

# November 19, 2021 Meeting Materials

## Health Technology Clinical Committee

---

Use of Cardiac Magnetic Resonance Angiography (CMRA) in adults and children

### Contents

- HTCC Clinical Expert information
- Agency Medical Director presentation
- Scheduled Public Comments presenters and presentations
- CMRA evidence presentation
- HTCC Decision Aid
- CMRA Final Key Questions

**CURRICULUM VITAE**  
**JAMES N. KIRKPATRICK, MD**  
1959 NE Pacific St  
Box 356422  
Seattle, WA 98195

**February, 2021**

**1. PERSONAL DATA**

Citizenship: USA  
Place of Birth: Seattle, WA

**2. EDUCATION**

1989-1993 Bachelor of Arts in Politics, cum laude, Pomona College, Claremont, CA  
1994 -1998 M.D. in Internal Medicine, Loma Linda University School of Medicine, Loma Linda, CA

**3. POSTGRADUATE TRAINING**

1998-1999 Intern, Categorical Internal Medicine, Yale New Haven Hospital  
1999-2001 Resident, Categorical Internal Medicine, Yale New Haven Hospital  
2001-2002 Fellow, Clinical Medical Ethics, MacLean Center for Clinical Medical Ethics, University of Chicago  
2001-2002 Human Subject Protection/Biostatistics and Quantitative Methods, National Institutes of Health (Fulfills NIH criteria for principal investigator training in human subject protection), University of Chicago  
2002-2003 Research Fellow, Echocardiography, University of Chicago  
2003-2006 Fellow, Cardiovascular Disease, University of Chicago  
2004-2005 Chief Cardiology Fellow, University of Chicago  
2006 Level III Echocardiography Training, University of Chicago

**4. FACULTY POSITIONS HELD**

2006-2014 Assistant Professor, Department of Medicine, Cardiovascular Division at the Hospital of the University of Pennsylvania, University of Pennsylvania School of Medicine, Philadelphia, PA  
2014-2015 Associate Professor, Department of Medicine, Cardiovascular Division at the Hospital of the University of Pennsylvania, University of Pennsylvania School of Medicine, Philadelphia, PA  
2013-2014 Assistant Professor, Department of Medical Ethics and Health Policy, University of Pennsylvania School of Medicine (Secondary), Philadelphia, PA  
2014-2015 Associate Professor, Department of Medical Ethics and Health Policy, University of Pennsylvania School of Medicine (Secondary), Philadelphia, PA  
2015-present Associate Professor, Department of Medicine, Division of Cardiology, University of Washington School of Medicine, Seattle, WA  
2018-present Section Chief, Cardiac Imaging, University of Washington Department of Medicine, Division of Cardiology, Seattle, WA  
2019-present Professor, Department of Medicine, Division of Cardiology, University of Washington School of Medicine, Seattle, WA  
2019-present Adjunct Professor, Department of Bioethics and Humanities, University of Washington School of Medicine, Seattle, WA

**5. HOSPITAL POSITIONS HELD**

2001-2006 Staff Internist, Lawndale Christian Health Center, Chicago, IL

2013-2015	Interim Associate Director of the Echocardiography Laboratory and Program, Hospital of the University of Pennsylvania, Philadelphia, PA
2013-2015	Physician co-Chair, Ethics Committee, Hospital of the University of Pennsylvania, University of Pennsylvania, Philadelphia, PA
2015-present	Director of Echocardiography, University of Washington Medical Center
2015-present	Ethics Consultant, Ethics Consultation Service, University of Washington Medical Center, Seattle, WA
2016-present	Chair, Ethics Committee, University of Washington Medical Center, Seattle, WA
2020-2021	D1 Governance Committee, Division of Cardiology

## 6. CURRENT EMPLOYMENT FOR WWAMI FACULTY- NONE

## 7. HONORS

1993	John Veig Memorial Prize for Academic Distinction (Government), Pomona College
1993	Graduate Cum Laude, Pomona College
1993	Distinction in Final Project, Pomona College
1995	Appleton and Lange Academic Medical Student Aware, Loma Linda University School of Medicine
1996	Honors in Psychiatry, Loma Linda University School of Medicine
1996	Honors in Pathophysiology, Loma Linda University School of Medicine
1997	Honors in Internal Medicine, Loma Linda University School of Medicine
1998	President's Award, Class of 1998, Loma Linda University School of Medicine
1998	Alpha Omega Alpha Medical Honor Society, Loma Linda University School of Medicine
1998	Harold J. Hoxie Award, Department of Medicine, Loma Linda University School of Medicine
2002	American Heart Association Fellows Travel Award for Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke
2009	Faculty Teaching Award, Cardiovascular Division, Department of Medicine, University of Pennsylvania
2010	Paper selected as one of the must-read papers in non-invasive cardiac imaging by editorial team at ThePreparedMinds.com for April, 2010.
2013	Certificate of Reviewing Excellence presented by Elsevier for Journal of the American Society of Echocardiography peer reviews.
2016-2019	American Society of Echocardiography Board of Directors
2017	Grace Marie Kaylor Endowed Award in Cardiology, Division of Cardiology, University of Washington
2017	Names to list of Top 27 Cardiologists Honor Roll—Forbes Magazine-Grand Rounds
2020-2023	Chair, American College of Cardiology Geriatrics Section
2021-2022	Chair Elect, American College of Cardiology Ethics Board
2020-2022	American Society of Echocardiography Foundation Board of Directors
2019	Vietnam Heart Institute Appreciation Award

## 8. BOARD CERTIFICATION

2006, 2019	National Board of Echocardiography--adult comprehensive echocardiography, level III certification
2006, 2016	American Board of Internal Medicine (Cardiovascular Diseases)

2011 American Board of Internal Medicine (Internal Medicine)

## 9. LICENSURE

2001-2008 State of Illinois Medical License #: 036104485  
 2006-present State of Pennsylvania Medical License #: MD429897  
 2015-present State of Washington Medical License #: MD60589898

