

Curriculum Vitae
Christopher L. Wu, M.D.

Business: The Johns Hopkins Hospital
 1800 Orleans Street, Zayed 8-120J; Baltimore, MD 21287
 410.955.5608 (office tel); 410.614.1796 (fax); cwu3@jhmi.edu

Professional History

2009-present **The Johns Hopkins University**
 Professor; Department of Anesthesiology/CCM
 Division of Regional Anesthesia & Acute Pain Medicine
 Division of Obstetric, Maternal-Fetal and Gynecological Anesthesia
 Baltimore, Maryland

2016-present **The Armstrong Institute for Patient Safety and Quality**
 Johns Hopkins Medicine
 Core faculty
 Baltimore, Maryland

2001-2009 **The Johns Hopkins University**
 Associate Professor; Department of Anesthesiology/CCM
 Division of Pain Medicine; Division of Obstetric Anesthesia
 Baltimore, Maryland

1999-2001 **The Johns Hopkins University**
 Assistant Professor; Department of Anesthesiology/CCM
 Baltimore, Maryland

1994-1999 **The University of Rochester Medical Center**
 Assistant Professor; Department of Anesthesiology; Rochester, New York

1993-1994 **The University of Rochester Medical Center**
 Senior Instructor; Department of Anesthesiology; Rochester, New York

Education

1990-1993 **Residency: Anesthesiology**
 The University of Rochester; Rochester, New York

1989-1990 **Internship: Internal Medicine**
 The Albany Medical Center; Albany, New York

1985-1989 **Doctorate of Medicine (MD)**
 Albany Medical College; Albany, New York

1983-1985 **Bachelor of Science (BS)** [received in 1987]
 Union College; Schenectady, New York

Honors/Awards

Phi Beta Kappa
 Chief Resident: University of Rochester; Department of Anesthesiology, 1992-1993
 Northeast Anesthesia Resident Educational Conference: May 14-15, 1993 (1st Place)
 2006 IARS Teaching Recognition Award (finalist)
 2011 ASRA Teaching/Mentorship Award
 Teacher of the Year: University of Rochester; Department of Anesthesiology; 1995-6
 Teacher of the Year: University of Rochester; Department of Anesthesiology; 1998-9
 Teacher of the Year: The Johns Hopkins University; Department of Anesthesiology; 1999-2000
 Teacher of the Year: The Johns Hopkins University; Department of Anesthesiology; 2005-6

Teacher of the Year: The Johns Hopkins University; Department of Anesthesiology; 2007-8
 Teacher of the Year: The Johns Hopkins University; Department of Anesthesiology; 2013-4
 Teacher of the Year: The Johns Hopkins University; Department of Anesthesiology; 2015-6
 ASRA (American Society of Regional Anesthesia & Pain Medicine) Board of Directors: 2008-2014
 ASER (American Society of Enhanced Recovery) Founding/Organizing Committee: 2014
 Minogue Award from the Maryland Patient Safety Center (ERAS): 2016

Original Peer-Reviewed and Medline Articles

1. Litman RS, **Wu CL**, Catanzaro FC. Ondansetron decreases emesis after tonsillectomy in children. *Anesth Analg* 1994;78:478-81. PMID: 8109763
2. Litman RS, **Wu CL**, Quinlivan JK. Gastric volume and pH in infants fed clear liquids and breast milk prior to surgery (*with accompanying editorial*). *Anesth Analg* 1994;79:482-5. PMID: 8067551
3. Litman RS, **Wu CL**, Lee AC, Griswold JD, Voisine R, Marshall C. Prevention of emesis after strabismus repair in children: a prospective, randomized, double-blinded study comparing droperidol versus ondansetron. *J Clin Anesth* 1995;7:58-62. PMID: 7772361
4. Lee AC, **Wu CL**, Feins RH, Ward DS. Anesthetic management of thoracic procedures. *Thor Clin N Am* 1996;6:329-47. PMID: 8724282
5. **Wu CL**, Perkins FM. Oral anticoagulant prophylaxis and epidural catheter removal (*with accompanying editorial*). *Reg Anes* 1996;21:517-24. PMID: 8956387
6. Richardson MG, **Wu CL**, Hussain A. The effect of midazolam on recovery in patients undergoing outpatient laparoscopic surgery. *Anesth Analg* 1997;85:301-5. PMID: 9249104
7. **Wu CL**, Jani ND, Perkins FM, Barquist E. Comparison of thoracic epidural analgesia versus intravenous patient-controlled analgesia for the treatment of rib fracture pain. *J Trauma* 1999;47:564-7. PMID: 10498316
8. Min KT, **Wu CL**, Yang J. Non-depolarizing neuromuscular blockers inhibit the serotonin-type 3A receptor expressed in *Xenopus* oocytes. *Anesth Analg* 2000;90:476-81. PMID: 10648343
9. **Wu CL**, Marsh A, Dworkin R. Role of sympathetic blocks in postherpetic neuralgia. *Pain* 2000;87:121-9. PMID: 10924805
10. **Wu CL**, Fleisher LA. Outcomes in perioperative medicine and anesthesiology: into the next millennium. *Anes Clin N Am* 2000;18:633-45. PMID: 10989712
11. **Wu CL**, Fleisher LA. Outcomes research in regional anesthesia and analgesia. *Anesth Analg* 2000;91:1232-42. PMID: 11049915
12. **Wu CL**, Bronstein R, Chen JM, Lee DH, Rouse LM. Relationship between perioperative factors and postoperative analgesic requirements in patients undergoing arthroscopic anterior cruciate ligament repair. *Am J Orthop* 2000;29:974-8. PMID: 11140353
13. **Wu CL**. Regional anesthesia and anticoagulation. *J Clin Anesth* 2001;13:49-58. PMID: 11259898
14. **Wu CL**, Garry MG, Zollo RA, Yang J. Gene therapy for the management of pain part I: methods and strategies. *Anesthesiology* 2001;94:1119-32. PMID: 11465606
15. **Wu CL**, Carter HB, Naqibuddin M, Fleisher LA. The effect of local anesthetic injection in patients undergoing transrectal ultrasonic prostatic biopsy. *Urology* 2001;57: 925-9. PMID: 11337296
16. **Wu CL**, Naqibuddin M, Fleisher LA. Measurement of patient satisfaction as an outcome of regional anesthesia and analgesia (*with accompanying editorial*). *Reg Anesth Pain Med* 2001;26:196-208. PMID: 11359218
17. **Wu CL**, Bronstein R, Chen JM, Lee DH, Rouse LM. Postoperative analgesic requirements in patients undergoing arthroscopic anterior cruciate ligament reconstruction. *Am J Anesth* 2001;28:176-80. PMID: 11140353
18. **Wu CL**, Garry MG, Zollo RA, Yang J. Gene therapy for the management of pain part II: molecular targets. *Anesthesiology* 2001;95:216-40. PMID: 11465561
19. **Wu CL**, Rouse LM, Chen JM, Miller RJ. Comparison of postoperative pain in patients receiving interscalene block or general anesthesia for shoulder surgery. *Orthopedics* 2002;25:45-8. PMID: 11811241
20. **Wu CL**, Tella P, Staats PS, Vaslav R, Kazim D, Wesselmann U, Raja SN. Analgesic effects of intravenous lidocaine and morphine on post-amputation pain: a randomized double-blind, active-placebo-controlled, crossover trial. *Anesthesiology* 2002;96:841-8. PMID: 11964590
21. **Wu CL**, Berenholtz SM, Pronovost PJ, Fleisher LA. A systematic review and analysis of postdischarge complications after ambulatory surgery. *Anesthesiology* 2002;96:994-1003. PMID: 11964610

22. Kaufmann SC, **Wu CL**, Pronovost PJ, Jermyn RM, Fleisher LA. The effect of intraoperative regional anesthesia on anticipated admission to the intensive care unit. *J Clin Anesth* 2002;14:432-6. PMID: 12393111
23. Gottschalk A, **Wu CL**, Ochroch EA. Current treatment options for acute pain. *Expert Opin Pharmacother* 2002;3:1599-611. PMID: 12437494
24. **Wu CL**, Caldwell MD. The influence of postoperative analgesia on perioperative morbidity. *Best Practice Res Clin Anes* 2002;16:549-63. PMID: 12516891
25. Steinberg RB, Liu SS, **Wu CL**, Mackey DC, Grass JA, Ahlen K, Jeppsson L. Comparison of ropivacaine-fentanyl patient-controlled epidural analgesia with morphine intravenous patient-controlled analgesia for perioperative analgesia and recovery after open colon surgery. *J Clin Anesth* 2002;14:571-7. PMID: 12565114
26. Deutsch N, **Wu CL**. Patient outcome following ambulatory anesthesia. *Anes Clin N Amer* 2003;21:403-15. PMID: 12812403
27. Gupta A, **Wu CL**, El-Kassabany N, Krug C, Parker SD, Fleisher LA. A meta-analysis of the effect of intraoperative anti-emetic therapy on postdischarge nausea and vomiting after outpatient surgery. *Anesthesiology* 2003;99:488-95. PMID: 12883424
28. **Wu CL**, Anderson GF, Herbert R, Lietman SA, Fleisher LA. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing total hip replacement (*with 2 accompanying editorials*). *Reg Anesth Pain Med* 2003;28:271-8. PMID: 12945019
29. **Wu CL**, Naqibuddin M, Rowlingson AJ, Leitman SA, Jermyn RM, Fleisher LA. The effect of postoperative pain on quality-of-life measurements. *Anesth Analg* 2003;97:1078-85. PMID: 14500161
30. Block BM, Liu SS, Rowlingson AJ, Cowan AR, Cowen JA, **Wu CL**. Efficacy of postoperative epidural analgesia versus systemic opioids: a meta-analysis. *JAMA* 2003;290:2455-63. PMID: 14612482
31. **Wu CL**, Hsu W, Richman JM, Raja SN. The effect of regional anesthesia and analgesia on postoperative cognitive function. *Reg Anesth Pain Med* 2004;29:257-68. PMID: 15138912
32. Liu SS, Block BM, **Wu CL**. Effects of perioperative central neuraxial analgesia on outcome after coronary artery bypass surgery: a meta-analysis. *Anesthesiology* 2004;101:153-61.
33. **Wu CL**, Richman JM. Postoperative pain and quality of recovery. *Curr Opinion Anesthesiol* 2004;17:455-60. PMID: 17023905
34. Brown AK, Christo PJ, **Wu CL**. Options in postoperative analgesia. *Best Practice Res Clin Anes* 2004;18:703-17. PMID: 15460554
35. **Wu CL**, Hurley RW, Anderson GF, Herbert R, Rowlingson AJ, Fleisher LA. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population (*with accompanying editorial*). *Reg Anesth Pain Med* 2004;29:525-33. PMID: 15635510
36. Richman JM, **Wu CL**. Epidural analgesia for postoperative pain. *Anes Clin N Amer* 2005;23:125-40. PMID: 15763415
37. **Wu CL**, Partin AW, Rowlingson AJ, Kalish MA, Walsh PC, Fleisher LA. Efficacy of continuous local anesthetic infusion for postoperative pain after radical prostatectomy. *Urology* 2005;66:366-70. PMID: 16040091
38. Liu SS, Strodtbeck WM, Richman JM, **Wu CL**. Comparison of regional versus general anesthesia for ambulatory anesthesia: A meta-analysis of randomized controlled trials (*with accompanying editorial*). *Anesth Analg* 2005;101:1634-42. PMID: 16301234
39. **Wu CL**, Cohen SR, Richman JM, Courpas GE, Rowlingson AJ, Cheung K, Lin EE, Liu SS. Efficacy of postoperative epidural analgesia versus intravenous patient-controlled analgesia with opioids: a meta-analysis. *Anesthesiology* 2005;103:1079-88. PMID: 16249683
40. **Wu CL**, Rowlingson AJ, Partin AW, Courpas GE, Walsh PC, Fleisher LA. Correlation of postoperative pain on quality on recovery and patient-oriented outcomes in the immediate postoperative period. *Reg Anesth Pain Med* 2005;30:516-22. PMID: 16326335
41. Richman JM, Liu SS, Courpas G, Wong R, Rowlingson AJ, McGready J, Cohen SR, **Wu CL**. Efficacy of postoperative peripheral continuous catheter analgesia versus systemic opioids: a meta-analysis. *Anesth Analg* 2006;102:248-57. PMID: 16368838
42. Hurley RW, Cohen SM, Williams KA, Rowlingson AJ, **Wu CL**. The efficacy of perioperative oral gabapentin on postoperative recovery. *Reg Anesth Pain Med* 2006;31:237-47. PMID: 16701190
43. Richman JM, Carter HB, Hanna MN, Murphy JA, Rowlingson AJ, Andrews RA, **Wu CL**. Efficacy of local anesthetics for prostate biopsy: a meta-analysis. *Urology* 2006;67:1224-8. PMID: 16765183
44. Lin EE, Horasek S, Agarwal S, **Wu CL**, Raja SN. Local administration of norepinephrine in stump evokes dose-dependent pain in amputees. *Clin J Pain* 2006;22:482-6. PMID: 16772803

