–44. PMCID: PMC4957543
9. Simmons S, Sims N, Durkin DW, **Shotwell MS**, Erwin S, and Schnelle J (2013) The Quality of Feeding Assistance Care Practices for Long-Term Care Veterans: Implications for Quality Improvement Efforts. *Journal of Applied Gerontology*, 32(6), 669–686. PMID: 25474793
10. Shah V, Shi J, Hout D, Oztop I, Krishnan L, Ahn J, **Shotwell MS**, Engelman A, and Aiken C (2013) The Host Proteins Transportin SR2/TNPO3 and Cyclophilin A Exert Opposing Effects on HIV-1 Uncoating. *Journal of Virology* 87(1), 422–432. PMCID: 3536424
11. **Shotwell MS** (2013) profdpm: An R Package for MAP Estimation in a Class of Conjugate Product Partition Models. *Journal of Statistical Software*, published online May 29, 2013. URL: <http://www.jstatsoft.org/v53/i08>.
12. Simmons SF, Durkin DW, **Shotwell MS**, Erwin S, Schnelle JF (2013) A Staff Training and Management Intervention in VA Long-Term Care: Impact on Feeding Assistance Care Quality. *Translational Behavioral Medicine: Practice, Policy and Research*, 3(2), 189–199. PMCID: PMC3717980
13. **Shotwell MS**, Drake, KJ, Sidorov, VY, and Wikswo, JP (2013) Mechanistic Analysis of Response to Challenge Experiments. *Biometrics* 69(3): 741–747. PMCID: PMC4156014
14. Durkin DW, **Shotwell MS**, and Simmons SF (2014) The Impact of Family Visitation on Feeding Assistance Quality in Nursing Homes. *Journal of Applied Gerontology*, 33(5), 586–602. PMID: 24652932

15. Wolin JA, Carder TR, Baysinger CL, Han X, **Shotwell MS**, and Downing JW (2014) A Randomized, Observer Blind Comparison of the Neurotip Mounted Neuropen™ and a Pocket-sized, Disposable Plastic Neurological Wheel for Assessing the Level of Spinal Blockade at Cesarean Section. *International Journal of Obstetric Anesthesia*, 23(2), 125–130. PMID: 24569062
16. Schlesinger JJ, Stevenson RA, **Shotwell MS**, and Wallace MT (2014) Improving Pulse Oximetry Pitch Perception with Multisensory Perceptual Training. *Anesthesia & Analgesia*, 118(6), 1249–1253. PMID: 24846194
17. Bulka CM, **Shotwell MS**, Gupta RK, Sandberg WS, Ehrenfeld JM (2014) Regional Anesthesia, Time to Hospital Discharge, and In-Hospital Mortality: A Propensity Score Matched Analysis. *Regional Anesthesia and Pain Medicine*, 39(5), 381–386. PMID: 25025697
18. Kumar AB, Shi Y, **Shotwell MS**, Richards J, Ehrenfeld JM (2015) Hyponatremia is a Significant Risk Factor for Acute Kidney Injury After Subarachnoid Hemorrhage: A Retrospective Analysis. *Neurocritical Care* 22(2), 184–191. PMID 25231531
19. **Shotwell MS**, Madonia PN, Connor MJ, Amde M, Salem C, Aduroja OA, Bauer SR, Groszek JJ, Fissell WH (2015) Ciprofloxacin Pharmacokinetics in Critically Ill Patients Receiving Concomitant Continuous Venovenous Hemodialysis. *American Journal of Kidney Disease*, 66(1), 173–175. PMID 25912840