## 10. DIVERSITY, EQUITY AND INCLUSION

EDI Committee—University of Washington Division of Cardiology

## 11. PROFESSIONAL ORGANIZATIONS

1998-2006 Member, American Medical Association  
 2001-present Member, American Society of Bioethics and Humanities  
 2002-present Member, American Society of Echocardiography  
 2008-present Fellow, American Society of Echocardiography  
 2003-present Member, American College of Cardiology  
 2010-present Fellow, American College of Cardiology  
 2003-2016 Member, American Heart Association  
 2011-2018 Member, Heart Failure Society of America

## 12. TEACHING RESPONSIBILITIES

Spring 2002 Course Director. Oak Forest Hospital and MacLean Center for Clinical Medical Ethics at the University of Chicago Conference on Spirituality and Healthcare, Oak Forest Hospital, Chicago, IL, 2002.  
 Mar, 2012 Course Director for Ethics of the Heart II: Ethical and Policy Challenges in Pediatric and Adult Congenital Heart Disease. The Penn Cardiovascular Institute and the Center for Bioethics. Friday - Saturday March 16-17, 2012 Perelman School of Medicine at the University of Pennsylvania and the Cardiac Center at Children's, Hospital of Philadelphia. Philadelphia, PA  
 Oct, 2010 Course Director, Ethics of the Heart I: Ethics and Policy Challenges in the Treatment of Advanced Heart Failure. October 8-9, 2010, Class of 1949 Auditorium, Houston Hall University of Pennsylvania Philadelphia, PA

### A. Fellows and Post-Doctoral Fellows in Laboratory

2006-2009 Research Mentor, University of Pennsylvania Bioethics Masters Students (Todd Mendelson, Christina Papini, David Wolfe)  
 2007-2015 Echocardiography Research Mentor, Cardiovascular Division of Medicine/University of Pennsylvania School of Medicine: Fellows (Steven Farmer, Bonnie Ky, Jeffrey Testani, Elad Anter, Abby Khan, Amresh Raina, Hansie Mathelier, Vinay Kini, Dawn Pedrotty), Residents (Jeffrey Ogbara, Anjali Fields, Vinay Kini, Harish Seetha Rammohan), Medical students (Amit Khera, Sachin Logani, Jennifer Chen)  
 2008-2015 Cardioethics Research Mentor, Cardiovascular Division of Medicine/University of Pennsylvania School of Medicine: Fellows (Steven Farmer, Abby Khan, Anjali Fields), Residents (Sarah Hull, Sachin Logani, Anjali Fields, Esther Pak), Public Health School Student (Karthik Kota)  
 2009 Faculty Liaison, Narrative Professionalism workshops for Cardiovascular Fellowship program

- 2015-present Faculty Research Mentor, internal medicine resident, University of Washington (Pranothi Hiremath, Chinoso Opara)
- 2015-present Faculty Research Mentor, cardiology fellows, University of Washington (Selma Carlson, Kathleen Kearney, Shalin Patel, Tiffany Chen, James Lee, Hans Huang, Amy Cheney, Jill Steiner, Vidang Nguyen, Andrew Harris, Minnu Mudigonda, Michael Morcos)
- 2017-present Faculty Research Mentor, palliative care T32 fellows, University of Washington (Jill Steiner, Gwen Bernacki)
- 2020-present Faculty Review Paper Mentor, cardiology fellows, University of Washington (Fitz Medhane and Tomio Tran)

#### B. Medical Students

- 2006-2015 Preceptor, Cardiology Module, Curriculum 2000 (MOD200C) University of Pennsylvania School of Medicine
- 2007-2015 Small Group Preceptor, MD301-600: Doctor-Patient Relationship: Culture and Communication, University of Pennsylvania School of Medicine
- 2008-2015 Small Group Preceptor, FR601: Bioethics and Professionalism and Respect for Persons, University of Pennsylvania School of Medicine
- 2008-2015 Small Group Preceptor, MD610: Ethics of Human Subjects Research, University of Pennsylvania School of Medicine
- 2009-2010 Faculty Mentor, 4th year University of Pennsylvania medical student research project. (Alexander Ende)
- 2012 Research Mentor, National Heart Lung and Blood Institute Summer Medical Student Short Term Research Program. (Penn Med first year student Arjeme Cave Committee, University of Washington Medical Center)

### 13. RESEARCH FUNDING

#### Current:

- 8/18-6/21 Sponsor: NIH R34 HL143279  
Title: "Role of Statins in Slowing Rheumatic Heart Disease (RHD) Progression: A Feasibility Study for a Randomized Controlled Trial"  
Total Costs: \$546,527  
PI: Nona Sododhenia  
Role: Co-Investigator
- 4/20-3/21 NHLBI: 2T32HL125195-06  
"Palliative Care Research Training Grant"  
Total Costs: \$392,985  
PI: J. Randall Curtis  
Role: Mentor
- 5/20-4/21 Sponsor: University of Nairobi UON-1R21TW011460-01  
Title: "Subclinical cardiac dysfunction after hypertensive disorders in pregnancy"  
Total Costs: \$119,428  
PI: Carey Farquhar  
Role: Co-Investigator

- 7/20-4/25 Sponsor: NIDDK 1 R01 DK 121800-01A1  
“Kidney Injury in Patients with Acute Decompensated Heart Failure”  
Total Costs: \$564,633  
PI: Nisha Bansal  
Role: Co-Investigator
- 9/20-5/21 Sponsor NIH 1D43TW011596-01  
“Building Capacity”  
Total Costs: \$239,421  
PI: Annette Fitzpatrick  
Role: Mentor
- Past:**
- 7/2002-7/2003 Sponsor: American Society of Echocardiography Foundation  
Title: Use of Hand Carried Ultrasound to Screen for Clinically Important  
Cardiac Disease in an Underserved Population  
Total Costs: \$25,000/annual direct costs, 50% effort  
PI: Kirk T. Spencer, MD, PI  
Role: Research Fellow
- 1/2011-12/2012 Sponsor: Greenwall Foundation  
Title: Caregiver And Left Ventricular Assist Devices As Destination Therapy  
For End Stage Heart Failure: A Pilot Study Of A Journey  
Total Costs: \$52,223/annual direct costs, 7% effort  
Role: PI
- 7/2011-5/2012 Sponsor: Mount Sinai Medical Center  
Title: Promoting Independence Through Pain And Symptom Management,  
0254-7892-4609  
Total Costs: \$0/annual direct costs  
Role: PI
- 8/2011-7/2015 Sponsor: National Heart, Lung, And Blood Institute/NIH/DHHS  
Title: Implementation of Cardiopulmonary Resuscitation Training For At-Risk  
Families  
Total Costs: \$346,363/annual direct costs. Advisory members do not receive  
effort as part of the committee  
PI: Benjamin S. Abella  
Role: Advisory Member
- 3/2012-2/2013 Sponsor: National Heart, Lung, And Blood Institute/NIH/DHHS  
Title: Ethics And Policy Challenges In Pediatric And Adult Congenital Heart  
Disease, 1-R13-HL-112570-01  
Total Costs: \$15,000/annual direct costs  
Role: PI
- 4/2013-8/2015 Sponsor: NHLBI  
Title: Cardiac Surgical Techniques to treat ventricular and aortic  
remodeling, RFA-A-HL-13-017, 5UM1HL088957