45. Cohen SP, Sireci A, **Wu CL**, Larkin TM, Williams KA, Hurley RW. Pulsed radiofrequency of the dorsal root ganglia is superior to pharmacotherapy or pulsed radiofrequency of the intercostal nerves in the treatment of chronic postsurgical thoracic pain. *Pain Physician* 2006;9:227-36. PMID: 16886031
46. Richman JM, Joe EM, Cohen SR, Rowlingson AJ, Michaels RK, Jeffries MA, **Wu CL**. Bevel direction and postdural puncture headache: a meta-analysis. *Neurologist* 2006;12:224-8. PMID: 16832241
47. **Wu CL**, Rowlingson AJ, Cohen SR, Michaels RK, Courpas GE, Joe EM, Liu SS. Gender and postdural puncture headache: a meta-analysis. *Anesthesiology* 2006;105:613-8. PMID: 16931996
48. Rathmell JP, **Wu CL**, Sinatra RS, Ballantyne JC, Ginsberg B, Gordon DB, Liu SS, Perkins FM, Reuben SS, Rosenquist R, Viscusi ER. Acute postsurgical pain management: a critical appraisal of current practice. *Reg Anesth Pain Med* 2006;31(4 Suppl):1-42. PMID: 16849098
49. Richman JM, Maine D, Rowlingson AJ, Weller JF, **Wu CL**. The effect of neuraxial anesthesia on perioperative blood loss. *J Clin Anesth* 2006;18:427-35. PMID: 16980159
50. **Wu CL**, Saperstein A, Herbert R, Rowlingson AJ, Michaels RK, Petrovic M, Fleisher LA. Effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing partial lobectomy. *J Clin Anesth* 2006;18:515-20. PMID: 17126780
51. **Wu CL**, Rowlingson AJ, Herbert R, Richman JM, Andrews RA, Fleisher LA. Correlation of postoperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing colectomy. *J Clin Anesth* 2006;18:594-9. PMID: 17175429
52. Liu SS, Richman JM, Thirlby RS, **Wu CL**. Efficacy of local anesthetic infusions on postoperative pain: a meta-analysis. *J Am Coll Surg* 2006;203:914-32. PMID: 17116561
53. Liu SS, **Wu CL**. Effect of postoperative analgesia on postoperative mortality and morbidity: an update of the evidence. *Anesth Analg* 2007;104:689-702. PMID: 17312231
54. Liu SS, **Wu CL**. Effect of analgesia techniques on postoperative patient-reported outcomes (including analgesia): a systematic review. *Anesth Analg* 2007; 105:789-808. PMID: 17717242
55. Wong RP, Carter HB, Wolfson A, Faustin C, Cohen SR, **Wu CL**. Lack of correlation between type of intraoperative anesthesia and blood loss. *Urology* 2007;70:523-6. PMID: 17905109
56. **Wu CL**, Raja SN. An update on the treatment of postherpetic neuralgia. *J Pain* 2008;9(1 Suppl 1):S19-30. PMID: 18166462
57. **Wu CL**, Demeester JS, Hebert R, Maine DN, Rowlingson AJ, Fleisher LA. Correlation of postoperative epidural analgesia on morbidity and mortality following total knee replacement in Medicare patients. *Am J Orthop* 2008;37:524-7. PMID: 19081883
58. **Wu CL**, Agarwal S, Tella PK, Klick B, Clark MR, Haythornthwaite JA, Max MB, Raja SN. Morphine versus mexiletine for treatment of post-amputation pain: a randomized, placebo-controlled, crossover trial (with accompanying editorial). *Anesthesiology* 2008;109:289-96. PMID: 18648238
59. Hurley RW, Lesley MR, Adams MC, Brummett CM, **Wu CL**. Pregabalin as a treatment for painful diabetic neuropathy: a meta-analysis. *Reg Anesth Pain Med* 2008;33:389-94. PMID: 18774507
60. Hanna MN, Elhassan A, Richman JM, Lesley MR, Lissauer J, **Wu CL**. Efficacy of bicarbonate in decreasing pain on intradermal injection of local anesthetics: a meta-analysis. *Reg Anesth Pain Med* 2009;34:122-5. PMID: 19282711
61. American Society of Anesthesiologists Task Force on Neuraxial Opioids, Horlocker TT, Burton AW, Connis RT, Hughes SC, Nickinovich DG, Palmer CM, Pollock JE, Rathmell JP, Rosenquist RW, Swisher JL, **Wu CL**. Practice guidelines for the prevention, detection, and management of respiratory depression associated with neuraxial opioid administration. *Anesthesiology* 2009;110:218-30. PMID: 19194148
62. Hanna MN, Murphy JD, Kumar K, **Wu CL**. Regional techniques and outcome: what is the evidence? *Curr Opin Anaesthesiol* 2009;22:672-7. PMID: 19581804
63. Hanna MN, Murphy JD, Kumar K, **Wu CL**. Postoperative pain management in the elderly undergoing thoracic surgery. *Thorac Surg Clin* 2009;19:353-61. PMID: 20066947
64. Hanna MN, Jeffries MA, Hamzehzadeh S, Richman JM, Veloso PM, Cox L, **Wu CL**. Survey of the utilization of regional and general anesthesia in a tertiary teaching hospital. *Reg Anesth Pain Med* 2009;34:224-8. PMID: 19587619
65. Sumida S, Lesley MR, Hanna MN, Murphy JD, Kumar K, **Wu CL**. Meta-analysis of the effect of extended-release epidural morphine versus intravenous patient-controlled analgesia on respiratory depression. *J Opioid Manag* 2009;5:301-5. PMID: 19947071
66. Haller G, Myles PS, Taffé P, Perneger TV, **Wu CL**. Rate of undesirable events at beginning of academic year: retrospective cohort study (with accompanying editorial). *BMJ* 2009;339:b3974. PMID: 19826176

67. George JA, Lin EE, Hanna MN, Murphy JD, Kumar K, Ko PS, **Wu CL**. The effect of intravenous opioid patient-controlled analgesia with and without background infusion on respiratory depression: a meta-analysis. *J Opioid Manag* 2010;6:47-54. PMID: 20297614
68. American Society of Anesthesiologists Task Force on Neuraxial Opioids, Horlocker TT, Birnbach DJ AW, Connis RT, Nickinovich DG, Palmer CM, Pollock JE, Rathmell JP, Rosenquist RW, Swisher JL, **Wu CL**. Practice advisory for the prevention, diagnosis, and management of infectious complications associated with neuraxial techniques. *Anesthesiology* 2010;112:530-45. PMID: 20051824
69. Murphy JD, Yan D, Hanna MN, Bravos ED, Isaac GR, Eng CA, **Wu CL**. Comparison of the postoperative analgesic efficacy of intravenous patient-controlled analgesia with tramadol to intravenous patient-controlled analgesia with opioids. *J Opioid Manag* 2010;6:141-7. PMID: 20481179
70. Liu SS, Togioka BM, Hurley RW, Vu CM, Hanna MN, Murphy JD, **Wu CL**. Methodological quality of randomized controlled trials of postoperative epidural analgesia (*with accompanying editorial*). *Reg Anesth Pain Med* 2010;35:549-55. PMID: 20975473
71. Stierer TL, Wright C, George A, Thompson RE, **Wu CL**, Collop N. Risk assessment of obstructive sleep apnea in a population of patients undergoing ambulatory surgery. *J Clin Sleep Med* 2010;6:467-72. PMID: 20957847
72. Murphy JD, Gelfand HJ, Bicket MC, Ouanes JP, Kumar K, Isaac GR, **Wu CL**. Analgesic efficacy of intravenous naloxone for the treatment of postoperative pruritus. *J Opioid Manage* 2011;7:321-7. PMID: 21957831
73. Gelfand HJ, Ouanes JP, Lesley MR, Ko PS, Murphy JD, Sumida SM, Isaac GR, Kumar K, **Wu CL**. Analgesic efficacy of ultrasound-guided regional anesthesia: a meta-analysis (*with accompanying editorial*). *J Clin Anesth* 2011;23:90-6. PMID: 21377070
74. **Wu CL**, Raja SN. Acute and postoperative pain. *Lancet* 2011;377:2215-25. PMID: 21704871
75. Regional Anesthesiology and Acute Pain Medicine Fellowship Directors Group. Guidelines for fellowship training in regional anesthesiology and acute pain medicine: second edition, 2010. *Reg Anesth Pain Med* 2011;36:282-8. PMID: 21519314
76. Togioka BM, Galvagno SM, Sumida SM, Murphy JD, Ouanes JP, **Wu CL**. Supplemental oxygen does not reduce risk of surgical site infection: a meta-analysis. *Anesth Analg* 2012;114:334-42. PMID: 22156334
77. Murphy JD, Paskaradevan J, Eisler LL, Ouanes JP, Garcia Tomas VA, Freck EA, **Wu CL**. Analgesic efficacy of continuous intravenous magnesium infusion as an adjuvant to morphine for postoperative analgesia: a systematic review and meta-analysis. *Middle East J Anaesthesiol* 2013;22:11-20. PMID: 23833845
78. Memtsoudis SC, Hargett M, Russell LA, Parvizi J, Cats-Baril WL, Studner O, Sculco TP, Consensus Conference on Bilateral Total Knee Arthroplasty Group (**Wu CL**). *Clin Orthop Rel Res* 2013;471:2649-57. PMID: 23564364
79. Hurley RW, Zhao K, Tighe PJ, Pronovost PJ, **Wu CL**. Examination of Medline publications from academic anesthesiologists and institutions in the United States (*with accompanying editorial*). *Anesth Analg* 2014;118:192-9. PMID: 24149582
80. Manohar A, Cheung K, **Wu CL**, Stierer T. Burden incurred by patients and their caregivers following outpatient surgery. *Clin Orthop Rel Res* 2014;472:1416-26. PMID: 24005979
81. Memtsoudis SG, Rasul R, Suzuki S, Poran J, Danninger T, **Wu CL**, Mazumdar M, Vougioukas VV. Does the impact of the type of anesthesia on outcomes differ by patient age and comorbidity burden? *Reg Anesth Pain Med* 2014;39:112-9. PMID: 24509423
82. Tseng KS, Kulkarni S, Humphreys EB, Carter HB, Mostwin JL, Partin AW, Han M, **Wu CL**. Spinal anesthesia does not impact prostate cancer recurrence in a cohort of men undergoing radical prostatectomy. *Reg Anesth Pain Med* 2014;39:284-8. PMID: 24918335
83. Vaghari B, Ahmed O, **Wu CL**. Effect of regional anesthesia and analgesia on inflammation, infection, and cancer recurrence. *Anes Clin N Amer* 2014;32:841-51. PMID: 25453665
84. Owens S, Erturk A, Ouanes JP, Murphy JD, **Wu CL**, Bottomley P. Safety of epidural and peripheral nerve catheters in MRI. *Reg Anesth Pain Med* 2014;39:534-9. PMID: 25275576
85. Ouanes JP, Bicket MC, Togioka B, Tomas VG, **Wu CL**, Murphy JD. The role of perioperative chewing gum on gastric fluid volume and gastric pH: a meta-analysis. *J Clin Anesth* 2015;27:146-52. PMID: 25442242
86. Page AJ, Ejaz A, Spolverato G, Zavadsky T, Grant MC, Galante DJ, Wick EC, Weiss M, Makary MA, **Wu CL**, Pawlik TM. Enhanced recovery after surgery protocols for open hepatectomy-