20. Franklin AD, Lorinc AN, **Shotwell MS**, Greene EB, Wushensky CA (2015) Evaluation of the Skin to Epidural and Subarachnoid Space Distance in Young Children Using Magnetic Resonance Imaging. *Regional Anesthesia and Pain Medicine* 40(3): 245–248. PMID: 25899953
21. Drake K, **Shotwell MS**, Wikswo JP, Sidorov VY (2015) Glutamine and glutamate limit the shortening of action potential duration in anoxia-challenged rabbit hearts. *Physiological Reports*, 3(9). PMCID: PMC4600381
22. Pathmanathan P, **Shotwell MS**, Gavaghan DJ, Cordeiro JM, Gray RA (2015) Uncertainty quantification of fast sodium current steady-state inactivation for multi-scale models of cardiac electrophysiology. *Progress in Biophysics and Molecular Biology* 117(1): 4–18. PMCID: PMC4472478
23. Jering MZ, Marolen KN, **Shotwell MS**, Denton JN, Sandberg WS, Ehrenfeld JM (2015) Combining the ASA Physical Classification System and Continuous Intraoperative Surgical Apgar Score Measurement in Predicting Postoperative Risk. *J Med Syst*, 39(11), 147. PMID: 26359018
24. Simmons SF, Keeler E, Ruopeng A, Liu X, **Shotwell MS**, Kuertz B, Silver HJ, Schnelle JF (2015) Cost-Effectiveness of Nutrition Intervention in Long Term Care. *Journal of the American Geriatrics Society*, Epub October 27, 2015. PMID: 26503137
25. Jackson T, Thomas S, Stabile V, Han X, **Shotwell M**, McQueen KA (2015) Prevalence of chronic pain in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet*, Suppl 2:S10. PMID: 26313056
26. **Shotwell MS**, Zhou M, Fissell WH (2016) Optimal Design of Perturbations for Individual Two-Compartment Pharmacokinetic Analysis. *Journal of Biopharmaceutical Statistics* 26(5), 803–815. PMCID: PMC4744591
27. Watkins SC, Anders S, Clenbone A, Hughes E, Zeigler L, Patel V, Shi Y, **Shotwell MS**, McEvoy M, Weinger MB (2016) Paper or Plastic? Simulation Based Evaluation of Two Versions of a Cognitive Aid for Managing Pediatric Peri-operative Critical Events by Anesthesia Trainees: Evaluation of the Society for Pediatric Anesthesia Emergency Checklist. *Journal of Clinical Monitoring and Computing*, 30(3), 275–83. PMID: 26067401
28. McEvoy MD, Hand WR, Stiegler MP, DiLorenzo AN, Ehrenfeld JM, Moran KR, Lekowski R, Nunnally ME, Manning EL, Shi Y, **Shotwell MS**, Gupta RK, Corey JM, Schell RM (2016) A Smartphone-based Decision Support Tool Improves Test Performance of the Guidelines for Managing Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy. *Anesthesiology*, 124(1), 186–198. PMID: 26513023
29. Ventura-Marra M, Hudson AL, Hollingsworth EK, Long E, Simmons SF, **Shotwell MS**, Silver HJ (2016) Elevated Serum Osmolality and Total Water Deficit Indicate Impaired Hydration Status in Residents of