Total Costs: \$11,842/annual direct costs, .6% effort, effort is 0.6 calendar months

PI: Michael Acker

Role: Site Co-PI

- 10/01/14-09/30/18 Sponsor: NASA. NNX14AN49G  
 Title: Biomarkers as Predictors of Resiliency and Susceptibility to Stress in Space Flight.  
 Total Costs: \$325,646  
 PI: Namni Goel  
 Role: Co-Investigator
- 7/2016-6/2019 Sponsor: Locke Charitable Research Grant, University of Washington.  
 Title: "Patient & Partner Intimacy in Patients with LVADs."  
 Total Costs: \$25,000  
 Role: PI
- 3/2019-3/2020 Sponsor: American College of Cardiology  
 Title: "Eliciting TAVR Perioperative Code Status"  
 Total Coasts: \$10,000  
 Role: Co-PI

## 14. BIBLIOGRAPHY

### 1. Publications in Refereed Journals

1. Sugeng L, **Kirkpatrick JN**, Lang RM, Bednarz JE, Decara JM, Lammertin G, Spencer KT. Biplane stress echocardiography using a prototype matrix-array transducer. *J Am Soc Echocardiogr.* 2003 Sep;16(9):937-941. PMID: 12931105
2. **Kirkpatrick JN**, Ring M, Lang, RM. Expanding the differential diagnosis of hemoptysis: mycotic aortic aneurysms. *Rev Cardiovasc Med.* 2003 Summer;4(3):180-183. PMID: 12949444
3. Spencer KT, Lang RM, **Kirkpatrick JN**, Mor-Avi V. Assessment of global and regional left ventricular diastolic function in hypertensive heart disease using automated border detection techniques. *J Am Soc Echocardiogr.* 2003 Oct; 20(7):673-681. PMID: 14536017
4. Spencer KT, Mor-Avi V, **Kirkpatrick JN**, Gorcsan J, Kimball TR, Monaghan MJ, Perez JE, Weinert L, Bednarz J, Edelman K, Glascock B, Hancock J, Baumann C, Lang RM. Normal values of left ventricular systolic and diastolic function derived from signal-averaged acoustic quantification waveforms: a multicenter study. *J Am Soc Echocardiogr.* 2003 Dec;16(12): 1244-1251. PMID: 14652603
5. **\*Kirkpatrick JN**, Wong T, Bednarz JE, Spencer KT, Sugeng L, Ward RP, DeCara JM, Weinert L, Krausz T, Lang RM. Differential diagnosis of cardiac masses using contrast echocardiographic perfusion imaging. *J Am Coll Cardiol.* 2004 Apr 21;43(8):1412-1419. PMID: 15093876
6. Spencer KT, **Kirkpatrick JN**, Mor-Avi V, Decara JM, Lang RM. Age Dependency Myocardial of the Tei Index of Myocardial Performance. *J Am Soc Echocardiogr.* 2004 Apr;17(4):350-352. PMID: 15044869
7. **Kirkpatrick JN**, Davis A, DeCara JM, Hong AE, Kurtz PL, Balasia B, Spencer KT. Hand-carried cardiac ultrasound as a tool to screen for important cardiovascular disease in an underserved minority health care clinic. *J Am Soc of Echocardiogr.* 2004May;17(5):399-403. PMID: 15122177