- physiology, immunomodulation, and implementation. *J Gastrointest Surg* 2015;19:387-99. PMID: 25472030
87. Wick EC, Galante DJ, Hobson DB, Benson AR, Lee KH, Berenholtz SM, Efron JE, Pronovost PJ, **Wu CL**. Organizational culture changes result in improvement in patient-centered outcomes: implementation of an integrated recovery pathway for surgical patients. *J Am Coll Surg* 2015;221:669-77. PMID: 26228010
 88. **Wu CL**, Benson AR, Hobson DB, Pio Roda C, Demski R, Galante DJ, Page AJ, Pronovost PJ, Wick EC. Initiating an enhanced recovery pathway program: an anesthesiology department's perspective (*with accompanying editorial*). *Jt Comm J Qual Patient Saf* 2015;41:447-56. PMID: 26404073
 89. Amini N, Kim Y, Hyder O, Spolverato G, **Wu CL**, Page A, Pawlik TM. A nationwide analysis of the use and outcomes of peri-operative epidural analgesia in patients undergoing hepatic and pancreatic surgery. *Am J Surg* 2015;210:483-91. PMID: 26105799
 90. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, Carter T, Cassidy CL, Chittenden EH, Degenhardt E, Griffith S, Manworren R, McCarberg B, Montgomery R, Murphy J, Perkal MF, Suresh S, Sluka K, Strassels S, Thirlby R, Viscusi E, Walco GA, Warner L, Weisman SJ, **Wu CL**. Management of postoperative pain: a clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain* 2016;17:131-57. PMID: 26827847
 91. Gordon DB, de Leon-Casasola OA, **Wu CL**, Sluka K, Brennan T, Chou R. Research gaps on practice guidelines for acute postoperative pain management in adults: Findings from a review of the evidence for an American Pain Society Clinical Practice Guideline. *J Pain* 2016;17:158-66. PMID: 26719073
 92. Cooper SA, Desjardins PJ, Turk DC, Dworkin RH, Katz NP, Kehlet H, Ballantyne JC, Burke LB, Carragee E, Cowan P, Croll S, Dionne RA, Farrar JT, Gilron I, Gordon DB, Iyengar S, Jay GW, Kalso EA, Kerns RD, McDermott MP, Raja SN, Rappaport BA, Rauschkolb C, Royal MA, Segerdahl M, Stauffer JW, Todd KH, Vanhove GF, Wallace MS, West C, White RE, **Wu C**. Research design considerations for single-dose analgesic clinical trials in acute pain: IMMPACT recommendations. *Pain* 2016;157:288-301. PMID: 26827847
 93. Grant MC, Kim J, Page AJ, Hobson D, Wick EC, **Wu CL**. The effect of intravenous midazolam on postoperative nausea and vomiting: a meta-analysis (*with accompanying editorial*). *Anesth Analg* 2016;122:656-63. PMID: 26332858
 94. Apfelbaum JL, Horlocker TT, Agarkar M, Connis RT, Hebl JR, Nickinovich DG, Palmer CM, Rathmell JP, Rosenquist RW, **Wu CL**. Practice guidelines for the prevention, detection, and management of respiratory depression associated with neuraxial opioid administration: an updated report by the American Society of Anesthesiologists Task Force on Neuraxial Opioids and the American Society of Regional Anesthesia and Pain Medicine. *Anesthesiology* 2016;124:535-52. PMID: 26655725
 95. Grant MC, Lee H, Page AJ, Hobson D, Wick EC, **Wu CL**. The effect of preoperative gabapentin on postoperative nausea and vomiting: a meta-analysis. *Anesth Analg* 2016;122:976-85. PMID: 26991615
 96. Stone AB, Grant MC, Pio Roda C, Hobson D, Pawlik T, **Wu CL**, Wick EC. Implementation costs of an enhanced recovery after surgery program in the United States: a financial model and sensitivity analysis based on experiences at a quaternary academic medical center. *J Am Coll Surg* 2016;222:219-25. PMID: 26774492
 97. Yang D, Grant MC, Stone A, **Wu CL**, Wick EC. A meta-analysis of intraoperative ventilation strategies to prevent pulmonary complications: Is low tidal volume alone sufficient to protect healthy lungs? *Ann Surg* 2016;263:881-7. PMID: 26720429
 98. Page AJ, Gani F, Crowley KT, Lee KH, Grant MC, Zavadsky TL, Hobson D, **Wu C**, Wick EC, Pawlik TM. Patient outcomes and provider perceptions following implementation of a standardized perioperative care pathway for open liver resection. *Br J Surg* 2016;103:564-71. PMID: 26859713
 99. Zorrilla-Vaca A, Grant MC, Mathur V, Li J, **Wu CL**. The impact of neuraxial versus general anesthesia on the incidence of postoperative surgical site infections following knee or hip arthroplasty: a meta-analysis (*with accompanying editorial*). *Reg Anesth Pain Med* 2016;41:555-63. PMID: 27380106
 100. Apfelbaum JL, Horlocker TT, Madhulika A, Connis RT, Hebl JR, Nickinovich DG, Palmer CM, Rathmell, JP, Rosenquist RW, **Wu CL**. Practice guidelines for the prevention, detection, and

- management of respiratory depression associated with neuraxial opioid administration: an updated report by the American Society of Anesthesiologists Task Force on Neuraxial Opioids and the American Society of Regional Anesthesia and Pain Medicine. *Anesthesiology* 2016;124:535-52. PMID: 26655725
101. Grant MC, Betz M, Hulse M, Zorrilla-Vaca A, Hobson D, Wick EC, **Wu CL**. The effect of preoperative pregabalin on postoperative nausea and vomiting: a meta-analysis. *Anesth Analg* 2016;123:1100-7. PMID: 27464972
 102. Zeng A, Nami N, **Wu CL**, Murphy JD. Analgesic efficacy of nonsteroidal anti-inflammatory agents after Cesarean section: meta-analysis. *Reg Anesth Pain Med* 2016;41:763-72. PMID: 27755486
 103. Grant MC, Yang D, **Wu CL**, Makary MA, Wick EC. Impact of enhanced recovery after surgery and fast track surgery pathways on healthcare-associated infections: results from a systematic review and meta-analysis. *Ann Surg* 2017;265:68-79. PMID: 28009729
 104. Zorrilla-Vaca A, Healy RJ, **Wu CL**, Grant MC. Depth of anesthesia as measured by bispectral index and postoperative mortality: A meta-analysis of observational studies. *Can J Anaesth* 2017;64:597-607. PMID: 28361391
 105. Kumar K, Gulotta LV, Dines JS, Allen AA, Cheng J, Fields KG, YaDeau JT, **Wu CL**. Unused opioid pills after outpatient shoulder surgeries given current perioperative prescribing habits. *Am J Sports Med* 2017;363546517693665. PMID: 28182507
 106. Stone AB, Grant MC, Lau BD, Hobson DB, Streiff MB, Haut ER, **Wu CL**, Wick EC. Thoracic epidural anesthesia and prophylactic three times daily unfractionated heparin within an enhanced recovery after surgery pathway for colorectal surgery. *Reg Anesth Pain Med* 2017;42:197-203. PMID: 28079734
 107. Haskins S, Tsui BC, Nejm J, **Wu CL**, Boublik J. Point-of-care lung ultrasound for the regional anesthesiologist. *Reg Anesth Pain Med* 2017;42:289-98. PMID: 28282364
 108. Pauls LS, Johnson-Paben R, Murphy JD, McGready J, Pronovost PJ, **Wu CL**. The weekend effect in hospitalized patients (*with accompanying editorial*). *J Hosp Med* 2017;12:760-6. PMID: 28914284
 109. Haskins SC, Tanaka CY, Boublik J, **Wu CL**, Sloth E. Focused cardiac ultrasound for the regional anesthesiologist and pain specialist. *Reg Anesth Pain Med* 2017;42(5):632-44. PMID: 28786898.
 110. Scott MJ, McEvoy MD, Gordon DB, Grant S, Thacker JK, **Wu CL**, Gan TJ, Mythen MG, Shaw AD, Miller TE, Perioperative quality Initiative (POQI) I Workgroup. American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) Joint Consensus Statement on Optimal Analgesia within an Enhanced Recovery Pathway for Colorectal Surgery: Part 2-From PACU to the Transition Home. *Perioper Med (Lond)*. 2017 Apr 13;6:7. PMID: 28413628
 111. McEvoy MD, Scott MJ, Gordon DB, Grant S, Thacker JK, **Wu CL**, Gan TJ, Mythen MG, Shaw AD, Miller TE, Perioperative quality Initiative (POQI) I Workgroup. American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) Joint Consensus Statement on Optimal Analgesia within an Enhanced Recovery Pathway for Colorectal Surgery: Part 1-From the Preoperative Period to PACU. *Perioper Med (Lond)*. 2017 Apr 13;6:8. PMID: 28413629
 112. Wick EC, Grant MC, **Wu CL**. Postoperative multimodal analgesia pain management with nonopioid analgesics and techniques: a review. *JAMA Surg* 2017;152:691-7. PMID: 28564673
 113. Grant MC, Sommer PM, He C, Li S, Page AJ, Stone AB, Hobson D, Wick E, **Wu CL**. Preserved analgesia with reduction in opioids through the use of an acute pain protocol in enhanced recovery after surgery for open hepatectomy. *Reg Anesth Pain Med* 2017;42:451-7. PMID: 28525409.
 114. Bicket MC, Kattail D, Yaster M, **Wu CL**, Pronovost P. An analysis of errors, discrepancies, and variation in opioid prescriptions for adult outpatients at a teaching hospital. *J Opioid Manag* 2017;13:51-57. PMID: 28345746
 115. Fabrizio AC, Grant MC, Siddiqui Z, Alimi Y, Gearhart SL, **Wu C**, Efron JE, Wick EC. Is enhanced recovery enough for reducing 30-d readmissions after surgery? *J Surg Res* 2017;217:45-53. PMID: 28602223
 116. Bicket MC, Long JJ, Pronovost PJ, Alexander GC, **Wu CL**. The over-supply of opioid medication after surgery: a systematic review. *JAMA Surg* 2017 (in press). PMID: 28768328
 117. Kent ML, Tighe PJ, Belfer I, Brennan TJ, Bruehl S, Brummett CM, Buckenmaier CC 3rd, Buvanendran A, Cohen RI, Desjardins P, Edwards D, Fillingim R, Gewandter J, Gordon DB, Hurley RW, Kehlet H, Loeser JD, Mackey S, McLean SA, Polomano R, Rahman S, Raja S,

- Rowbotham M, Suresh S, Schachtel B, Schreiber K, Schumacher M, Stacey B, Stanos S, Todd K, Turk DC, Weisman SJ, **Wu C**, Carr DB, Dworkin RH, Terman G. The ACTION-APS-AAPM Pain Taxonomy (AAAPT) multidimensional approach to classifying acute pain conditions. *J Pain* 2017;18:479-89. PMID: 28495013 and *Pain Med* 2017;18:947-58. PMID: 28482098
118. Semerjian A, Milbar N, Kates M, Gorin MA, Patel HD, Chalfin HJ, Frank SM, **Wu CL**, Yang WW, Hobson D, Robertson L, Wick E, Schoenberg MP, Pierorazio PM, Johnson MH, Stimson CJ, Bivalacqua TJ. Hospital charges and length of stay following radical cystectomy in the ERAS era. *Urology* 2018;111:86-91. PMID: 29032237
119. Grant MC, Hanna A, Benson A, Hobson D, **Wu CL**, Yuan CT, Rosen M, Wick EC. Dedicated operating room teams and clinical outcomes in an enhanced recovery after surgery pathway for colorectal surgery. *J Am Coll Surg* 2017 Dec 21. [Epub ahead of print]. PMID: 29274837.
120. George JA, Koka R, Gan TJ, Jelin E, Boss EF, Strockbine V, Hobson D, Wick EC, **Wu CL**. Review of the enhanced recovery pathway for children: perioperative anesthetic considerations. *Can J Anaesth* 2017 Dec 19. [Epub ahead of print]. PMID: 29270915.
121. Kumar K, Kirksey MA, Duong S, **Wu CL**. A review of opioid-sparing modalities in perioperative pain management: methods to decrease opioid use postoperatively. *Anesth Analg* 2017;125:1749-60.

Invited Non-Medline Articles

1. Yang J, **Wu CL**. The use of gene therapy for the treatment of pain. *American Scientist* 2001;89:126-35.
2. **Wu CL**. The pharmacologic management of acute pain in patients with sickle cell disease. *Int J Pain Med Pall Care* 2001; 1:15-22.
3. Block BM, **Wu CL**. Pain and sleep. *Int J Pain Med Pall Care* 2001;1:56-61.
4. **Wu CL**, Fleisher LA. An overview of outcomes research in anesthesiology. *Prob Anes* 2001;13:481-90.
5. Berry CE, **Wu CL**, Fleisher LA. Outcomes research: the effect of recent clinical research on anesthesia practice. *Clin Research* 2002;2:2-6.
6. Sharma MC, Tella PS, **Wu CL**. A review of postamputation pain. *Int J Pain Med Pall Care* 2002;1:82-90.
7. **Wu CL**, Casey ZA. Management of postoperative pain in the opioid-tolerant and chronic pain patient. *J Crit Illness* 2002;17; 426-32.
8. **Wu CL**, Thomsen RW. Effect of postoperative epidural analgesia on patient outcomes. *Tech Reg Anes Pain Med* 2003;7:140-7.
9. Assad SA, Isaacson SA, **Wu CL**. An update on patient-controlled epidural analgesia. *Tech Reg Anes Pain Med* 2003;7:127-32.
10. **Wu CL**, Cristo PJ, Richman JM, Hsu W. An update on postdural puncture headache. *Int J Pain Med Pall Care* 2004; 3:53-9.
11. **Wu CL**. Regional anesthesia-analgesia and patient outcomes – are we there yet? *ASA Newsletter* 2005;69:14-5.
12. **Wu CL**. Acute pain management. *ASA Refresher Course Lectures* 2007
13. Wolfson A, Wong RP, Veloso PM, **Wu CL**. Postoperative analgesia for patients with obstructive sleep apnea syndrome. *Seminars in Anesthesia* 2007;26:103-9.
14. Mathur V, Bravos ED, Vallera C, **Wu CL**. Regional anesthesia and patient outcomes: evidence-based medicine. *Tech Reg Anesth Pain Med* 2008;12:163-70.
15. **Wu CL**. Murphy JD. Epidural anesthesia-analgesia and patient outcomes: a perspective. *Adv Anesthes* 2014, Article ID 948164.

Case Reports/Editorials/Letters

1. **Wu CL**, Patt RB. Accidental overdose of systemic morphine during intended refill of intrathecal infusion device. *Anesth Analg* 1992;75:130-2. PMID: 1616139.
2. Patt RB, **Wu CL**, Bressi J, Catania JA. Accidental intraspinal overdose revisited. *Anesth Analg* 1993;76:202.
3. Patt RB, Reddy S, **Wu CL**, Catania JA. Pneumothorax as a consequence of thoracic subarachnoid block. *Anesth Analg* 1994;78:160-2. PMID: 8267153.
4. **Wu CL**, Litman RS. Anesthetic management for a child with the Ellis-van Creveld syndrome. *Paediatr Anaesth* 1994;4:335-7.
5. Porterfield WR, **Wu CL**. Epidural hematoma in an ambulatory surgical patient. *J Clin Anesth* 1997;9:74-7. PMID: 9051551.
6. **Wu CL**, Yang J, Ward DS. Relationship between NIH dollars and percentage of residents matched through the National Residency Matching Program (letter). *Anesthesiology* 1997;87:454-6.