Long-Term Care Facilities Regardless of Low or High Body Mass Index. *Journal of the Academy of Nutrition and Dietetics*, 116(5), 828–836. PMID: PMC4852282

30. **Shotwell MS**, Nesbitt R, Madonia PN, Gould ER, Connor MJ, Salem C, Aduroja OA, Amde M, Groszek JJ, Wei P, Taylor ME, Tolwani AJ, Fissell WH (2016) Pharmacokinetics and Pharmacodynamics of Extended Infusion Versus Short Infusion Piperacillin-Tazobactam in Critically Ill Patients Undergoing CRRT. *Clinical Journal of the American Society of Nephrology*, 11(8), 1377–1388. PMID: PMC4974884
31. **Shotwell MS**, Gray RA (2016) Estimability Analysis and Optimal Design in Dynamic Multi-scale Models of Cardiac Electrophysiology. *Journal of Agricultural, Biological, and Environmental Statistics*, 21(2), 261–276. PMID: PMC4906545
32. Jackson T, Thomas S, Stabile V, Han X, **Shotwell M**, McQueen KA (2016) Chronic Pain Without Clear Etiology in Low- and Middle-income Countries: A Narrative Review. *Anesthesia and Analgesia*, 122(6), 2028–2039. PMID: 27195643
33. Hanna GM, Fishman I, Edwards DA, Shen S, Kram C, Liu X, **Shotwell M**, Gilligan C (2016) Development and Patient Satisfaction of a New Telemedicine Service for Pain Management at Massachusetts General Hospital to the Island of Martha's Vineyard. *Pain Medicine*, 17(9), 1658–1663. PMID: 27121891
34. Dobie KH, Shi Y, **Shotwell MS**, Sandberg WS (2016) New technique targeting the C5 nerve root proximal to the traditional interscalene sonoanatomical approach is analgesic for outpatient arthroscopic shoulder surgery. *Journal of Clinical Anesthesia*, 34, 79–84. PMID: 27687351
35. Rothman BS, **Shotwell MS**, Beebe R, Wanderer JP, Ehrenfeld JM, Patel N, Sandberg WS (2016) Electronically Mediated Time-out Initiative to Reduce the Incidence of Wrong Surgery: An Interventional Observational Study. *Anesthesiology*, 125(3), 484–494. PMID 27272671
36. Jackson T, Thomas S, Stabile V, **Shotwell M**, Han X, McQueen K (2016) A Systematic Review and Meta-Analysis of The Global Burden of Chronic Pain Without Clear Etiology in Low- and Middle- Income Countries: Trends in Heterogeneous Data and a Proposal for New Assessment Methods. *Anesthesia and Analgesia*, 123(3), 739-48. PMID: 27537761
37. Richardson MG, Lopez BM, Baysinger CL, **Shotwell MS**, Chestnut DH (2016) Nitrous Oxide During Labor: Maternal Satisfaction Does Not Depend Exclusively on Analgesic Effectiveness. *Anesthesia and Analgesia*, 124(2), 548–553. PMID: 28002168
38. Downing JW, Baysinger CL, Johnson RF, Paschall RL, **Shotwell MS** (2016) The Effects of Vasopressin and Oxytocin on the Fetoplacental Distal Stem Arteriolar Vascular Resistance of the Dual-Perfused, Single, Isolated, Human Placental Cotyledon. *Anesthesia and Analgesia*, 123(3), 698-702. PMID: 27537759
39. Simmons SF, Hollingsworth EK, Long EA, Liu X, **Shotwell MS**, Keeler E, An R, Silver HJ (2016) Training Non-Nursing Staff to Assist with Nutritional Care Delivery in Nursing Homes: A Cost-Effectiveness Analysis. *Journal of the American Geriatrics Society*, 65(2), 313–322. PMID: PMC5315268
40. Hutson SM, Alexander PG, Allwardt V, Aronoff DM, Bruner-Tran KL, Cliffl DE, Davidson JM, Gough A, Markov DA, McCawley LJ, McKenzie JR, McLean JA, Osteen KG, Pensabene V, Samson PC, Senutovitch NK, Sherrod SD, **Shotwell MS**, Taylor DL, Tetz LM, Tuan RS, Verneti LA, Wikswo JP (2016) Organ-on-Chips as Bridges for Predictive Toxicology. *Applied In Vitro Toxicology*, 2(2), 97-102.
41. Mclvor WR, Banerjee A, Boulet JR, Bekhuis T, Tseytlin E, Torsher L, DeMaria S, Rask JP, **Shotwell MS**, Burden A, Cooper J, Gaba DM, Levine A, Park C, Sinz E, Steadman R, Weinger MB (2016) A Taxonomy of Delivery and Documentation Deviations During Delivery of High-Fidelity Simulations. *Simulation in Healthcare*, 12(1), 1–8. PMID: 28146449
42. Watkins SC, Anders S, Clebone A, Hughs E, Patel V, Zeigler L, Shi Y, **Shotwell MS**, McEvoy MD, Weinger MB (2016) Mode of Information Delivery Does Not Effect Anesthesia Trainee Performance During Simulated Perioperative Pediatric Critical Events: a Trial of Paper Versus Electronic Cognitive Aids. *Simulation in Healthcare*, 11(6), 385–393. PMID: 27922569
43. Kumar AB, Andrews W, Shi Y, **Shotwell MS**, Dennis S, Wanderer J, Summitt B (2016) Fluid Resuscitation Mediates the Association Between Inhalational Burn Injury and Acute Kidney Injury in the Major Burn Population. *Journal of Critical Care*, 38, 62–67. PMID: 27863270