8. Kaldjian LC, Wu BJ, **Kirkpatrick JN**, Thomas-Geevarghese A, Vaughan-Sarrazin M. Medical house officers' attitudes toward vigorous analgesia, terminal sedation, and physician-assisted suicide. *Am J Hosp Palliat Care*. 2004 Sep-Oct;21(5):381-387. PMID: 15510576
9. **Kirkpatrick JN**, Mahowald MB. Golden rule reasoning in clinical medicine: Theoretical and empirical aspects. *J Clin Ethics*. 2004 Fall;15(3):250-260. PMID: 15630868
10. Everett ME, **Kirkpatrick JN**, Lang RM. Noncompaction of the myocardium complicated by coronary artery embolism. *J Am Soc Echocardiogr*. 2005 Feb;18(2):194-196. PMID: 15682061
11. DeCara JM, **Kirkpatrick JN**, Spencer KT, Ward RP, Kasza K, Furlong K, Lang RM. Use of hand-carried ultrasound devices to augment the accuracy of medical student bedside cardiac diagnoses. *J Am Soc Echocardiogr*. 2005 Mar;18(3):257-263. PMID: 15746716
12. **Kirkpatrick JN**, Nash K, Duffy TP. Well rounded. *Arch Intern Med*. 2005 May 28;165(6):613-616. PMID: 15795335
13. **Kirkpatrick JN**, Belka V, Furlong K, Balasia B, Jacobs LD, Corcoran M, Anderson AS, Pastoret A, Spencer KT. Effectiveness of echocardiographic imaging by nurses to identify left ventricular systolic dysfunction in high-risk patients. *Am J Cardiol*. 2005 May 15;95(10):1271-1272. PMID: 15878012
14. **Kirkpatrick JN**, Lang RM, Fedson SE, Anderson AS, Bednarz J, Spencer KT. Automated border detection on contrast enhanced echocardiographic images. *Int J Cardiol*. 2005 Aug;103(2):164-167. PMID: 16080975
15. Ward RP, Leeper NJ, **Kirkpatrick JN**, Lang RM, Sorrentino MJ, Williams KA. The effect of preoperative statin therapy on cardiovascular outcomes in patients undergoing infrainguinal vascular surgery. *Int J Cardiol*. 2005 Oct 10;104(3):264-268. PMID: 16186054
16. Ghani SN, **Kirkpatrick JN**, Spencer KT, Smith GL, Burke MC, Kim SS, Desai AD, Knight BP. Rapid assessment of left ventricular systolic function in a pacemaker clinic using a hand-carried ultrasound device. *J Interv Card Electrophysiol*. 2006 Jun;16(1):39-43. PMID: 17051437
17. Brennan JM, Ronan A, Goonewardena S, Blair JEA, Hammes M, Shah D, Vasaiwala S, **Kirkpatrick JN**, Spencer KT. Hand-carried ultrasound measurement of the inferior vena cava for assessment of intravascular volume status in the outpatient hemodialysis clinic. *Clin J Am Soc Nephrol*. 2006 Jul;1(4):749-753. PMID: 17699282
18. **Kirkpatrick JN**, Burke MC, Knight BP. Postmortem analysis and retrieval of implantable pacemakers and defibrillators. *N Engl J Med*. 2006 Apr 13;354(15):1649-1650. PMID: 16611964.
19. **Kirkpatrick JN**, Ghani SN, Burke MC, Knight BP. Postmortem interrogation and retrieval of implantable pacemakers and defibrillators: A Survey of Morticians and Patients. *J Cardiovasc Electrophysiol*. 2007 May;18(5):478-482. PMID: 17313530
20. Brennan JM, Blair JE, Goonewardena S, Ronan A, Shah D, Vasaiwala S, Brooks E, Levy A, **Kirkpatrick JN**, Spencer KT. A Comparison by Medicine Residents of Physical Examination versus Hand-carried Ultrasound for Estimation of Right Atrial Pressure. *Am J Cardiol*. 2007 Jun;99(11):1614-6. PMID: 17531592
21. Brennan JM, Blair JE, Goonewardena S, Ronan A, Shah D, Vasaiwala S, **Kirkpatrick JN**, Spencer KT. Reappraisal of the use of inferior vena cava for estimating right atrial pressure. *J Am Soc Echocardiogr*. 2007 Jul;20(7):857-861. PMID: 17617312
22. **Kirkpatrick JN**, Vannan MA, Narula J, Lang RM. Echocardiography in heart failure - Applications, utility, and new horizons. *J Am Col Cardiol*. 2007 Jul 31;50(5): 381-396. PMID: 17662389
23. **Kirkpatrick JN**, Guger CJ, Arnsdorf MF, Fedson SE. Advance directives in the cardiac care unit. *Am Heart J*. 2007 Sep;154(3): 477-481. PMID: 17719293



24. Glassberg H, **Kirkpatrick JN**, Ferrari VA: Imaging studies in patients with heart failure: current and evolving technologies. *Crit Care Med*. 2008 Jan;36(1 Suppl):S28-39. Doi: 10.1097/01.ccm.0000297163.25900.63. PMID: 18158474
25. Rahmouni HW, Ky, B, Plappert T, Duffy K, Wiegers SE, Ferrari VA, Keane MG, **Kirkpatrick JN**, Silvestry FE, St John Sutton M. Clinical Utility of Automated Assessment of Left Ventricular Ejection Fraction using Artificial Intelligence-assisted Border Detection. *Am Heart J*. 2008 Mar;155(3):562-570. Doi: 10.1016/j.ahj.2007.11.002. PMID: 18294497
26. **Kirkpatrick JN**, Ghani SN, Spencer KT. Hand carried echocardiography screening for LV systolic dysfunction in a pulmonary function laboratory. *Eur J Echocardiogr*. 2008 May;9(3):381-3. PMID: 17697799
27. **Kirkpatrick JN**, Keane MG. Future Potential of Echocardiography in Heart Failure. *Future Cardiol*. 2008 May;4(3):299-319. Doi: 10.2217/14796678.4.3.299. PMID: 19804334
28. **Kirkpatrick JN**, Knight BP. The management of implantable cardiac devices at the end of life. *Progress in Palliative Care* 16(5-6 ): 250-256, 2008.
29. **Kirkpatrick JN**, Ky B, Rahmouni HW, Chirinos JA, Farmer SA, Fields AV, Ogbara J, Eberman KM, Ferrari VA, Silvestry FE, Keane MG, Opatowsky AR, St John Sutton M, Wiegers SE. Application of Appropriateness Criteria in Outpatient Transthoracic Echocardiography. *J Am Soc Echocardiogr*. 2009 Jan; 22(1):53-59. Doi: 10.1016/j.echo.2008.10.020. PMID: 19131002. Presented at the American Society of Echocardiography Scientific Sessions, 2008.
30. Mark DG, Hayden GE, Ky B, Paszczuk A, Pugh M, Matthews S, Horan A, Gracias VH, **Kirkpatrick JN**, Dean AJ: Hand-carried echocardiography for assessment of left ventricular filling and ejection fraction in the surgical intensive care unit. *J Critl Care*. 2009 Sep;24(3):470e1-7. Doi: 10.1016/j.jcerc.2008.07.003. PMID: 19327304
31. Romero J, Romero A, **Kirkpatrick JN**, Lange DC, Eagle KA, Baman TS. Pacemaker Reuse in a 65-Year-Old Woman in the Philippines with Severe Medical Need. *Pacing Clin Electrophysiol*. 2010 Jan;33(1):e8-9. Doi: 10.1111/j. 1540-8159.2009.02557.x. PMID: 19793365
32. Farmer SA, **Kirkpatrick JN**, Heidenreich PA, Curtis JP, Wang YF, Groeneveld PW. Ethnic and racial disparities in cardiac resynchronization therapy. *Heart Rhythm*. 2009 Mar;6(3):325-31. Doi: 10.1016/j.hrthm.2008.12.018. PMID: 19251206
33. Chirinos JA, Segers P, Gupta AK, Swillens A, Rietzschel ER, De Buyzere ML, **Kirkpatrick JN**, Gillebert TC, Wang Y, Keane MG, Townsend R, Ferrari VA, Wiegers SE, St John Sutton M.. Time-varying myocardial stress and systolic pressure-stress relationship: role in myocardial-arterial coupling in hypertension. *Circulation* 2009 Jun 2;119(21):2798-807. doi: 10.1161/CIRCULATIONAHA.108.829366. PMID: 19451350
34. Stawicki SP, Braslow BM, Panebianco NL, **Kirkpatrick JN**, Gracias VH, Hayden GE, Dean AJ. Intensivist use of hand-carried ultrasonography to measure IVC collapsibility in estimating intravascular volume status: correlations with CVP. *J Am Coll Surg*. 2009 Jul;209(1):55-61. Doi: 10.1016/j.jamcollsurg.2009.02.062. PMID: 19651063.
35. Baman TS, Romero A, **Kirkpatrick JN**, Romero J, Lange DC, Sison EO, Tangco RV, Abelardo NS, Samson G, Grezlik R, Goldman EB, Oral H, Eagle KA. Safety and efficacy of pacemaker reuse in underdeveloped nations: a case series. *J Am Coll Cardiol*. 2009 Oct 13;54(16):1557-8. doi: 10.1016/j.jacc.2009.04.096. PMID: 19815129
36. Testani J, St John Sutton MG, **Kirkpatrick JN**: Venous congestion and worsening renal function. *J Am Coll Cardiol*. 2009 Aug 11;54(7):661. PMID: 19660699
37. Cottrell C, **Kirkpatrick JN**: Echocardiographic Strain Imaging and its Use in the Clinical Setting. *Expert Rev Cardiovasc Ther*. 2010 Jan;8(1):93-102. PMID: 20030024
38. Chirinos JA, Segers P, Raina A, Saif H, Swillens A, Gupta AK, Townsend R, Emmi AG Jr, **Kirkpatrick JN**, Keane MG, Ferrari VA, Wiegers SE, St John Sutton MG. Arterial Pulsatile Hemodynamic Load Induced by Isometric Exercise Strongly Predicts Left Ventricular Mass