7. **Wu CL**, Perkins FM. Thromboprophylaxis and regional anesthesia. *Reg Anesth* 1997;22:588-90.
8. Cladis F, **Wu CL**. Pacemeningeal enhancement in a patient with post-dural puncture headache. *Am J Anesth* 1999;26:229.
9. **Wu CL**, Francisco DR, Benesch CG. Perioperative stroke associated with postoperative epidural analgesia. *J Clin Anesth* 2000;12:61-3. PMID: 10773511.
10. **Wu CL**, Carter HB, Naqibuddin M, Fleisher LA. Patient recovery after local anesthetics for transrectal biopsy (reply). *Urology* 2001;58:636.
11. Block BM, **Wu CL**. Pain and sleep (reply). *Int J Pain Med Pall Care* 2002;1:110.
12. **Wu CL**, Raja SN. Optimizing postoperative analgesia: the use of global outcome measures (editorial). *Anesthesiology* 2002;97:533-4. PMID: 12218515.
13. Pierre HL, Block BM, **Wu CL**. Difficult removal of a wire-reinforced epidural catheter. *J Clin Anesth* 2003;15:140-1. PMID: 12719055.
14. Bergqvist D, **Wu CL**, Neal JM. Regional anesthesia and anticoagulation (editorial). *Reg Anesth Pain Med* 2003;28:163-6. PMID: 12772132.
15. **Wu CL**, Block BM, Rowlingson AJ, Liu SS, Cowan AR, Cowen JA. Efficacy of postoperative epidural analgesia versus systemic opioids: a meta-analysis (reply). *JAMA* 2004;291:1198.
16. Bergqvist D, **Wu CL**, Neal JM. Anticoagulation and neuraxial regional anesthesia: Perspectives (editorial). *Reg Anesth Pain Med* 2004;29(2 Suppl):13-6.
17. **Wu CL**, Rowlingson AJ, Fleisher LA. Veterans Administration-National Surgical Quality Improvement Program (reply). *Reg Anesth Pain Med* 2005;30:312-3.
18. Richman JM, Stearns JD, Rowlingson AJ, **Wu CL**, McFarland EM. The effect of regional anesthesia on operating room efficiency and resident education (letter). *J Clin Anesth* 2006;18:240-1. PMID: 16731336.
19. Liu SS Warren DT, **Wu CL**, Ballantyne JC, Rathmell JP, Ginsberg B, Rosenquist R, Viscusi ER. A lovely idea: forming an ASRA Acute Postoperative Pain (AcutePOP) database (editorial). *Reg Anesth Pain Med* 2006;31(4):291-3. PMID: 16857547.
20. Cordone M, **Wu CL**, Maceda AL, Richman JM. Unrecognized contralateral intrapleural catheter: bilateral analgesia may obscure detection of failed epidural catheterization. *Anesth Analg* 2007;104:735-7.
21. Stevens RS, **Wu CL**. Regional anesthesia and carotid surgery – do we have an answer? (editorial) *J Cardiovasc Thor Anes* 2007;21:1-2.
22. Liu SS, **Wu CL**, Ballantyne JC, Buvanendran A, Rathmell JP, Warren DT, Viscusi ER, Ginsberg B, Rosenquist RW, Yadeau JT, Liguori GA. Where in the world is ASRA AcutePOP. *Reg Anesth Pain Med* 2009;34:269-74. PMID: 19591261.
23. **Wu CL**, Liu SS. Intravenous lidocaine for ambulatory anesthesia: good to go or not so fast? *Anesth Analg* 2009;109:1718-9. PMID: 19923494.
24. **Wu CL**, Hanna MN. Reply to Dr. Andreae. *Reg Anesth Pain Med* 2010;35:116.
25. Sumida S, Murphy JD, **Wu CL**. Author's response. *J Opioid Manag* 2010;6:13-4.
26. Liu SS, **Wu CL**, Ballantyne JC, Buvanendran A, Rathmell JP, Warren DT, Viscusi ER, Ginsberg B, Rosenquist RW, Yadeau JY, Liguori GA. An end and a beginning for ASRA AcutePOP. *Reg Anesth Pain Med* 2011;36:289.
27. Ward DS, **Wu CL**. Don't forget mentoring. *Anaesthesia* 2012;67:186-7. PMID: 22251113.
28. Iffeld BM, **Wu CL**. Meta-analysis: somewhere between mega-silliness and the final word, but where? *Reg Anesth Pain Med* 2012;37:571-3. PMID: 23086346.
29. Gelfand HJ, Ouanes JP, Murphy JD, **Wu CL**. Reply. *J Clin Anesth* 2012;24:165.
30. Togioka BM, **Wu CL**. In response. *Anesth Analg* 2012;115:734-5.
31. Stierer TS, **Wu CL**. Obstructive sleep apnea and regional anesthesia/analgesia. *Reg Anesth Pain Med* 2013;38:255-6. PMID: 23788063.
32. **Wu CL**, Murphy JD. Conflicting guidelines: what should a clinician do? *J Clin Anesth* 2014;26:1-2. PMID: 24418510.
33. Stone AB, **Wu CL**, Wick EC, Hobson D, Grant MC. Enhanced recovery programs increase thoracic epidural opportunities for trainees. *Reg Anesth Pain Med* 2016;41:793-4. PMID: 27776106.
34. Benzon HT, Mascha EJ, **Wu CL**. Studies on postoperative analgesic efficacy: focusing the statistical methods and broadening outcome measures and measurement tools. *Anesth Analg* 2017;125:726-8. PMID: 28817527.
35. Stone AB, Wick EC, **Wu CL**, Grant MC. The US opioid crisis: a role for enhanced recovery after surgery. *Anesth Analg* 2017;125:1803-5. PMID: 28678072.
36. Haskins SC, Boublik J, **Wu CL**. Point-of-care ultrasound for the regional anesthesiologist and pain specialist: a series introduction. *Reg Anesth Pain Med* 2017;42:281-2. PMID: 28419046.
37. Stone AB, **Wu CL**, Grant MC. Should hospitals market opioid-sparing analgesia to patients? *Reg Anesth*

Pain Med 2018;43:2-4.

38. Benzon HT, Mascha EJ, **Wu CL**. Studies on postoperative analgesic efficacy: focusing the statistical methods and broadening outcome measures and measurement tools. *Anesth Analg* 2017;125:726-8.

Book Chapters

1. Patt RB, Szalados JE, **Wu CL**. Appendix 1, Pharmacotherapeutic Guidelines. In: Patt RB, ed. Manual of Cancer Pain Management. Philadelphia: JB Lippincott, 1992.
2. Lee AC, **Wu CL**, Henson LC. Anesthesia and pain management. In: Illig K, Husser WC, eds. The Rochester Manual: Practical Patient Care. New Jersey: Laennec Publishing, Inc., 1996.
3. **Wu CL**. Outcomes after neuraxial and peripheral nerve block. In: Textbook of Regional Anesthesia. Raj P, ed. New York: Churchill Livingstone, 2002.
4. Weller JF, **Wu CL**. Does regional anesthesia decrease perioperative blood loss? In: Evidence-Based Practice of Anesthesia. Fleisher LA, ed. Philadelphia: WB Saunders Company, 2004.
5. Setty A, **Wu CL**. Postoperative pain syndromes. In: Just the Facts: Pain Medicine. Staats PS, Wallace M, eds. New York: McGraw-Hill Professional, 2004.
6. Casey Z, **Wu CL**. Epidural opioids for postoperative analgesia. In: Essentials of Pain Medicine and Regional Anesthesia, 2nd ed. Benzon H et al, eds. New York: Churchill Livingstone, 2004.
7. Richman JM, **Wu CL**. Intrathecal opioids for postoperative analgesia. In: Essentials of Pain Medicine and Regional Anesthesia, 2nd ed. Benzon H et al, eds. New York: Churchill Livingstone, 2004.
8. **Wu CL**. Acute postoperative pain. In: Anesthesia, 6th ed. Miller RD, et al, eds. New York: Churchill Livingstone, 2004.
9. Richman JM, **Wu CL**. Ambulatory regional anesthesia: complications and treatment. In: Ambulatory anesthesia and perioperative analgesia. Steele SM, Nielsen KC, Klein SM, eds. New York: McGraw-Hill Publishers, 2004.
10. **Wu CL**, Hurley RW, Stauffer J. Assessment of anti-inflammatory and pain drugs. In: Handbook of phase I/II trials. Lee CJ, Lee LH, Wu CL, Lee BR, Chen ML, eds. Analgesics. Boca Raton: CRC Press, 2005.
11. **Wu CL**, Hurley RW. Postoperative pain and patient outcomes. In: Postoperative pain management: an evidence-based guide to practice. Shorten G, Carr D, Harmon D; Puig MM; Browne J, eds. Philadelphia: WB Saunders, 2006.
12. Williams BA, **Wu CL**. Effects of regional anesthesia & analgesia on perioperative outcome. In: Regional Anesthesia and Acute Pain Management. Hadzic, A, ed. New York, McGraw Hill, 2006.
13. **Wu CL**, Richman JM. Complications of acute pain management: continuous epidural analgesia. In: Complications of Regional Anesthesia and Pain Medicine. Neal JM, Rathmell JP, eds. Saunders, 2006.
14. **Wu CL**, Caldwell MD. The effect of postoperative epidural analgesia on perioperative morbidity and mortality. In: Best Practice & Research Compendium: Pain.. Breivik H, ed. Elsevier, 2007.
15. **Wu CL**, Neumann K, Williams BA. Postoperative pain and other acute pain syndromes. In: Raj's Practical Management of Pain. Benzon H, Rathmell JP, Wu CL, Turk DC, Argoff CE, eds. New York: Elsevier-Mosby, 2008.
16. Williams K, Hurley RW, Lin EE, **Wu CL**. Neuropathic pain syndromes. In: Raj's Practical Management of Pain. Benzon H, Rathmell JP, Wu CL, Turk DC, Argoff CE, eds. New York: Elsevier-Mosby, 2008.
17. **Wu CL**, Liu SS. Outcomes, efficacy and complications from acute pain management. In: Raj's Practical Management of Pain. Benzon H, Rathmell JP, Wu CL, Turk DC, Argoff CE, eds. New York: Elsevier-Mosby, 2008.
18. **Wu CL**, Lin EE, Maine DN. Outcomes, efficacy and complications of neuropathic pain management. In: Raj's Practical Management of Pain. Benzon H, Rathmell JP, Wu CL, Turk DC, Argoff CE, eds. New York: Elsevier-Mosby, 2008.
19. **Wu CL**, Liu SS. Neural blockade: impact on outcome. In: Neuraxial blockade, 4th ed. Cousins M, Bridenbaugh P, eds. Philadelphia: Lippincott Williams & Wilkins, 2009.
20. Hurley RW, **Wu CL**. Acute postoperative pain. In: Anesthesia, 7th ed. Miller RD, et al, eds. New York: Churchill Livingstone, 2009.
21. Hanna MN, Liu SS, **Wu CL**. Effect of epidural analgesia on postoperative outcomes. In: Acute pain management. Sinatra RS, de Leon-Casasola OA, Ginsberg B, Viscusi ER, eds. New York, Cambridge University Press, 2009.
22. Hurley RW, **Wu CL**. Acute postoperative pain. In: Bonica's The Management of Pain. Rathmell JM, Ballantyne JC, eds. Philadelphia: Lippincott Williams & Wilkins, 2009.
23. Murphy JD, Gelfand HJ, **Wu CL**. Epidural opioids for postoperative pain. In: Essentials of Pain Medicine and Regional Anesthesia, 3rd ed. Benzon H et al, eds. Philadelphia: WB Saunders, 2011.

24. Murphy JD, Gelfand HJ, **Wu CL**. Intrathecal opioid injections for postoperative pain. In: Essentials of Pain Medicine and Regional Anesthesia, 3rd ed. Benzon H et al, eds. Philadelphia: WB Saunders, 2011.
25. **Wu CL**, Ouanes JP. Complications of acute pain management: continuous epidural analgesia. In: Complications of Regional Anesthesia and Pain Medicine, 2nd ed. Neal JM, Rathmell JP, eds. Saunders. Philadelphia: Lippincott Williams & Wilkins, 2012.
26. Hurley RW, Murphy JD, **Wu CL**. Acute postoperative pain. In: Anesthesia, 8th ed. Miller RD, et al, eds. New York: Churchill Livingstone, 2014.
27. Brookman J, Benzon HT, Manohar A, **Wu CL**. Postoperative pain management: trends and future directions & areas in need of investigations. In: Raj's Practical Management of Pain, 5th ed. New York: New York: Elsevier-Mosby, 2013.
28. Brookman J, **Wu CL**. Burn pain. In: Raj's Practical Management of Pain, 5th ed. New York: New York: Elsevier-Mosby, 2013.
29. Hurley RW, Henriquez OH, Wu CL. Neuropathic pain syndromes. In: Raj's Practical Management of Pain, 5th ed. New York: New York: Elsevier-Mosby, 2013.
30. Gelfand HJ, **Wu CL**. Postoperative pain syndromes. In: Just the Facts: Pain Medicine. Staats PS, Wallace M, eds. Boston, MA: McGraw-Hill Education, 2015.
31. **Wu CL**. Postoperative pain management for enhanced recovery after major abdominopelvic surgery. ASER Handbook for enhanced recovery after surgery (in press)
32. Conlin N, Grant MC, **Wu CL**. Epidural opioids for postoperative pain. In: Essentials of Pain Medicine and Regional Anesthesia, 4th ed. Benzon H et al, eds. Philadelphia: WB Saunders, 2016.
33. Hernandez G, Grant MC, **Wu CL**. Intrathecal opioid injections for postoperative pain. In: Essentials of Pain Medicine and Regional Anesthesia, 4th ed. Benzon H et al, eds. Philadelphia: WB Saunders, 2016.