44. Hemaue S, Kingeter AJ, Han X, **Shotwell MS**, Pandharipande PP, Weavind LM (2017) Daily Lowest Hemoglobin and Risk of Organ Dysfunctions in Critically Ill Patients. *Critical Care Medicine*, Epub 2017/03/01. PMID: 28252537
45. Saied NN, Helwani MA, Weavind LM, Shi Y, **Shotwell MS**, Pandharipande PP (2017) Effect of Anaesthesia Type on Postoperative Mortality and Morbidities: a Matched Analysis of the NSQIP Database. *British Journal of Anesthesia*, 118(1), 105–111. PMID: 28039248
46. Schroer AK, **Shotwell MS**, Sidorov VY, Wikswo JP Merryman WD (2017) I-Wire Heart-on-a-Chip II: Biomechanical analysis of contractile, three-dimensional cardiomyocyte tissue constructs. *Acta Biomaterialia*, 48, 79–87. PMCID: PMC5235976
47. Fei M, Blair JL, Rice MJ, Edwards DA, Liang Y, Pilla MA, **Shotwell MS**, Jiang Y (2017) A comparison of the effectiveness of two commonly used two-handed mask ventilation techniques on unconscious apnoeic obese adults. *British Journal of Anaesthesia*, 118(4), 618–624. PMID: 28403406
48. Lopez MG, Pandharipande P, Morse J, **Shotwell MS**, Milne GL, Pretorius M, Shaw AD, Roberts L , Billings FT (2017) Intraoperative cerebral oxygenation, oxidative injury, and delirium following cardiac surgery. *Free Radical Biology and Medicine*, 103, 192–198. PMCID: PMC5258679
49. Lopez MG, Pretorius M, **Shotwell MS**, Deegan R, Eagle SS, Bennett JM, Sileshi B, Liang Y, Gelfand BJ, Kingeter AJ, Siegrist KK, Lombard FW, Richburg TM, Fornero DA, Shaw AD, Hernandez A, Billings FT (2017) The Risk of Oxygen during Cardiac Surgery (ROCS) Trial: protocol design for a RCT of physiologic oxygenation versus hyper-oxygenation to reduce oxidative damage and kidney injury. *Trials*, 18(295). PMID: 28651648
50. Sileshi B, Newton MW, Kiptanui J, **Shotwell MS**, Wanderer JP, Mungai M, Scherdin J, Harris PA, Vermund SH, Sandberg WS, McEvoy MD (2017) Monitoring Anesthesia Care Delivery and Perioperative Mortality in Kenya Utilizing a Provider-driven Novel Data Collection Tool. *Anesthesiology*, 127(2), 250–271. PMID: 28657959
51. Weinger MB, Banerjee A, Burden AR, Mclvor WR, Boulet J, Cooper JB, Steadman R, **Shotwell MS**, Slagle J, DeMaria S, Torsher L, Sinz E, Levine AI, Rask J, Davis F, Park C, Gaba DM (2017) Simulation-based Assessment of the Management of Critical Events by Board-certified Anesthesiologists. *Anesthesiology*, 127(3), 475–489. PMID: 28671903
52. Baysinger CL, Pujic B, Veličković I, Owen MD, Serafin J, **Shotwell MS**, Braveman F (2017) Increasing Regional Anesthesia Use in a Serbian Teaching Hospital Through an International Collaboration. *Frontiers in Public Health*, 5, 134, PMCID: 5465237.
53. Xu J, Reale C, Slagle JM, Anders S, **Shotwell MS**, Dresselhaus T, Weinger MB (2017) Facilitated Nurse Medication-Related Event Reporting to Improve Medication Management Quality and Safety in Intensive Care Units. *Nursing Research*, 66(5), 337–349. PMID: 28858143
54. Easdown LJ, Wakefield ML, **Shotwell MS**, Sandison MR (2017) A Checklist Helps Faculty Assess ACGME Milestones in an “OSCE” Video Performance. *Journal of Graduate Medical Education*, 9(5), 605–610.
55. Walters JL, Jackson T, Baxter K, Chapman H, Kassebaum NJ, Joshi HR, Couldridge M, Sullivan B, Kundra P, Sethuraman A, Nair D, Liu X, **Showell MS**, McQueen KA (2017) Chronic Pain and Associated Factors in India and Nepal: A Pilot Study of the Vanderbilt Global Pain Survey. *Anesthesia & Analgesia*, 125(5), 1616–1626. PMID: 28806206
56. Malchow RJ, Gupta RK, Shi Y, **Shotwell MS**, Jaeger LM, Bowens C (2017) Predictors of Outcomes From A Comprehensive Analysis of 13,897 Consecutive Regional Anesthetics at an Ambulatory Surgery. *Pain Medicine*; Published online Mar. 24 2017.
57. O’Neal JB, Billings FT, Liu X, **Shotwell MS**, Liang Y, Shah AS, Ehrenfeld JM, Wanderer JP, Shaw AD (2017) Risk factors for delirium after cardiac surgery: an historical cohort study outlining the influence of cardiopulmonary bypass. *Can J Anaesth*, Published online Jul. 17, 2017. PMID: 28718100
58. Hyman SA, **Shotwell MS**, Michaels DM, Han X, Card EB, Morse JL, Weinger MB (2017) A Survey Evaluating Burnout, Health Status, Depression, Reported Alcohol and Substance Use, And Social Support of Anesthesiologists. *Anesthesia & Analgesia*, published online Oct. 5, 2017. PMID: 28991114