- in Hypertension. *Am J Physiol Heart Circ Physiol*. 2010 Feb;298(2):H320-30. doi: 10.1152/ajpheart.00334.2009. PMID: 19966060
39. Testani JM, Khera AV, St. John Sutton MG, Keane MG, Wieggers SE, Shannon RP, **Kirkpatrick JN**. Effect of Right Ventricular Function and Venous Congestion on Cardio-Renal Interactions during the Treatment of Decompensated Heart Failure. *Am J Cardiol*. 2010 Feb 15;105(4):511-6. doi: 10.1016/j.amjcard.2009.10.020. PMID: 20152246
  40. Kini V, Logani S, Ky B, Chirinos JA, Ferrari VA, St. John Sutton MG, Wieggers, **Kirkpatrick JN**. Transthoracic and Transesophageal Echocardiography for the Indication of Suspected Infective Endocarditis: Vegetations, Blood Cultures and Imaging. *J Am Soc Echocardiogr*. 2010 Apr;23(4):396-402. doi: 10.1016/j.echo.2009. PMID: 201138467
  41. Testani JM, St John Sutton MG, Wieggers SE, Khera AV, Shannon RP, **Kirkpatrick JN**. Accuracy of noninvasively determined pulmonary artery systolic pressure. *Am J Cardiol*. 2010 Apr 15;105(8):1192-7. doi: 10.1016/j.amjcard.2009.11.048. PMID: 20381676
  42. Lau B, **Kirkpatrick JN**, Merchant RM, Perman SM, Abella BS, Gaieski DF, Becker LB, Chiamas C, Reitsma AM. Experiences of sudden cardiac arrest survivors regarding prognostication and advance care planning. *Resuscitation* 2010 Aug;81(8):982-6. Doi: 10.1016/j.resuscitation.2010.03.031. pmid: 20435392
  43. Baman TS, **Kirkpatrick JN**, Romero J, Gakenheimer L, Romero A, Lange DC, Nosowsky R, Fuller K, Sison EO, Tangco RV, Abelardo NS, Samson G, Sovitch P, Machado CE, Kemp SR, Morgenstern K, Goldman EB, Oral H, Eagle KA. Pacemaker reutilization: an initiative to alleviate the burden of symptomatic bradyarrhythmia in impoverished nations around the world. *Circulation*. 2010 Oct 19;122(16):1649-56. Doi: 10.1161. PMID: 20956239
  44. **Kirkpatrick JN**, Papini C, Baman TS, Khota K, Eagle KA, Verdino RJ, Caplan AL: Reuse of pacemakers and defibrillators in developing countries: logistical, legal and ethical barriers and solutions. *Heart Rhythm* 2010 Nov;7(11):1623-7. doi: 10.1016/j.hrthm.2010.04.027. PMID: 20430113
  45. **Kirkpatrick JN**, Beasley KD, Caplan AL: Death is just not what it used to be. *Camb Q Healthc Ethics*. 2010 Winter;19(1):7-16. doi: 10.1017/S096318010999020X. PMID: 20025798
  46. \*Mendelson TB, Meltzer M, Campbell EG, Caplan AL, **Kirkpatrick JN**. Conflicts of Interest in Cardiovascular Clinical Practice Guidelines. *Arch Intern Med*. 2011 Mar 28;171(6):577-84. doi: 10.1001. PMID: 21444849
  47. Gakenheimer L, Lange DC, Romero J, **Kirkpatrick JN**, Sovitch P, Oral H, Eagle KA, Baman TS. Societal views of pacemaker reutilization for those with untreated symptomatic bradycardia in underserved nations. *J Interv Card Electrophysiol*. 2011 Apr;30(3):261-6. doi: 10.1007/s10840-010-9534-0. PMID: 21249438
  48. Baman TS, Meier P, Romero J, Gakenheimer L, **Kirkpatrick JN**, Sovitch P, Oral H, Eagle KA: Safety of pacemaker reuse: a meta-analysis with implications for underserved nations. *Circ Arrhythm Electrophysiol*. 2011 Jun;4(3):318-23. doi: 10.1161/CIRCEP.110.960112. PMID: 21493963
  49. Logani S, Gottlieb M, Verdino RJ, Baman TS, Eagle KA, **Kirkpatrick JN**. Recovery of Pacemakers and Defibrillators for Analysis and Device Advance Directives: Electrophysiologists' Perspectives. *Pacing Clin Electrophysiol*. 2011 Jun;34(6):659-65. doi: 10.1111/j.1540-8159.2011.03032. PMID: 21314698
  50. Ogbara J, Logani S, Ky B, Chirinos JA, Silvestry FE, Eberman K, Moss JD, Ferrari VA, Keane MG, John Sutton MS, Wieggers SE, **Kirkpatrick JN**. The Utility of Prescreening Transesophageal Echocardiograms: A Prospective Study. *Echocardiography*. 2011 Aug;28(7):767-73. doi: 10.1111/j.1540-8175.2011.01421. PMID: 21564279
  51. Aragam KG, Baman TS, **Kirkpatrick JN**, Goldman EB, Brown AC, Crawford T, Oral H, Eagle KA. The ethics of pacemaker reuse: might the best be the enemy of the good? *Heart*. 2011 Dec;97(24):2005-6. doi: 10.1136/heartjnl-2011-301031. PMID: 21997673