Book Editor

1. Lee CJ, Lee LH, **Wu CL**, Lee BR, Chen ML, eds. *Handbook of phase I/II trials*, 2nd ed. Boca Raton: CRC Press, 2005.
2. Benzon HT, Rathmell JP, **Wu CL**, Argoff CE, Turk DC. *Raj's Practical Management of Pain*, 4th ed. New York: New York: Elsevier-Mosby, 2008.
3. Benzon HT, Rathmell JP, **Wu CL**, Argoff CE, Turk DC. *Raj's Practical Management of Pain*, 5th ed. New York: New York: Elsevier-Mosby, 2013.

Other Publications

1. Wurl D, Wu CL. Review of post-dural puncture headaches. *JURMC* 1995;7:12-7.
2. Lee AC, Wu CL. Anesthesia simulators. *Sphere* 1995;47:18-21.
3. Wu CL, Perkins FM. Pain forum: chronic abdominal pain. *Sphere* 1996;48:18-25.
4. Wu CL, Perkins FM. Chronic abdominal pain. *ASRA News* June 1996:8-11.
5. Wu CL. Anticoagulants and neuraxial block. *Sphere* 1997;49:42-6.
6. Wu CL. Anticoagulants and neuraxial blocks. *ASRA News* May 1997;5-6.
7. Wu CL. Acute pain at the crossroads: an overview of the management, economics, and future of acute pain (book review). *Clin J Pain* 2000;16:89-90.
8. Wu CL. Review of "Multimodal analgesia and intravenous nutrition preserves total body protein following major upper gastrointestinal surgery" (commentary). *MD Consult Pain Medicine* 2002.
9. Wu CL. Principles and practice of pain medicine, 2nd ed (book review). *Anesthesiology* 2005;102:1073.
10. Wu CL. Correlation of postoperative pain to quality of recovery in the immediate postoperative period. *ASRA Newsletter* 2005.

Peer-Reviewed Abstracts

1. Litman RS, **Wu CL**, Catanzaro FA. Ondansetron prevents vomiting after tonsillectomy in children. IARS: March 8, 1993.
2. Isaacson S, Perkins FM, Mevorach DL, Patt RB, **Wu CL**. Safety of continuous epidural morphine infusion for postoperative pain management on surgical wards. ASA: October 13, 1993.
3. Litman RS, **Wu CL**, Quinlivan JK. Gastric volume and pH in infants fed clear liquids and breast milk prior to surgery. ASA: October 11, 1993
4. Litman RS, **Wu CL**, Quinlivan JK. Gastric volume and pH in infants fed clear liquids and breast milk prior to surgery. PGA: December 13, 1993.
5. Patt RB, Reddy S, Proper GP, **Wu CL**. Management of intractable cancer pain with subarachnoid neurolytic block. ASRA: April 9, 1994.

6. Richardson MJ, **Wu CL**, Hussain A. The effect of midazolam on sedation and recovery in patients following brief outpatient general anesthesia. PGA: December 7, 1996.
7. **Wu CL**, Steinberg R, Liu SS. Ropivacaine/fentanyl patient controlled epidural analgesia improves analgesia and hastens recovery after colon surgery compared to IV PCA morphine. World Congress of Anesthesiologists: June 6, 2000.
8. Vaslav R, Staats PS, Kazim DA, **Wu CL**, Raja SN. Analgesic effects of intravenous lidocaine and morphine on post-amputation pain: a double blind cross-over trial. APS: November, 2000.
9. **Wu CL**, Naqibuddin M, Jermyn RM, Fleisher LA. The effect of postoperative analgesia on quality-of-life measurements. IARS: March 18, 2001.
10. Kaufmann SC, **Wu CL**, Pronovost PJ, Jermyn RM, Fleisher LA. The effect of intraoperative regional anesthesia on anticipated admission to the intensive care unit. ASRA: May 11, 2001.
11. Raja SN, **Wu CL**, Tella P, Staats PS, Vaslav R, Kazim D, Wesselmann U. Analgesic effects of intravenous lidocaine and morphine on post-amputation pain: a randomized double-blind, active-placebo-controlled, crossover trial. ASA: October 16, 2001.
12. Block BM, El-Kassabany N, Lietman SA, Frassica FJ, Raja SN, Naqibuddin M, **Wu CL**. The effect of postoperative epidural analgesia on lower extremity blood flow: a prospective randomized trial. ASRA: April 25, 2002.
13. **Wu CL**, Anderson GF, Herbert R, Lietman SA, Fleisher LA. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing total hip replacement. ASRA: April 4, 2003.
14. Stearns JD, Richman JM, Rowlingson AJ, McFarland EM, **Wu CL**. The effect of regional anesthesia on operating room efficiency and resident education. ASRA: March, 2004.
15. DelPizzo K, Anderson GF, Herbert R, Fleisher LA, **Wu CL**. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing colectomy. ASRA: March, 2004.
16. Demeester J, Anderson GF, Herbert R, Fleisher LA, **Wu CL**. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing total knee replacement. ASRA: March, 2004.
17. Brown AK, Anderson GF, Herbert R, Fleisher LA, **Wu CL**. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing thoracotomy. ASRA: March, 2004.
18. Hurley RW, Anderson GF, Herbert R, Rowlingson AJ, Fleisher LA, **Wu CL**. The effect of perioperative epidural analgesia on patient mortality and morbidity in the Medicare population undergoing surgery. ASRA: March, 2004.
19. Maine D, Richman JM, Rowlingson AJ, **Wu CL**. The efficacy of neuraxial anesthesia on intraoperative blood loss: a meta-analysis. ASRA: March, 2004.
20. Liu SS, Block BM, **Wu CL**. Effects of perioperative central neuraxial analgesia on outcome after coronary artery bypass surgery: a meta-analysis. ASA: October, 2004.
21. Liu SS, Strodbeck WM, Richman JM, **Wu CL**. Comparison of regional versus general anesthesia for ambulatory anesthesia: A meta-analysis of randomized controlled trials.. IARS: March, 2005.
22. Hurley RW, Cohen SM, Rowlingson AR, **Wu CL**. Efficacy of oral gabapentin on postoperative pain. ASRA: April, 2005.
23. Michaels RK, Cohen SR, Liu SS, **Wu CL**. Efficacy of postoperative epidural analgesia versus IV PCA with opioids: a meta-analysis. ASRA: April, 2005.
24. Petrovic M, Cohen SR, Liu SS, **Wu CL**. The effect of gender on postdural puncture headache. ASRA: April, 2005.
25. Jeffries M, Cohen SR, Liu SS, **Wu CL**. The effect of needle bevel direction on postdural puncture headache. ASRA: April, 2005.
26. Levin J, Partin AW, Fleisher LA, **Wu CL**. Efficacy of continuous local anesthetic infusion for postoperative pain after radical retropubic prostatectomy. ASRA: April, 2005.
27. Doherty J, Partin AW, Fleisher LA, **Wu CL**. Effect of postoperative pain on quality of recovery and patient-oriented outcomes in the immediate postoperative period (*best abstract*). ASRA: April, 2005.
28. Lin EE, Agarwal S, **Wu CL**, Raja SN. Perineuromal administration of norepinephrine evokes dose-dependent pain in amputees. ASRA: April, 2005.
29. Kumar K, Stierer T, Fleisher L, **Wu CL**. Postdischarge pain and burden incurred by patients and their caregivers following outpatient surgery: a pilot study. ASRA: April, 2006.
30. Lee J, Liu SS, Thirlby R, **Wu CL**. Efficacy of continuous wound catheters delivering local anesthetic for postoperative analgesia: a quantitative and qualitative systematic review of randomized controlled trials. ASRA: April, 2006.

31. Jones C, Carter HB, Hanna M, **Wu CL**. Efficacy of periprostatic biopsy analgesia: a meta-analysis. ASRA: April, 2006.
32. Bolka J, Hurley R, Hanna M, **Wu CL**. Analgesic efficacy of extrapleural catheters versus thoracic epidural analgesia for postoperative pain control after thoracic surgery: a systematic review. ASRA: April, 2006.
33. Andrews R, Hurley R, Hanna M, **Wu CL**. Analgesic efficacy of extrapleural catheters versus placebo for postoperative pain control after thoracic surgery: a systematic review. ASRA: April, 2006.
34. Hobelman JT, Hurley R, Bolka J, **Wu CL**. Analgesic efficacy of intrapleural catheters versus placebo for postoperative pain control after thoracic surgery: a systematic review. ASRA: April, 2006.
35. Hassan A, Richman JM, Liu SS, **Wu CL**. The effects of epidural catheter location on outcomes in women undergoing gynecologic surgery with an abdominal incision: A randomized clinical trial. ASRA: April, 2006.
36. Cordone M, **Wu CL**, Maceda AL, Richman JM. Unrecognized contralateral intrapleural catheter: bilateral analgesia may obscure detection of failed epidural catheterization. ASRA: April, 2006.
37. Murphy J, Hanna M, Richman J, **Wu CL**. A systematic review of the efficacy of sustained-release opioids for postoperative analgesia. ASRA: April, 2006.
38. Cox L, Hanna M, Jeffries M, **Wu CL**. Survey utilization of regional and general anesthesia. ASRA: April, 2007.
39. Jeffries MJ, Mathur V, Veloso P, **Wu CL**. Quality of meta-analyses in the anesthesiology and pain medicine literature. ASRA: April, 2007.
40. Belan M, Patel A, Hanna M, **Wu CL**. Efficacy of bicarbonate in decreasing pain on intradermal injection of local anesthetics: a meta-analysis. ASRA: April, 2007.
41. Lin EE, Mathur V, Veloso P, **Wu CL**. Systematic review of chlorhexidine versus iodine for sterile preparation prior to neuraxial techniques. ASRA: April, 2007.
42. Patel A, Hanna M, Veloso P, **Wu CL**. Efficacy of bicarbonate in hastening onset of sensory. ASRA: April, 2007.
43. Crooks M, **Wu CL**. Chronobiology, postoperative/labor pain, and analgesic requirement: a systematic review. ASRA: April, 2007.
44. Lehrer I, Lesley MR, Kong GJ, Hang J, Lin EE, **Wu CL**. Ultrasound-guided nerve blocks: a meta-analysis (*best abstract*). ASRA: May, 2008.
45. Abraham A, Lesley MR, Kong GJ, Bolka J, **Wu CL**. Meta-analysis of the effect of Depodur versus IV-PCA on respiratory depression. ASRA: May, 2008.
46. Lin EE, Kong GJ, Bolka J, Lehrer I, **Wu CL**. Meta-analysis of ondansetron versus placebo for the prevention and treatment of opioid-induced pruritis. ASRA: May, 2008.
47. Kim D, Sumida S, Lesley MR, Kong GJ, **Wu CL**. Meta-analysis of the effect of clonidine on epidural analgesia. ASRA: May, 2008.
48. Bolka J, Lesley MR, Hurley RW, Adams M, **Wu CL**. Meta-analysis of the analgesic effect of pregabalin on chronic pain. ASRA: May, 2008.
49. Lehrer I, Tadel M, Kumar K, **Wu CL**. Acute compartment syndrome of lower extremity after surgery: can it be masked by postoperative analgesia? ASRA: May, 2008.
50. Eldeman A, Hang J, **Wu CL**. Assessment and prevention of fall risks after femoral nerve blocks in ambulatory surgical patients (*best abstract*). ASRA: May, 2008.
51. Newman G, Murphy J, Kim D, Lesley MR, Kong GJ, **Wu CL**. Meta-analysis of the effect of clonidine on labor epidural analgesia. SOAP: May, 2008.
52. Newman G, Murphy J, Lin EE, Kong GJ, **Wu CL**. Meta-analysis of ondansetron versus placebo for the prevention and treatment of opioid-induced pruritis in obstetric patients. SOAP: May, 2008.
53. LacKamp A, Brown C, Ko P, **Wu CL**. Analgesic efficacy of lumbar plexus block after hip arthroplasty. ASRA: May 2009.
54. Brown C, Togioka B, Khalil C, Mathur V, **Wu CL**. Analgesic efficacy of NSIADs after Cesarean section. ASRA: May 2009.
55. Kong B, Togioka B, Mathur V, Bravos ED, **Wu CL**. PCEA without background infusion vs. continuous epidural infusion for labor analgesia. ASRA: May 2009.
56. Kong B, Yan D, Bravos ED, Mathur V, **Wu CL**. The effect of background infusion for PCEA on labor analgesia. ASRA: May 2009.
57. Togioka BM, Liu SS, Hurley RW, Hanna MN, **Wu CL**. Quality of randomized controlled trials of postoperative epidural analgesia. ASRA: May 2009.
58. Lin EE, George JA, Hanna MN, Murphy JD, **Wu CL**. The effect of patient-controlled analgesia with and without background infusion on respiratory depression. ASRA: May 2009.