59. O'Neal JB, Billings FT, Liu X, **Shotwell MS**, Liang Y, Shah AS, Ehrenfeld JM, Wanderer JP, Shaw AD (2017) Effect of preoperative β -blocker use on outcomes following cardiac surgery. *American Journal of Cardiology*, 120(8), 1293–1297. PMID: PMC5675103
60. Wanderer JP, Nelson S, Hester DL, **Shotwell MS**, Sandberg WS, Anderson-Dam J, Raines DE, Ehrenfeld JM (2018) Sources of Variation in Anesthetic Drug Costs. *Anesthesia & Analgesia*, 126(4), 1241–1248. PMID: 29256939
61. Slagle JM, Porterfield ES, Lorinc AN, Afshartous D, **Shotwell MS**, Weinger MB (2018) Prevalence of Potentially Distracting Non-Care Activities and their Effects on Vigilance, Workload and Non-Routine Events during Anesthesia Care. *Anesthesiology*, 128(1), 44–54. PMID 29035894
62. Francois B, Jeannet R, Daix T, Walton AH, **Shotwell MS**, Unsinger J, Monneret G, Rimmelé T, Blood T, Morre M, Gregoire A, Mayo GA, Blood J, Durum SK, Sherwood ER, Hotchkiss RS (2018) Interleukin-7 Restores Lymphocytes in Septic Shock - the IRIS-7 randomized clinical trial. *JCI Insight*, 3(5), Epub ahead of print. PMID: PMC5922293
63. Marra A, Pandharipande PP, **Shotwell MS**, Chandrasekhar R, Girard TD, Shintani AK, Peelen LM, Moons K, Dittus RS, Ely EW, Vasilevskis EE (2018) Acute Brain Dysfunction: Development and Validation of a daily Prediction Model. *Chest*, 154(2), 293–301. PMID: PMC6113630
64. Borislava P, Kendrisic M, **Shotwell MS**, Shi Y, Baysinger CL (2018) A Survey of Enhanced Recovery After Surgery (ERAS) Protocols for Cesarean Delivery in Serbia. *Frontiers in Medicine*, 5(100). PMID: PMC5913329
65. King AB, Kensinger CD, Shi Y, **Shotwell MS**, Karp SJ, Pandharipande PP, Wright JK, Weavind LM (2018) Intensive Care Unit Enhanced Recovery Pathway for Patients Undergoing Orthoptic Liver Transplants Recipients: A Prospective, Observational Study. *Anesthesia & Analgesia*, 126(5), 1495–1503. PMID: 29438158
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81. Miles M, Mueller DA, Gay-Betton D, Baum-Miller SH, Massa S, Shi Y, **Shotwell MS**, Lane-Fall MB, Schlesinger JJ (2019) OSCAR - Observational Study of Clinician Attentional Reserves: Acuity-based rounds help preserve clinicians' attention. *Critical Care Medicine*, In press.
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85. Liberman JS, Slagle JM, Whitney G, **Shotwell MS**, Lorinc A, Porterfield E, Weinger MB (2020) Incidence and Classification of Nonroutine Events during Anesthesia Care. *Anesthesiology*, In Press.
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90. Dobie KH, Tiwari V, Shi Y, **Shotwell MS**, Sandberg WS (2020) Transition from Private to Academic Anesthesia Provision Changes Process and Patient Centered Outcomes in an Ambulatory Surgery Center. *J Med Syst*, 44(12).
91. Dunham WC, Lombard FW, Edwards DA, Shi Y, **Shotwell MS**, Siegrist K, Eagle SS, Pretorius M, McEvoy MD, Gillaspie EA, Nesbitt JC, Wanderer JP, Kertai MD (2020) Effect of Regional Analgesia Techniques on Opioid Consumption and Length of Stay After Thoracic Surgery. *Semin Cardiothorac Vasc Anesth*, In Press.
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93. McIlroy DR, Murphy D, **Shotwell MS**, Bhatia D (2020) Peak Serum Chloride and Hyperchloremia in Patients Undergoing Cardiac Surgery Is Not Explained by Chloride-Rich Intravenous Fluid Alone: A Post-Hoc Analysis of the LICRA Trial. *J Cardiothorac Vasc Anesth*, In Press.
94. Wanderer JP, Lasko TA, Coco JR, Fowler LC, McEvoy MD, Feng X, **Shotwell MS**, Li G, Gelfand BJ, Novak LL, Owens DA, Fabbri DV (2021) Visualization of aggregate perioperative data improves anesthesia case planning: A randomized, cross-over trial. *J Clin Anesth*, 68:110114.
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96. Bellomy ML, Engoren MC, Martin BJ, Shi Y, **Shotwell MS**, Highes CG, Freundlich RE (2021) The Attributable Mortality of Postoperative Bleeding Exceeds the Attributable Mortality of Postoperative Venous Thromboembolism. *Anesth Analg*, 132(1).
97. Boncyk CS, Farrin E, Stollings JL, Rumbaugh K, Wilson JE, Marshall M, Feng X, **Shotwell MS**, Pandharipande PP, Hughes CG (2021) Pharmacologic Management of Intensive Care Unit Delirium: Clinical Prescribing Practices and Outcomes in More Than 8500 Patient Encounters. *Anesthesia & Analgesia*, In Press.
98. Ende HB, Lozada MJ, Chestnut DH, Osmundson SS, Walden RL, **Shotwell MS**, Bauchat JR (2021) Risk Factors for Atonic Postpartum Hemorrhage: A Systematic Review and Meta-Analysis. *Obstet Gynecol*, In Press.
99. McEvoy MD, Wanderer JP, Shi Y, Ramanujan KS, Geiger TM, **Shotwell MS**, Shaw AD, Hawkins AT, Martin BJ, Mythen MG, Sandberg WS (2020) The effect of adding goal-directed hemodynamic management for elective patients in an established enhanced recovery program for colorectal surgery: results of a quasi-experimental pragmatic trial. *Perioper Med (Lond)*, 9(1).
100. Hyman SA, Card EB, de Leon-Casasola OA, **Shotwell MS**, Shi Y, Weinger MB (2021) Prevalence of Burnout and Its Relationship to Health Status and Social Support in More Than 1,000 Subspecialty Anesthesiologists. *Regional Anesthesia & Pain Medicine*, In Press.