52. **Kirkpatrick JN**, Gottlieb M, Sehgal P, Patel R, Verdino R. Deactivation of Implantable Cardioverter Defibrillators in Terminal Illness and End of Life Care. *Am J Cardiol.* 2012 Jan 1;109(1):91-4. doi: 10.1016/j.amjcard.2011.08.011. PMID: 21943937
53. Baman TS, Crawford T, Sovitch P, Meier P, Sovitch N, Gakenheimer L, **Kirkpatrick J**, Wasserman B, Samson G, Oral H, Eagle KA. Feasibility of postmortem device acquisition for potential reuse in underserved nations. *Heart Rhythm.* 2012 Feb;9(2):211-4. doi: 10.1016/j.hrthm.2011.09.067. PMID: 21952007
54. Ky B, Plappert T, **Kirkpatrick J**, Silvestry FE, Ferrari VA, Keane MG, Wiegers SE, Chirinos JA, Sutton MS. Left Ventricular Remodeling in Human Heart Failure: Quantitative Echocardiographic Assessment of 1,794 Patients. *Echocardiography.* 2012 Aug;29(7):758-65. doi: 10.1111/j.1540-8175.2012.01701. PMID: 22497559
55. Ky B, Plappert T, **Kirkpatrick J**, Silvestry FE, Ferrari VA, Keane MG, Wiegers SE, Chirinos JA, St. John Sutton M. Continuing Medical Education Activity in Echocardiography. *Echocardiogr.* 2012 Aug;29(7):757.
56. Agarwal R, Gosain P, **Kirkpatrick JN**, Alyousef T, Doukky R, Singh G, Umscheid CA. Tissue Doppler imaging for diagnosis of coronary artery disease: a systematic review and meta-analysis. *Cardiovasc Ultrasound.* 2012 Nov 30;10:47. doi: 10.1186/1476-7120-10-47. PMID: 23199010
57. Perman SM, **Kirkpatrick JN**, Reitsma AM, Gaieski DF, Lau B, Smith TM, Leary M, Fuchs BD, Levine JM, Abella BS, Becker LB, Merchant RM. Timing of neuroprognostication in postcardiac arrest therapeutic hypothermia. *Crit Care Med.* 2012 Mar;40(3):719-24. doi: 10.1097/CCM.0b013e3182372f93. PMID: 22080630
58. Zamani P, **Kirkpatrick JN**, Litzky LA, Verdino RJ. Longevity of implantable electrophysiology devices explanted from patients having autopsy in hospitals. *Am J Cardiol.* 2012 Dec 1;110(11):1643-5. doi: 10.1016/j.amjcard.2012.07.031. PMID: 22939580
59. Raina A, Rammohan HRS, Gertz ZM, Rame JE, Woo YJ, **Kirkpatrick JN**. Postoperative right ventricular failure after left ventricular assist device placement is predicted by preoperative echocardiographic structural, hemodynamic and functional parameters. *J Card Fail.* 2013 Jan;19(1):16-24. Doi: 10.1016/j.cardfail.2012.11.001. PMID: 23273590
60. Ramjee V, Shreenivas S, Rame JE, **Kirkpatrick JN**, Jagasia D. Complete Spontaneous Left Heart and Aortic Thromboses on Extracorporeal Membrane Oxygenation Support. *Echocardiography.* 2013 Nov;30(10):E342-3. doi: 10.1111/echo.12323. PMID: 23889597
61. **Kirkpatrick JN**. Goals of care discussion: how hard it can be. *JAMA Intern Med.* 2015 Apr;175(4):557-8. doi: 10.1001/jamainternmed.2014.7740. PMID: 25643175
62. Birati EY, **Kirkpatrick JN**, Rame JE, Bala R, Margulies KB: Dynamic Left Ventricular Assist Device Inflow Obstruction. *Circulation Heart Failure* 7(1): 225-226, January 2014. PMID:
63. Cooper JM, Patel RK, Emmi A, Wang Y, **Kirkpatrick JN**. RV-Only Pacing Can Produce a Q Wave in Lead 1 and an R Wave in V1: Implications for Biventricular Pacing. *Pacing Clin Electrophysiol.* 2014 May;37(5):585-90. doi: 10.1111/pace.12327. PMID: 24372196
64. Goldstone AB, Howard JL, Cohen JE, MacArthur JW, Paval A, **Kirkpatrick JN**, Woo YJ.: Natural History of Coexistent Tricuspid Regurgitation in Patients with Degenerative Mitral Valve Disease: Implications for Future Guidelines. *J Thorac Cardiovasc Surg.* 2014 Dec;148(6):2802-9. doi: 10.1016/j.jtcvs.2014.08.001. PMID: 25218532
65. Hughey AM, Desai N, Baman TS, Gakenheimer L, Hagan L, **Kirkpatrick JN**, Oral H, Eagle KA, Crawford TC. Heart Rhythm Society Members' Views on Pacemaker and Implantable Cardioverter Defibrillator Reuse. *Pacing Clin Electrophysiol.* 2014 Aug;37(8): 969-977 doi: 10.1111/pace.12418. PMID: 24787631
66. Ranola P-A, Merchant R, Perman S, Khan AM, Gaieski D, Caplan AL, **Kirkpatrick JN**. How long is long enough, and have we done everything we should?-Ethics of calling codes. *J Med Ethics.* 2015 Aug;41(8):663-6. doi: 10.1136/medethics-2013-101949. PMID: 25249374