59. Yan D, Kong B, Mathur V, Bravos ED, **Wu CL**. Comparison of IV PCA tramadol to IV PCA opioids. ASRA: May 2009.
60. Sumida SM, Brown C, Bravos ED, Hanna MN, **Wu CL**. Meta-analysis of the effect of intraoperative adenosine infusion vs placebo on postoperative pain scores and opioid consumption. ASRA: May 2009.
61. Sumida SM, Togioka B, Murphy JD, Khalil C, **Wu CL**. Analgesic efficacy of intrawound infusion of local anesthetic after Cesarean section. ASRA: May, 2009.
62. Blaha KK, Murphy JD, Newman G, Vallera C, Hanna MN, **Wu CL**. PCEA vs. intermittent dosing for labor analgesia. SOAP: May 2009.
63. Newman G, Murphy JD, Khalil C, Blaha KK, Vallera C, **Wu CL**. Analgesic efficacy of intrawound infusion of local anesthetic after Cesarean section. SOAP: May, 2009.
64. Newman G, Murphy JD, Khalil C, Blaha KK, Vallera C, **Wu CL**. Analgesic efficacy of NSIADs after Cesarean section. SOAP: May 2009.
65. Bhala KK, Murphy JD, Newman G, Vallera C, Hanna MN, **Wu CL**. Meta-analysis of the efficacy of PCEA with background infusion vs. continuous infusion for labor analgesia. SOAP: May, 2009.
66. Newman G, Bhala KK, Murphy JD, Vallera C, Hanna MN, **Wu CL**. PCEA without background infusion vs continuous epidural infusion for labor analgesia. SOAP: May 2009.
67. Bhala KK, Murphy JD, Newman G, Vallera C, Hanna MN, **Wu CL**. The effect of background infusion for PCEA on labor analgesia: a systematic review. SOAP: May 2009.
68. Haller G, Myles PS, Taffé P, Perneger T, **Wu CL**. Increase in the Rate of Undesirable Events at the Beginning of the Academic Year. ASA: October 2009.
69. Chenault K, Birmingham PK, **Wu CL**, Suresh S. Efficacy of postoperative epidural analgesia versus systemic opioids in children: a systematic meta-analysis. IARS: March, 2010.
70. Gelfand H, Lesley M, Ko P, Eng C, **Wu CL**. An updated meta-analysis of ultrasound-guided nerve blocks. ASRA: April, 2010.
71. Wingate J, Bravos ED, Eng C, Kumar K, **Wu CL**. Air versus saline and analgesic efficacy for labor. ASRA: April, 2010.
72. Kong G, Bravos ED, Eng C, Mathur V, **Wu CL**. Meta-analysis of the efficacy of transversus abdominis plane block after abdominal surgery. ASRA: April, 2010
73. Gelfand H, Bicket M, Mathur V, Kumar K, **Wu CL**. Analgesic efficacy of intravenous naloxone for the treatment of postoperative pruritus. ASRA: April, 2010.
74. Sumida S, Grunseich C, Mathur V, M Eng C, **Wu CL**. Survey of skin preparation technique during neuraxial procedures. ASRA: April, 2010.
75. Gelfand H, Bravos ED, Mathur V, Kumar K, **Wu CL**. Meta-analysis of the efficacy of epidural naloxone in decreasing postoperative pruritus and PONV. ASRA: April, 2010.
76. Flagg A, Deng C, Kumar K, Eng C, **Wu CL**. Systematic review of direct costs comparing regional to local or general anesthesia. ASRA: April, 2010.
77. Gelfand H, Horng FA, Murphy JD, Newman G, Vallera C, **Wu CL**. Air versus saline and analgesic efficacy for labor. SOAP: May, 2010.
78. Horng FA, Sumida SM, Grunseich C, Murphy JD, Newman G, **Wu CL**. Survey of skin preparation technique during neuraxial procedures. SOAP: May, 2010.
79. Togioka B, Murphy JD, Gelfand H, Newman G, Vallera C, **Wu CL**. Meta-analysis of the efficacy of epidural naloxone in decreasing postoperative pruritus and PONV. SOAP: May, 2010.
80. Togioka B, Bicket M, Murphy JD, Newman G, Vallera C, **Wu CL**. Analgesic efficacy of intravenous naloxone for the treatment of postoperative pruritus. SOAP: May, 2010.
81. Gelfand H, Murphy JD, Horng FA, Newman G, Vallera C, **Wu CL**. Meta-analysis of the efficacy of transversus abdominis plane block after abdominal surgery. SOAP: May, 2010.
82. Murphy J, Ouanes JP, Sumida S, Togioka B, Isaac G, **Wu CL**. Injection of fluid into the epidural space prior to epidural catheter insertion: a meta-analysis. SOAP: April, 2011.
83. Tsang JG, Togioka B, **Wu CL**. Review of regional anesthesia literature from 1992-2010. ASRA: May, 2011.
84. Togioka B, Sumida S, Kumar K, Ouanes JP, Mon K, Tsang JG, **Wu CL**. Efficacy of pregabalin for treatment of postoperative pain: a meta-analysis. ASRA: May, 2011.
85. Hurley RW, Zhao K, Murphy JD, Ko P, Sumida S, Pronovost P, **Wu CL**. Examination of Medline publications from academic anesthesiologists in the United States from 2006-2008. ASRA: May, 2011.
86. Kong G, Tsang JG, Togioka B, Kumar K, Ouanes JP, **Wu CL**. Analgesic efficacy of intravenous magnesium: a meta-analysis. ASRA: May, 2011.

87. Mon K, Murphy J, Sumida S, Togioka B, Ouanes JP, **Wu CL**. Injection of fluid into the epidural space prior to epidural catheter insertion: a meta-analysis. ASRA: May, 2011.
88. Owens S, Manohar A, Cheung K, Stierer TS, **Wu CL**. Economic burden of unexpected days off incurred by patients and their caregivers following outpatient surgery. ASRA: May 2013.
89. Pandya P, **Wu CL**. Platelet transfusion in a patient with thrombocytopenia prior to epidural catheter removal. ASRA: May 2015.
90. Sathiyakumar A, Grant M, Page A, Samaha G, Hobson D, Wick E, Pawlik T. **Wu CL**. Epidural use in open hepatectomy: results from an enhanced recovery after surgery cohort. ASRA: April 2015.
91. Beckwith C, **Wu CL**. Recurrent postural headache due to possible CSF leak of unknown etiology treated successfully with repeat epidural blood patch. ASRA: April 2015.
92. Grant MC, Betz M, Hulse M, Hobson D, Wick EC, **Wu CL**. The effect of preoperative pregabalin on postoperative nausea and vomiting: a meta-analysis (best poster). ASRA: April 2016.
93. Zorrilla-Vaca A, Grant MC, Mathur V, Li J, **Wu CL**. The impact of neuraxial versus general anesthesia on the incidence of postoperative surgical site infections following knee or hip arthroplasty: a meta-analysis. ASRA: April 2016.
94. Stone AB, Grant MC, Page A, Garcia-Tomas V, **Wu CL**. Postoperative analgesia in pancreaticoduodenectomy: is epidural alone sufficient? ASRA: April 2016.
95. Stone AB, **Wu CL**, Wick E. A clinical rotation in enhanced recovery pathways and evidence based perioperative medicine for medical students. ASER: April 2016.
96. Fabrizio AC, Grant MC, Hobson D, Efron J, Gearhart S, Safar B, Fang S, **Wu C**, Wick E. Addressing readmissions associated with an enhanced recovery pathway for colorectal surgery. ASER; April 2016.
97. Richter H, **Wu C**. Epidural blood patch considerations in a patient with AML. ASRA: April 2017.
98. Ouanes JP, Stone A, Prasad R, Karkar A, **Wu C**, Grant M. The effect of gabapentin on postoperative pain and opioid consumption in the context of regional anesthesia: a meta-analysis. ASRA: April 2017.
99. He C, Li S, Stone A, Scott A, Hobson D, Wick E, **Wu C**, Grant M. Race and perioperative thoracic epidural analgesia use within an ERAS pathway for colorectal surgery. ASRA: April 2017.
100. Li S, He C, Zorrilla-Vaca A, **Wu C**, Grant M. The impact of spinal needle selection on post-dural puncture headache: a meta-analysis and meta-regression of randomized studies. ASRA: April 2017.

Grants/Funding

Primary Investigator

- 1996-99 Astra Pain Control, Protocol 96Ro97. "Ropivacaine for analgesia in patients undergoing elective laparotomy for partial colonic resection" \$30,000
- 1997-99 University of Rochester Anesthesiology Grant. "Comparison of PCEA versus PCA for pain management in patients with multiple rib fractures after MVA" \$25,000
- 2002 ASRA: Carl Koller Memorial Research Grant. "The effectiveness of postoperative epidural analgesia on patient-related outcomes: an analysis of the Medicare database" \$10,000
- 2004 Blaustein Pain Research Fund. "Effectiveness of postoperative epidural analgesia on patient outcomes" \$10,000

Co-investigator

- 1999-01 PO-1 HD33990 NIH. "Treatment of postamputation pain" (PI: Srinivasa N. Raja, MD) 15% FTE
- 2000-02 R01-NS41865.NIH. "The long-term impact of epidural analgesia on pain and recovery from major thoracotomy: (PI: Allan Gottschalk, MD, PhD)
- 2001 Blaustein Pain Research Fund. "The long-term impact of epidural analgesia on pain and recovery from major thoracotomy: a pilot study" (PI: Allan Gottschalk, MD, PhD)
- 2010 American Patient Safety Foundation. "Assessing cerebral blood flow autoregulation in the head-up versus supine position during general anesthesia and its relationship with postoperative neurocognitive changes and serum biomarkers of brain injury." (PI: Charles Hogue, MD)
- 2017 HHSP233201500020I/HHSP2337004T.AHRQ. "The Comprehensive Unit-base Safety Program (CUSP) for Enhanced Recovery After Surgery"

The purpose of this task order is to measurably improve patient outcomes by increasing the implementation of enhanced recovery after surgery (ERAS) practices in hospitals, through the use of an adaptation of CUSP. This is a ~\$15 million grant to develop and implement several ERAS pathways (colorectal, total knee arthroplasty, total hip arthroplasty, hip fracture, bariatric surgery, hysterectomy) through the American College of Surgeons and The Johns Hopkins Armstrong Institute for Patient Safety and Quality. I was the only/primary

anesthesiologist who developed the anesthesiology portions of each evidence-based ERAS pathway. (PI: Elizabeth Wick, MD) 10% FTE

Program Development

1993	Acute Pain Service: didactic series [Rochester]
1999-2001	Regional Anesthesia: clinical service and didactic series [Hopkins ACCM]
1999-2001	Acute Pain Service: clinical service and didactic series [Hopkins ACCM]
2001	Clinical CA-3 concentration in Regional Anesthesia [Hopkins ACCM]
2001	Evidence-based Resident Journal Club [Hopkins ACCM]
2002	Chronic Pain: resident didactic series (with Paul Christo, MD) [Hopkins ACCM]
2002	Core Didactic Curriculum (Coordinator) [Hopkins ACCM]
2002	Obstetric Anesthesia: resident didactic series (with Don Penning, MD) [Hopkins ACCM]
2002	Resident Career Development Series and Curriculum [Hopkins ACCM]
2003	Obstetric Anesthesia - Regional Anesthesia Health Services Research Fellowship (co-developer with Don Penning, MD) [Hopkins ACCM]
2003	Evidence-based Medicine Didactic Series (co-developer with Sean Berenholtz, MD, Elizabeth Hunt, MD, Peter Pronovost, MD, PhD) [Hopkins ACCM]
2004	Classic articles: didactic series (co-developer with Rob Michaels, MD) [Hopkins ACCM]
2006	Research didactic curriculum (residents, fellows) [Hopkins ACCM]
2013	Anesthesiology ERAS colorectal pathway [Hopkins ACCM]
2014	Anesthesiology ERAS liver resection pathway [Hopkins ACCM]
2014	Anesthesiology ERAS breast surgery (non-flap) pathway (with Robert Thomsen, MD) [Hopkins ACCM]
2015	Anesthesiology ERAS radical cystectomy pathway [Hopkins ACCM]
2015	Anesthesiology ERAS GYN-ONC pathway [Hopkins ACCM]
2015	Anesthesiology Post-partum analgesic pathway [Hopkins ACCM]
2016	American College of Surgeons: Colorectal ERAS pathway [National/ACS]
2017	American College of Surgeons: Total Hip Replacement ERAS pathway [National/ACS]
2017	American College of Surgeons: Total Knee Replacement ERAS pathway [National/ACS]
2017	American College of Surgeons: Total Hip Fracture ERAS pathway [National/ACS]
2017	Anesthesiology ERAS HIPEC pathway (with Christy Gray, MD, PhD) [Hopkins ACCM]
2017	Anesthesiology ERAS transgender surgery pathway (with Kara Segna, MD) [Hopkins ACCM]

Invited Lectures

1. *Management of pain in the pediatric patient.* Department of Pediatrics; University of Rochester. Rochester, NY. November, 1992.
2. *Selecting an anesthesiology residency.* 48th PGA. New York, NY. December, 1994.
3. *Getting into a residency.* Albany Medical College. Albany, NY. March, 1995.
4. *New intravenous agents.* 13th CAN-AM Conference. Niagara-on-the-Lake, Canada. May, 1995.
5. *Serotonin antagonists.* Department of Anesthesiology; Highland Hospital. Rochester, NY. October, 1995.
6. *Current status of anesthesiology residencies.* 50th PGA. New York, NY. December, 1996.
7. *Risks and benefits of regional anesthesia.* Department of Anesthesiology; St. James Hospital. Hornell, NY. April, 1997.
8. *Postoperative nausea and vomiting.* Department of Anesthesiology; Highland Hospital. Rochester, NY. April, 1997.
9. *A career in anesthesiology.* AMSA 48th Annual Meeting. Washington, DC. March, 1998.
10. *Controversies in acute pain management.* 5th Annual Pain Medicine Update. Baltimore, MD. August, 1999.
11. *Pain in hospitalized patients.* Department of Medicine; Johns Hopkins Hospital, Baltimore, MD. January, 2000.
12. *Issues in postoperative pain management.* AAPM 16th Annual Conference. New Orleans, LA. February, 2000.
13. *Regional anesthesia and anticoagulation.* 6th Annual Pain Medicine Update. Baltimore, MD. August, 2000.
14. *Benefits of regional anesthesia.* 6th Annual Pain Medicine Update. Baltimore, MD. August, 2000.
15. *Outcomes research and regional analgesia.* Blaustein Pain Conference. Baltimore, MD. October, 2000.
16. *Update in acute pain management.* AAPM 17th Annual Conference. Ft Lauderdale, FL. February, 2001.