Manuscripts

1. Pretorius, **Shotwell MS**, ... (2020) Acute kidney injury and chronic kidney disease following left ventricular assist device placement. Submitted to *CJASN*, Mar 2020.
2. Hughes C, ..., **Shotwell MS**, ... Delirium during Critical Illness and its Association with In-hospital and Out-of-hospital Mortality: Multicenter Prospective Cohort Study. Submitted to *British Medical Journal* Jan 2020.

3. Banerjee A, ..., **Shotwell MS** (2019) Key Performance Gaps of Practicing Anesthesiologists: How they Contribute to Hazards in Anesthesiology and Proposals for addressing them. Submitted to International Anesthesiology Clinics.
4. Wanderer JP, Li G, Kappen TH, Pace NT, **Shotwell MS**, Ehrenfeld JM (2019) National Practice Patterns for Postoperative Nausea and Vomiting Prophylaxis. In preparation.
5. Nelson S, Sandberg W, Clifton J, Cui Y, **Shotwell MS**, Wanderer J (2019) Holding Postoperative Patients Overnight in the Post-Anesthesia Care Unit as a Tactic to Deal with Hospital Congestion is Associated with Increased Resource Length of Stay. Submitted to Journal of Clinical Anesthesia.
6. Dunham W, Weinger MB, Slagle J, Absi T, Shotwell MS, Beller M, Thomas E, Vnencak-Jones CL, Freundlich RE, Wanderer JP, Kertai MD (2019) CYP2D6 genotype-guided metoprolol therapy in cardiac surgery patients-Rational and design of the Pharmacogenetic-guided Metoprolol Management for Postoperative Atrial Fibrillation in Cardiac Surgery (PREEMPTIVE) Pilot study. In preparation
7. Kynes JM, Newton MW, Niconchuk J, Nabulindo S, Ngumi ZWW, Shi Y, **Shotwell MS**, McEvoy MD, Sileshi B (2018) The impact of resource limitation and hospital level on trauma-related perioperative mortality in Kenya. Submitted to Lancet Global Health.
8. Tippet KG, Slagle JM, Cleary RK, Friedman DL, Kachnic LA, **Shotwell MS**, Xu J, Moroz S, Anders S, Weinger MB (2018) Evaluating the Use of Patient-Reported Non-Routine Events in Pediatric and Radiation Oncology: A Pilot Study. In preparation.
9. ..., **Shotwell MS**, ... (2018) Reliability of Simulation-based Assessment for Practicing Physicians: Performance is Event-specific; In preparation.
10. Mclvor WR, DeMaria S, Torsher L, Banerjee A, Boulet JR, Burden A, Cooper J, Levine AI, Park C, **Shotwell MS**, Sinz E, Slagle J, Steadman R, Weinger MB, Gaba DM (2018) Study design methods from a multicenter simulation-based assessment: Challenges faced, choices made, and lessons learned; In preparation.
11. **Shotwell MS**, Chancellor A, Woodworth A, Patel P, Groszek JJ, Akers KM, Fissell WH (2019) Opportunistic Sampling to Estimate Piperacillin Pharmacokinetics in the Adult ICU. Clin J Am Soc Nephrol; In review.
12. Weeks A, Jarrett R, **Shotwell MS** (2017) pkpredict: An R Package for PK Prediction; In preparation.
13. **Shotwell MS**, Roth BJ, Kandel SM, Drake K, Sidorov V, Gray RA, Agboto VA, Wikswa JP (2017) Applying optimal experimental design to a 'black box' cardiac cell model. In preparation.