67. Mehta N, Chokshi NP, **Kirkpatrick JN**. Cardiac Imaging in the Geriatric Population: What Do We Think We Know, and What Do We Need to Learn? *Prog Cardiovasc Dis*. 2014 Sep-Oct;57(2):204-14. doi: 10.1016/j.pcad.2014.07.003. PMID: 25216620
68. **Kirkpatrick JN**, Kellom K, Hull SC, Henderson R, Singh J, Coyle LA, Mountis M, Shore ED, Petrucci R, Cronholm P, Barg FK. Caregivers and Left Ventricular Assist Devices as a Destination, Not a Journey. *J Card Fail*. 2015 Oct;21(10):806-15. doi: 10.1016/j.cardfail.2015.05.016. PMID: 26070494
69. Meltzer EC, Ivascu NS, Acres CA, Stark M, **Kirkpatrick JN**, Paul S, Sedrakyan A, Fins JJ. ECMO in adults: A brief review and ethical considerations for non-specialist health providers and hospitalists. *J Hospital Med*. 2014 Dec;9(12):808-13. doi: 10.1002/jhm.2262. PMID: 25332093
70. Khan AM, **Kirkpatrick JN**, Yang L, Groeneveld PW, Nadkarni VM, Merchant RM; American Heart Association's Get With the Guidelines-Resuscitation (GWTG-R) Investigators. Age, sex, and hospital factors are associated with the duration of cardiopulmonary resuscitation in hospitalized patients who do not experience sustained return of spontaneous circulation. *J Am Heart Assoc*. 2014 Dec;3(6):e001044. doi: 10.1161/JAHA.114.001044. PMID: 25520328
71. Birati EY, Quiaoit Y, Wald J, **Kirkpatrick JN**, Goldberg LR, Atluri P, Margulies KB, Eduardo Rame J. Ventricular assist device thrombosis: A wide spectrum of clinical presentation. *J Heart Lung Transplant*. 2015 Apr;34(4):613-5. doi: 10.1016/j.healun.2014.12.007. PMID: 25703960
72. **Kirkpatrick JN**, Hauptman PJ, Goodlin SJ. We need to talk: Bundling Informed Consent and Advance Care Planning in Chronic Cardiovascular Disease. *JAMA Intern Med*. 2015 Jan;175(1):5-6. doi: 10.1001/jamainternmed.2014.6219. PMID: 25419993
73. **Kirkpatrick JN**, Wieselthaler G, Strueber M, St John Sutton MG, Rame JE. Ventricular assist devices for treatment of acute heart failure and chronic heart failure. *Heart*. 2015 Jul;101(14):1091-6. doi: 10.1136/heartjnl-2014-306789. PMID: 25948420
74. \*Kini V, Mehta N, Mazurek J, Ferrari VA, Epstein AJ, Groeneveld PW, **Kirkpatrick JN**. Focused Cardiac Ultrasound In Place of Repeat Echocardiography: Reliability and Cost Implications Journal of the American Society of Echocardiography. *J Am Soc Echocardiogr*. 2015 Sep;28(9):1053-9. doi: 10.1016/j.echo.2015.06.002. PMID: 26165448
75. \*Stainback RF, Estep JD, Agler DA, Birks EJ, Bremer M, Hung J, **Kirkpatrick JN**, Rogers JG, Shah NR. Echocardiography in the Management of Patients with Left Ventricular Assist Devices: Recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr*. 2015 Aug;28(8):853-909. doi: 10.1016/j.echo.2015.05.008. PMID: 26239899
76. Lipman HI, Kalra A, **Kirkpatrick JN**. Foundations of medical decision-making for older adults with cardiovascular disease. *J Geriatr Cardiol*. 2015 Jul;12(4):335-9. doi: 10.11909/j.issn.1671-5411.2015.04.004. PMID: 26347213
77. Hiraoka A, Cohen JE, Shudo Y, MacArthur JW Jr, Howard JL, Fairman AS, Atluri P, **Kirkpatrick JN**, Woo YJ. Evaluation of late aortic insufficiency with continuous flow left ventricular assist device. *Eur J Cardiothorac Surg*. 2015 Sep;48(3):400-6. doi: 10.1093/ejcts/ezu507. PMID: 25653250
78. Daeschler M, Verdino RJ, Caplan AL, **Kirkpatrick JN**. Defibrillator Deactivation against a Patient's Wishes: Perspectives of Electrophysiology Practitioners. *Pacing Clin Electrophysiol*. 2015 Aug;38(8):917-24. doi: 10.1111/pace.12614. PMID: 25683098
79. Kramer DB, Matlock DD, Buxton AE, Goldstein NE, Goodwin C, Green AR, **Kirkpatrick JN**, Knoepke C, Lampert R, Mueller PS, Reynolds MR, Spertus JA, Stevenson LW, Mitchell SL. Implantable Cardioverter-Defibrillator Use in Older Adults: Proceedings of a Hartford Change AGENTS Symposium. *Circ Cardiovasc Qual Outcomes*. 2015 Jul;8(4):437-46. doi: 10.1161/CIRCOUTCOMES.114.001660. PMID: 26038525