17. *Outcomes research: effect of postoperative regional analgesia.* The Johns Hopkins Medical and Surgical Association. Baltimore, MD. June, 2001.
18. *Review of acute pain management.* Southern Pain Society. Baltimore, MD. August, 2001.
19. *Regional anesthesia and anticoagulation.* Franklin Square Hospital. Baltimore, MD. September, 2001.
20. *Outcomes of regional anesthesia.* Regional Anesthesia Symposium. Baltimore, MD. November, 2001.
21. *Perioperative neuraxial anesthesia and patient outcomes.* Department of Anesthesiology; Western Pennsylvania Hospital. Pittsburgh, PA. February, 2002.
22. *Outcomes research and regional anesthesia.* Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. New York, NY. March, 2002.
23. *Perioperative regional anesthesia on outcomes.* Department of Anesthesiology; Walter Reed Medical Center. Bethesda, MD. April, 2002.
24. *Regional anesthesia and postoperative analgesia.* ASRA 27th Annual Meeting. Chicago, IL. April, 2002.
25. *Patient-controlled analgesia: outcomes and complications.* Department of Surgery; The Johns Hopkins Hospital, Baltimore, MD. June, 2002.
26. *Perioperative neuraxial anesthesia and patient-oriented outcomes.* Department of Anesthesiology; Greater Baltimore Medical Center. Baltimore, MD. October, 2002.
27. *Update in regional anesthesia.* Department of Anesthesiology; Anne Arundel Medical Center. Annapolis, MD. November, 2002.
27. *Neuraxial anesthesia and perioperative outcomes.* Department of Anesthesiology; Union Memorial Hospital. Baltimore, MD. February, 2003.
28. *Outcomes research and evidence-based medicine.* ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
29. *Designing clinical research.* ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
30. *Regional anesthesia and OR management: cost and efficiency.* ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
31. *Does regional anesthesia affect patient outcomes?* 7th Annual Regional Anesthesia Symposium. Hospital for Special Surgery/Weill Medical College of Cornell University. April, 2003.
32. *If you don't have an epidural pain service, do you need one?* 7th Annual Regional Anesthesia Symposium. Hospital for Special Surgery/Weill Medical College of Cornell University. April, 2003.
33. *Neuraxial anesthesia and patient outcomes.* 7th Annual North American Neuromodulation Society Meeting. Orlando, FL. May, 2003.
34. *The effect of neuraxial anesthesia on patient outcomes.* Department of Anesthesiology; University of Rochester. Rochester, NY. May, 2003.
35. *Update on anticoagulation and neuraxial anesthesia.* Department of Anesthesiology; University of Rochester. Rochester, NY. May, 2003.
36. *Update on postdural puncture headache.* 12th Annual Update on Obstetric Anesthesia. Baltimore, MD. September, 2003.
37. *Evidence-based medicine and regional anesthesia.* ASA Annual Meeting. San Francisco, CA. October, 2003.
38. *Postoperative analgesia: an update.* Department of Surgery; The Johns Hopkins Hospital. Baltimore, MD. January, 2004.
39. *Are our patients more satisfied?* ASRA 29th Annual Meeting. Orlando, FL. March, 2004.
40. *Regional anesthesia and patient satisfaction.* 10th Annual Pain Medicine Update. Baltimore, MD. August, 2003.
41. *Maternal satisfaction and neuraxial anesthesia-analgesia.* 13th Annual Update on Obstetric Anesthesia. Baltimore, MD. September, 2003.
42. *Newer therapies for postoperative pain management.* ASRA 30th Annual Meeting. Toronto, Canada. April, 2005.
43. *Update on the role of epidural analgesia on outcomes.* Department of Anesthesiology; University of Toronto; Toronto, Canada. April, 2005.
44. *Epidural techniques and outcomes: what is the evidence?* 24th Annual European Society of Regional Anaesthesia. Berlin, Germany. September, 2005.
45. *How to perform a meta-analysis.* 24th Annual European Society of Regional Anaesthesia. Berlin, Germany. September, 2005.
46. *Acute pain services: audits and outcomes.* 24th Annual European Society of Regional Anaesthesia. Berlin, Germany. September, 2005.

47. *The role of perioperative epidural analgesia on patient outcomes.* Department of Anesthesiology; The Hospital at the University of Pennsylvania. Philadelphia, PA. October, 2005.
48. *Use of the Medicare claims dataset to examine the effect of postoperative epidural analgesia on patient outcomes.* Blaustein Pain Conference. Baltimore, MD. November, 2005.
49. *Postoperative analgesia: what is the evidence?* 12th Annual Pain Medicine Update. Baltimore, MD. December, 2005.
50. *Regional anesthesia for lower extremity vascular surgery: amputation and revascularization.* ASRA 31st Annual Meeting. Palm Springs, CA. April, 2006.
51. *Beyond discharge: burden to the family.* SAMBA 21st Annual Meeting Washington, DC. May, 2006.
52. *Acute pain management: does it alter perioperative outcome?* ASA Annual Meeting. Chicago, IL. October, 2006.
53. *Outcome data on acute pain management-what does it show?* ASA Annual Meeting. Chicago, IL. October, 2006.
54. *Meta-analysis.* Department of Obstetrics and Gynecology; The Johns Hopkins Hospital, Baltimore, MD. January, 2007.
55. *Acute pain management and outcomes – what's new?* Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. New York, NY. March, 2007.
56. *Meta-analysis: the role in resident research.* IARS Annual Meeting. Orlando, FL. March, 2007.
57. *A career in academic anesthesiology.* ASRA 32st Annual Meeting. Vancouver, Canada. April, 2007.
58. *Chronic pain after surgery – can it be prevented?* ASRA 32st Annual Meeting. Vancouver, Canada. April, 2007.
59. *Use of regional anesthesia in ambulatory surgery and outcomes.* ASRA 32st Annual Meeting. Vancouver, Canada. April, 2007.
60. *Postoperative pain management and patient outcomes.* Department of Anesthesia; Stanford University. Palo Alto, CA. September, 2007.
61. *Acute pain management: does it alter perioperative outcome?* ASA Annual Meeting. San Francisco, CA. October, 2007.
62. *What do we really know about the benefits of nerve blocks?* ASA Annual Meeting. Orlando, FL. October, 2008.
63. *Outcomes good and bad: the benefits and complications of acute pain medicine.* ASA Annual Meeting. Orlando, FL. October, 2008.
64. *The non-analgesic benefits of regional anesthesia.* ASRA 34st Annual Meeting. Phoenix, AZ. April, 2009.
65. *Status of academic anesthesiology.* Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. April, 2010.
66. *Regional anesthesia and acute pain medicine – an evidence-based review and critical assessment of clinical outcomes.* ASRA 35th Annual Meeting. Toronto, Canada. April, 2010.
67. *Update on regional analgesia and patient outcomes.* Mercy Hospital. Baltimore, MD. May, 2010.
68. *Epidural anesthesia-analgesia and patient outcomes.* Department of Anesthesiology; University of Rochester Medical Center. Rochester, NY. August, 2010.
69. *An overview of epidural anesthesia-analgesia and patient outcomes.* Department of Anesthesiology; Dartmouth Medical Center. Lebanon, NH. October, 2010.
70. *Update on epidural analgesia.* Department of Anesthesia & Critical Care Medicine; Massachusetts General Hospital. Boston, MA. November, 2010.
71. *Epidural anesthesia-analgesia and patient outcomes.* Department of Anesthesiology, Perioperative and Pain Medicine; Brigham & Women's Hospital. Boston, MA. November, 2010.
72. *The effect of perioperative epidural analgesia on outcomes.* Department of Anesthesiology; University of Alabama. Birmingham, AL. March, 2011.
73. *Academic anesthesiology.* Department of Anesthesiology; University of Alabama. Birmingham, AL. March, 2011.
74. *Regional anesthesia and perioperative outcomes.* Department of Anesthesiology; University of Vermont. Burlington, VT. September, 2011.
75. *Evidence-based review of the effects of regional anesthesia on cancer recurrence and surgical site infection.* ASRA 37th Annual Meeting. San Diego, CA. March, 2012.
76. *Epidural analgesia and outcomes.* Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. New York, NY. April, 2012.
77. *Regional anesthesia and cancer recurrence.* Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. New York, NY. April, 2012.

78. *Evidence on ultrasound-guided lower extremity nerve blocks*. ASA Annual Meeting. Washington, DC. October, 2012.
79. *ASA/APS/VA-DoD/ASRA Postoperative Pain Guidelines: Methodology*. ASA Annual Meeting. Washington, DC. October, 2012.
80. *Infection/inflammation and regional anesthesia-analgesia*. ASRA 36th Annual Meeting. Boston, MA. May, 2013.
81. *Weekends and mortality*. Department of Anesthesiology; Weill Medical College of Cornell University. New York, NY. December, 2013.
82. *Epidural anesthesia and outcomes: a perspective*. Department of Anesthesiology; University of Virginia. Charlottesville, VA. February, 2014.
83. *Studying outcomes and epidural anesthesia*. Department of Anesthesiology; Washington University; St Louis, MO. April, 2014
84. *Weekends and mortality*. Department of Anesthesiology; Washington University; St Louis, MO. April, 2014.
85. *ERAS and thoracic epidural. Is analgesia all we want?* 41st Argentine Congress of Anesthesiology. Buenos Aires, Argentina. August, 2014.
86. *ERAS and opioid-free analgesia*. 41st Argentine Congress of Anesthesiology. Buenos Aires, Argentina. August, 2014.
87. *Enhanced recovery after surgery (ERAS) and postoperative pain control*. Pain Day Symposium. The Johns Hopkins University. Baltimore, MD. September, 2014.
88. *Managing acute pain in the chronic pain patient*. ASRA 40th Annual Meeting. Las Vegas, NV. May, 2015. ASRA 40th Annual Meeting. Las Vegas, NV. May, 2015.
89. *Prescription opioid crisis: how can clinicians decrease the morbidity and mortality associated with prescription opioids?* ASRA 40th Annual Meeting. Las Vegas, NV. May, 2015.
90. *Innovative strategies to prevent readmission for acute pain*. ASRA 40th Annual Meeting. Las Vegas, NV. May, 2015.
91. *Enhanced recovery after surgery: strategies*. Pain Day Symposium. The Johns Hopkins University. Baltimore, MD. September, 2015.
92. *Enhanced recovery after surgery*. Washington Hospital Center. Washington, DC. October, 2015.
93. *Epidural anesthesia/analgesia and patient outcomes*. California Society of Anesthesiologists. November, 2015. Kauai, HI.
94. *An introduction to Enhanced recovery after surgery (ERAS)*. California Society of Anesthesiologists. November, 2015. Kauai, HI.
95. *A review of postdural puncture headaches*. California Society of Anesthesiologists. November, 2015. Kauai, HI.
96. *Anticoagulation and regional anesthesia/analgesia: an update*. California Society of Anesthesiologists. November, 2015. Kauai, HI.
97. *Show me the evidence: how strong is the evidence for" on epidurals, PVBs and TAP blocks*. Annual Congress of Enhanced Recovery and Perioperative Medicine. April, 2016. Washington, DC.
98. *Role of regional anesthesia within ERAS protocols*. ASRA 41th Annual Meeting. New Orleans, LA. April, 2016.
99. *The opioid-tolerant patient for revision thoraco-lumbar fusion*. ASRA 41th Annual Meeting. New Orleans, LA. April, 2016.
100. *Postdural puncture headache*. Department of Anesthesiology. Rutgers New Jersey Medical School. Newark, NJ. May, 2016.
101. *Enhanced recovery after surgery*. Department of Anesthesiology. Rutgers New Jersey Medical School. Newark, NJ. May, 2016.
102. *Role of the anesthesiologist in enhanced recovery after surgery*. MASA Annual Conference. Washington, DC. May, 2016.
103. *Role of ERAS in anesthesia*. Department of Anesthesiology. Westchester Medical Center. Vahalla, NY. September, 2016.
104. *Enhanced recovery after surgery – update*. Department of Anesthesiology. Northwestern University. Chicago, IL. October, 2016.
105. *Prehabilitation and enhanced recovery: intra-operative fluid management and postoperative outcomes*. American College of Surgeons Clinical Congress 2016. Washington, DC. October, 2016.
106. *Enhanced recovery after surgery*. Department of Anesthesiology; Hospital for Special Surgery/Weill Medical College of Cornell University. December, 2016.