Editorials

1. Bulka CM, **Shotwell MS**, Ehrenfeld JM (2015) Reply to Dr Bhatia; Comment on Regional Anesthesia, Time to Hospital Discharge, and In-Hospital Mortality: A Propensity Score Matched Analysis. Regional Anesthesia and Pain Medicine, 40(1), 86–87. PMID 25503352

Presentations and Posters

*Invited. •Local Invited or Topic Contributed. †Committed to present. ‡Presented by colleague or student.

Shotwell MS, Slate EH, and Lu X. (2008) Semiparametric Clustering of Microarray Gene Expression Data. SRCOS, Charleston, SC.

Shotwell MS and Slate EH (2008) The Cooper River Bridge Run: A Bayesian Hierarchical Mixture. MCMSki II, Bormio, Italy.

Shotwell MS* (2009) An Introduction to 8-bit Microcontroller Development in Linux. Meeting of the Charleston, SC Linux Users Group.

Shotwell MS (2009) Simplified Clustering with Dirichlet Process and Other Process Mixtures. The 7th Annual Rocky Mountain Bioinformatics Conference, Aspen, CO.

Shotwell MS* (2010) Advances in Partition Modeling for Biomedical Research. Vanderbilt University, Nashville, TN.

Shotwell MS* (2011) Tools and Strategies for Reproducible Research Practices. The 42nd Symposium on the Interface of Computing Science and Statistics, SAS Institute, Cary, NC.

Alvarez J[‡] and **Shotwell MS** (2011) Reproducible Research in Daily Practice. JSM, Miami Beach, FL.

Shotwell MS (2011) Outlier Detection using Dirichlet Process Mixtures. JSM, Miami Beach, FL.

Shotwell MS (2011) Experimenting with a TTY connection for R. *useR!* 2011, Coventry, UK.

Shotwell MS (2011) Reading SAS7BDAT Databases in R, without SAS! *useR!* 2011, Coventry, UK.

Shotwell MS* (2012) Exploring Statistical Strategies for Challenge-Response Experiments. Department of Biostatistics Seminar Series. Vanderbilt University, Nashville, TN.

Shotwell MS* (2012) Applied Nonparametric Bootstrap with Hierarchical and Correlated Data. Department of Biostatistics M.S. Continuing Education Series. Vanderbilt University, Nashville, TN.

Shotwell MS* (2012) Exploring Statistical Strategies for Use in Challenge-Response Experiments. The 43rd Symposium on the Interface of Computing Science and Statistics, Rice University, Houston, TX.

Shotwell MS (2012) Optimal Design of Challenge-Response Experiments for Mechanistic Model Discrimination. JSM, San Diego, CA.

Shotwell MS* (2012) Mechanistic Analysis of Response To Challenge Experiments. East Tennessee State University, Institute of Quantitative Biology, Johnson City, TN.

Shotwell MS* (2013) Bootstrap Simultaneous Confidence Bands: A Highest Sampling Density Approach. Mid-TN ASA Chapter Spring Meeting, Nashville, TN.

Shotwell MS* (2013) Barriers to Reproducible Research and a Web-Based Solution. Vanderbilt University, Department of Biostatistics, M.S. Spring Retreat. Nashville Zoo, Nashville, TN.

Shotwell MS* (2013) Barriers to Reproducible Research and a Web-Based Solution. Midwest Biopharmaceutical Statistics Workshop, Ball State University, Muncie, IN.

Shotwell MS* (2013) Asymptotic vs. Empirical Statistical Inference. Vanderbilt University, Department of Biostatistics Seminar Series. Nashville, TN.

Shotwell MS* (2014) Harnessing Intermittent Hemodialysis to Study Individual Pharmacokinetics. University of Louisville. Louisville, KY.

Zhou M[‡] and **Shotwell MS** (2014) Evaluating Novel Intradialytic Sampling Designs For Individual Pharmacokinetic Analysis Using Monte Carlo Simulation. ENAR. Baltimore, Maryland.

Shotwell MS, Gray RA (2014) What types of data do I need to fit my complex biomathematical model? 12th Annual Rocky Mountain Bioinformatics Conference. Snowmass, CO.

Hudson AW, Ventura-Marra M, Hollingsworth E, Long E, **Shotwell MS**, Simmons SF, and Silver HJ (2015) High Body Mass Index Does Not Protect Long Term Care Residents from Dehydration. FNCE. Nashville, TN.

Shotwell MS, Gray RA (2015) Estimating parameters of the Hodgkin-Huxley cardiac cell model by integrating raw data from multiple types of voltage-clamp experiments. 13th Annual Rocky Mountain Bioinformatics Conference. Snowmass, CO.

Fissell WH, Patel P, **Shotwell MS*** (2016) Sparse Opportunistic Sampling in Population Pharmacokinetic Studies. Joint Statistical Meeting. Chicago, IL.

Shotwell MS, Gray RA (2016) Automated Optimal Design of Voltage Clamp Protocols to Study Sodium Channel Kinetics Using a Minimal Cardiac Ion Channel Model. 14th Annual Rocky Mountain Bioinformatics Conference. Snowmass, CO.

Shotwell MS*, Wanderer JP (2017) Individualized Sample Timing for Pharmacokinetic Studies using Accessible Pharmacodynamic Data. CEN-ISBS Joint Conference on Biometrics & Biopharmaceutical Statistics. Vienna, Austria.

Shotwell MS*, Fissell WH, (2017) Using Leftover Blood from Clinical Labs to Study Individual and Population Pharmacokinetics. Renal Research Conference, Vanderbilt University Medical Center. Nashville, TN.

Shotwell MS (2018) Challenges Using Electronic Medical Record for Pharmacokinetic Analysis 16th Annual Rocky Mountain Bioinformatics Conference. Snowmass, CO.

Shotwell MS* (2019) Brownbag Presentation: Ordinal Logistic Regression for the Research Toolbox. Alaska Native Tribal Health Consortium Brownbag Lunch Seminar Series. Web-based.

Shotwell MS* (2019) Ordinal Logistic Regression for the Research Toolbox. Guest Lecture: Master of Science in Clinical Investigation Program. Vanderbilt University.

Shotwell MS* (2019) Ordinal Logistic Regression for the Research Toolbox. CRC Research Skills Workshop. Vanderbilt University Medical Center.

Shotwell MS* (2020) Basics of Simulation for Study Planning. Vanderbilt University Medical Center.

Other Honors and Awards

Second Place, Appalachian Student Research Forum, East Tennessee State University, 2005

Marcia Davis Research Award, East Tennessee State University, 2005

Appointment, Biostatistics Training for Basic Biomedical Research (NIH/NIGMS 1T32GM074934-01 Training Grant), Medical University of South Carolina, 2006–2010

Second Place, Bioinformatics, Student Research Day, Medical University of South Carolina, 2006

Second Place, Student Research Day, Medical University of South Carolina, 2007

SRCOS R.L. Anderson Student Paper Award, 2008

Student Travel Award, MCMSki Meeting, 2008

JSM Stat Bowl Contestant, 2009

Oak Leaf Society Member, 2014, 2015, 2016, 2017

First Place, Research Posters, American Academy of Nutrition and Dietetics Meeting, 2015

Patrick G. Arbogast Collaborative Publication Award, 2017