107. *ERAS: practical advice for the acute pain physician*. ASRA 42th Annual Meeting. San Francisco, CA. April, 2017.
108. *Opioid alternatives/neuromodulators for acute and persistent postoperative pain*. ASRA 42th Annual Meeting. San Francisco, CA. April, 2017.
109. *Managing failures in regional anesthesia and acute pain/PCA's: causes and strategies*. ASRA 42th Annual Meeting. San Francisco, CA. April, 2017.
110. *ERAS and multimodal analgesia*. Department of Plastic Surgery; The Johns Hopkins School of Medicine; Baltimore, MD. April, 2017
111. *The weekend effect*. Department of Anesthesiology; Virginia Mason Clinic; Seattle, WA. May, 2017.
112. *Enhanced recovery after surgery*. Department of Anesthesiology; Virginia Mason Clinic; Seattle, WA. May, 2017.
113. *The weekend effect*. Department of Anesthesiology; Westchester Medical Center. Vahalla, NY. September, 2017.
114. *Enhanced recovery after surgery (ERAS) and multimodal analgesia [non-CME]*. ASA, Boston, MA. October, 2017.
115. *Can ERAS and multimodal analgesia also help address the opioid crisis [non-CME]?* ASA, Boston, MA. October, 2017.
116. *Multimodal analgesia in ERAS*. ISCR National Leader's Webinar. October, 2017.

Presentations

Department of Anesthesiology Grand Rounds:

- Pseudocholinesterase*: April, 1993
- Nerve injury after brachial plexus blocks*: October, 1993
- Epidural hematoma*: April, 1995
- Ondansetron and granisetron*: June, 1995
- Anticoagulation and regional anesthesia*: February, 1998
- Continuous extrapleural catheters*: March, 1999
- Regional anesthesia and outcomes*: May, 2000
- Study design and statistics*: May, 2003
- Local anesthetic toxicity*: October, 2003
- Enhanced recovery after surgery*: September, 2015

Resident Lectures:

- Anesthetic implications of endocrine diseases*: August, 1993
- Nerve blocks in the head and neck region*: December, 1993
- Safety devices in anesthesia machines*: June, 1994
- Neuraxial blocks and partial anticoagulation*: January, 1997
- Local anesthetic toxicity*: January, 1998
- Postdural puncture headache*: July, 1998
- Postoperative nausea and vomiting*: September, 1998
- Regional anesthesia and patient outcomes*: August, 1999
- Regional anesthesia and anticoagulation*: April, 2000
- Acute pain management*: February, 2001
- Written board review-regional anesthesia*: June, 2001
- High spinal*: August, 2001
- Oral board preparation*: October, 2001
- Regional vs. general anesthesia – a historical perspective*: January, 2002
- Cardiac arrest after regional anesthesia*: January, 2002
- Regional vs general anesthesia: a historic overview*: February, 2002
- Overview of acute pain management*: February, 2002
- Introduction to regional anesthesia*: August, 2002
- Overview of the epidural test dose*: August, 2002
- Regional anesthesia and patient-related outcomes*: August, 2002
- Regional anesthesia and anticoagulation: update*: August, 2002
- Update on anticoagulation and neuraxial regional anesthesia and analgesia*: November, 2002
- Study design and interpretation of regional vs general anesthesia studies*: December, 2002
- Pulmonary aspiration*: February, 2003
- Postoperative stroke*: October, 2003

Perioperative use of NSAIDs: February, 2004
The test dose in obstetric analgesia: March, 2004
Newer therapies for postoperative pain management: May, 2005
A career in academic anesthesiology: September, 2006; lecturer
Postdural puncture headache: March, 2007; lecturer
Lower extremity blocks: (annually from 1995-1999)
Complications of regional anesthesia: (annually from 1995-1999)
Postoperative neuropathies: (annually from 1995-1999)
Anesthetic management of the diabetic patient: (annually from 1996-1999)
Bier blocks and local anesthetic toxicity: (annually from 1995-1999)
Local anesthetics: (annually from 1996-present)
Upper and lower extremity nerve blocks: (annually from 1999-present)
Neurobiology of nociception: (annually from 2000-present)
Intravenous patient-controlled analgesia: (annually from 2000-present)
Adjuvant analgesic agents: (annually from 2000-present)
Postdural puncture headache: (annually from 2001-present)

Medical Student Lectures:

Postamputation pain: February, 2002
Introduction to airway management (annually from 1994-2003)
Evaluation of patients with acute and chronic pain (annually from 1994-1997)
Management of acute pain (annually from 1994-1997)
Selecting a residency (annually from 1993-1997)

Departmental, Hospital and Medical School Activities

The Johns Hopkins University

2016 - present	Associate Professor Mentoring Committee [Anesthesiology]
2014 - present	Director of Research, Division of Regional Anesthesia & Acute Pain Medicine [Anesthesiology]
2014 - present	Director: ERAS Anesthesiology [Anesthesiology]
2014 - 2017	Pain Task Force; Co-chair [Hospital]
2008 - 2014	Assistant Professor Promotion and Mentorship Committee [Anesthesiology]
2009 - 2014	Chair of Committee
2007 - 2014	Division Chief: Division of OB & Regional Anesthesia and Acute Pain [Anesthesiology]
2012 - 2013	Orthopaedic Chair search committee [University]
2003 - 2009	Obstetric Anesthesia Pain Management Coordinator [Anesthesiology]
2001 - 2008	Clinical Competence Committee [Anesthesiology]
1999 - 2008	Operating Room Coordinator [Anesthesiology]
1999 - 2008	Residency Education Committee [Anesthesiology]
2000 - 2005	Operating Room Triad Project [Hospital]
2001 - 2004	Director, Regional Anesthesia [Anesthesiology]
1999 - 2004	Quality Assurance [Anesthesiology]
2002 - 2003	PCA Safety Product Task Force [Hospital]
2001 - 2003	Billing Compliance Committee [Anesthesiology]
2001 - 2003	Patient-Controlled Analgesia Device Committee [Hospital]
2002	ACGME Clinical Competencies Subcommittee [Medical School]
2002	PCA Root Cause Task Force [Hospital]
2001 - 2002	Co-Director, Residency Program [Anesthesiology]
2001	Neurosurgery Postoperative Pain Task Force [Neurosurgery]
2001	ACCM Billing and Compliance Task Force [Anesthesiology]
2000	Postoperative Pain Management Clinical Track: Shoulder Surgery [Orthopedics]
2000 - 2001	Pain Management Task Force [Hospital]
1999 - 2001	Acute Pain Service; Director of Service [Anesthesiology]
1999 - 2001	Interdisciplinary Clinical Policy on Management of Anticoagulation and Epidural Analgesia in Adult Patients [Hospital]
1999 - 2000	Pharmaceutics & Therapeutics Sub-Committee [Hospital]
<i>University of Rochester</i>	
1993 - 1999	Acute Pain Service [Anesthesiology]

1998 - 1999	Associate Residency Program Director [Anesthesiology]
1992 - 1998	Chair, Resident Selection Committee [Anesthesiology]
1997 - 1998	Postoperative Pain Management Clinical Guidelines [Hospital]
1996 - 1998	Anesthesia Simulator Education Committee [Anesthesiology]
1996	Strategic Planning: Residency Program [Anesthesiology]
1994 - 1996	Kidney Transplant Committee [Hospital]
1994	Strategic Planning: Residency Recruitment [Anesthesiology]
1993 - 1994	Operating Room Committee [Hospital]
1992 - 1993	Residency Program Task Force [Anesthesiology]

Professional Activities

Editorial Board

Anesthesia & Analgesia (Associate Editor): 2016 - present
Clinical Journal of Pain: 2002 - present
J Opioid Management: 2013 - present
Regional Anesthesia and Pain Medicine: 2003 - 2006 (Associate Editor); 2006 - present (Editor); 2014 - present (Section Editor: systematic review and guidelines)
Anesthesiology: 2005 - 2011 (Associate Editor)
International Journal of Pain Medicine and Palliative Care: 1999 - 2006
Sphere [NYSSA]: 1994 - 1997

Ad hoc Reviewer

American Journal of Anesthesiology: 2001, 2002
Anesthesia & Analgesia: 2001, 2003 - present
Anesthesiology: 1999 - 2016
Br J Anaesth: 2008
CMAJ: 2008
Clinical Journal of Pain: 1999, 2001
Current Gene Therapy: 2003
International Journal of Obstetric Anesthesia: 2007-present
JAMA: 2004
Journal of Clinical Anesthesia: 1999 - present
Journal of Clinical Psychopharmacology: 2003
Journal of Laparoscopic & Advanced Surgical Techniques: 2003
Journal of Pain: 2002
Lancet: 2006, 2011
Neurology: 1999, 2000, 2002, 2004 - 2007
Pain: 2000, 2004, 2012, 2013, 2015
Quality and Safety in Health Care: 2005
Quality of Life Research: 2003
Regional Anesthesia and Pain Medicine: 2002 - present
Techniques in Regional Anesthesia & Pain Medicine: 2003
Urology: 2001 - 2011

Guest Editor

Techniques in Regional Anesthesia & Pain Medicine: 2003

Committees/Task Force

ASRA Committee on Communications (2005 - 2013)
ASRA Patient Information Task Force, Chair (2005 - 2008)
ASA Task Force (guideline) on Respiratory Depression and Neuraxial Opioids (2004-2007)
ASA Task Force (guideline) on Infections and Neuraxial Techniques (2008-present)
American Society of Regional Anesthesia: Research Committee (2004-2009)
New York State Society of Anesthesiologists: Committee on Medical Student Guests (1993-1997)
American Society of Regional Anesthesia: Program Committee (2003, 2005, 2007-2010)
American Society of Regional Anesthesia: Award Committee (2005)
ASA Committee on Regional Anesthesia (2003 - 2005)
ASRA: Program Chair (2011)
APS/ASA/VaDoD Committee/Clinical guidelines for postoperative pain management (2010-2014)

Workshops/Panel Discussions

Upper and lower extremities blocks. 6th Annual Pain Medicine Update. Baltimore, MD. August, 2000.
Upper extremity blockade. Regional Anesthesia Symposium. Baltimore, MD. November, 2001.
Regional anesthesia and postoperative analgesia. ASRA 27th Annual Meeting. Chicago, IL. April, 2002.
Lower extremity blocks. ASRA 27th Annual Meeting. Chicago, IL. April, 2002.
Postoperative oral anticoagulation. ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
Developing a regional anesthesia program. ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
Thoracic epidural anesthesia and analgesia. ASRA 29th Annual Meeting. Orlando. March, 2004.
Critical appraisal of regional anesthesia/analgesia and outcome. ASRA 29th Annual Meeting. Orlando. March, 2004.
CABG and neuraxial anesthesia/analgesia. ASRA 30th Annual Meeting. Toronto, Canada. April, 2005.
Neuraxial anesthesia. ASA Annual Meeting. Atlanta, GA. October, 2005.
Neuraxial anesthesia. ASA Annual Meeting. Chicago, IL. October, 2006.
Upper extremity block: intensive workshop. ASRA 33th Annual Meeting. Cancun, Mexico. May, 2008.
Upper extremity block: intensive workshop. ASRA 34th Annual Meeting. Phoenix, AZ. May, 2009.
Upper extremity block: intensive workshop. ASRA 35th Annual Meeting. Toronto, Canada. April, 2010.
Upper extremity block: intensive workshop. ASRA 36th Annual Meeting. Las Vegas, NV. May, 2011.
Upper extremity block: intensive workshop. ASRA 37th Annual Meeting. San Diego, CA. March, 2012.
Multimodal postoperative analgesia (PBDL). ASRA 38th Annual Meeting. Boston, MA. May, 2013.
Upper extremity block: intensive workshop. ASRA 38th Annual Meeting. Boston, MA. May, 2013.
Blocks for knee and ankle surgery: fascia iliaca, femoral, saphenous/adductor canal, and sciatic lateral popliteal. ASRA 40th Annual Meeting. Las Vegas, NV. May, 2015.

Session/Panel Chair

Regional anesthesia. 6th Annual Pain Medicine Update. Baltimore, MD. August, 2000.
Regional anesthesia. 9th Annual Pain Medicine Update. Baltimore, MD. August, 2003.
Outcomes and regional anesthesia. ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
Economics and regional anesthesia. ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
Problem-based learning sessions. ASRA 28th Annual Meeting. San Diego, CA. April, 2003.
Regional anesthesia. 7th N. American Neuromodulation Society Meeting. Orlando, FL. May, 2003.
Evidence-based medicine. ASA Annual Meeting. San Francisco, CA. October, 2003.
Evidence-based best practices. ASRA 29th Annual Meeting. Orlando. March, 2004.
Developments in pain management. ASRA 30th Annual Meeting. Toronto, Canada. April, 2005.
Regional techniques and outcome-what is the evidence? ESRA. Berlin, Germany. September, 2005.
Best practice protocols for specific surgical and management indications. ASRA 31st Annual Meeting. Palm Springs, CA. April, 2006.
Regional anesthesia for ambulatory surgery. ASRA 32st Annual Meeting. Vancouver, Canada. April 2007; session chair.

CME courses

10th Annual Pain Medicine Update. Baltimore, MD. August, 2003. Co-director: Peter Staats, MD.

Certifications:

American Board of Anesthesiology: 1994

Licenses:

Maryland State: MD045598 (exp 9/30/2019)
 Maryland State CDS: M46243 (exp (3/31/2019)
 New York State: 183194 (exp 9/30/2019)
 DEA: BW3551707 (exp 5/31/2020)