80. Ramjee V, Grossestreuer AV, Yao Y, Perman SM, Leary M, **Kirkpatrick JN**, Forfia PR, Kolansky DM, Abella BS, Gaieski DF. Right ventricular dysfunction after resuscitation predicts poor outcomes in cardiac arrest patients independent of left ventricular function. *Resuscitation*. 2015 Nov; 96:186-91. doi: 10.1016/j.resuscitation.2015.08.008. PMID: 26318576
81. Bushyhead D, **Kirkpatrick JN**, Goldberg D. Pre-transplant echocardiographic parameters as markers of post-transplant outcomes in liver transplant recipients. *Liver Transpl*. 2016 Mar;22(3):316-23. doi: 10.1002/lt.24375. PMID: 26609681
82. Porteous MK, Ky B, **Kirkpatrick JN**, Shinohara R, Diamond JM, Shah RJ, Lee JC, Christie JD, Kawut SM. Diastolic dysfunction increases the risk of primary graft dysfunction after lung transplantation. *Am J Respir Crit Care Med*. 2016 Jun 15;193(12):1392-1400. PMID: 26745666
83. **Kirkpatrick JN**, Hauptman PJ, Swetz KM, Blume ED, Gauvreau K, Maurer M, Goodlin SJ. Palliative Care for Patients with End-Stage Cardiovascular Disease and Devices: A Report From the Palliative Care Working Group of the Geriatrics Section of the American College of Cardiology. *JAMA Intern Med*. 2016 Jul 1;176(7):1017-9. doi: 10.1001/jamainternmed.2016.2096. PMID: 27214624
84. Alexander KP, Rich MW, Forman DE, Wenger NK, Dodson JA, Alpert JS, **Kirkpatrick JN**, Maurer MS. Top 10 List for Cardiovascular Care of Older Adults. *Am J Med*. 2016 Sep;129(9):901-2. doi: 10.1016/j.amjmed.2016.04.031. PMID: 27215904
85. Weerahandi H, Goldstein N, Gelfman LP, Jorde U, **Kirkpatrick JN**, Marble J, Naka Y, Pinney S, Slaughter MS, Bagiella E, Ascheim DD. Pain and Functional Status in Patients with Ventricular Assist Devices. *J Pain Symptom Manage*. 2016 Oct;52(4):483-490. doi: 10.1016/j.jpainsymman.2016.05.016. PMID: 27401516
86. Sagin A, **Kirkpatrick JN**, Pisani BA, Fahlberg BB, Sundlof AL, O'Connor NR. Emerging Collaboration Between Palliative Care Specialists and Mechanical Circulatory Support Teams: A Qualitative Study. *J Pain Symptom Manage*. 2016 Oct;52(4):483-490. Doi: 10.1016/j.painsymman.2016.05.016. PMID: 27401517
87. O'Connor NR, Moyer ME, **Kirkpatrick JN**. Scripted Nurse Visits: A Resource-Efficient Palliative Care Model for Ventricular Assist Devices. *J Pall Med*. 2016 Dec;19(12):1312-1315. PMID: 27400133
88. Kini V, Weiner RB, McCarthy FH, Wiegers SE, **Kirkpatrick JN**. Association of Liability Concerns with Decisions to Order Echocardiography and Cardiac Stress Tests with Imaging. *J Am Soc Echocardiogr*. 2016 Dec;29(12):1156-1160. Doi: 10.1016/j.echo.2016.08.014. PMID: 27639813
89. Chick, JF, Reddy SN, Bhatt RD, Shin BJ, **Kirkpatrick JN**, Trerotola SO. Significance of Echocardiographically Detected Central Venous Catheter Tip–Associated Thrombi. *J Vasc Interv Radiol* 2016 Dec;27(12):1872-1877. Doi: 10.1016/j.jvir.2016.07.013. PMID: 27659895
90. Blewer AL, Putt ME, Becker LB, Riegel BJ, Li J, Leary M, Shea JA, **Kirkpatrick JN**, Berg RA, Nadkarni VM, Groeneveld PW, Abella BS; CHIP Study Group. Video-Only Cardiopulmonary Resuscitation Education for High-Risk Families Before Hospital Discharge: A Multicenter Pragmatic Trial. *Circ Cardiovasc Qual Outcomes*. 2016 Nov;9(6):740-748. doi: 10.1161/CIRCOUTCOMES.116.002493. PMID: 27703033
91. Daeschler M, Verdino RJ, **Kirkpatrick JN**. The ethics of unilateral implantable cardioverter defibrillators and cardiac resynchronization therapy with defibrillator deactivation: patient perspectives. *EP Europace* 2016 Dec 3 (19)81343-1348. doi: 10.1093/europace/euw227
92. Barg FK, Kellom K, Ziv T, Hull SC, Suhail-Sindhu S, **Kirkpatrick JN**. LVAD-DT: Culture of Rescue and Liminal Experience in the Treatment of Heart Failure. *Am J Bioeth*. 2017 Feb;17(2):3-11. doi: 10.1080/15265161.2016.1265162. PMID: 28112612

93. **Kirkpatrick JN**, Otto CM. Clinical Impact and Costs of Echocardiographic Screening for Rheumatic Heart Disease. *J Am Heart Assoc*. 2017 Mar 2;6(3). PMID: 28255081
94. **Kirkpatrick JN**, Lee J. The Devilish Details of Cardiovascular Imaging for Heart Failure Prevention. *JACC Cardiovasc Imaging*. 2017 Mar;10(3):227-229. doi: 10.1016/j.jcmg.2016. PMID: 28279369
95. Blume ED, Hauptman PJ, Gauvreau K, Cooper S, Goodlin S, Swetz KM, Alpert C, Hummel SL, Josephson RA, Doherty C, Brenes Salazar J, Maurer MS, Cestoni A, Bohannon K, Light-McGroary KA, **Kirkpatrick JN**. Deactivation of Ventricular Assist Devices: Perspectives and Experiences of Adult Cardiovascular Providers. *J Card Fail*. 2017 Jun;23(6):485-486. doi: 10.1016/j.cardfail.2017.04.008. PMID: 28433668
96. Tandon K, Tate T, **Kirkpatrick JN**. Pacemaker reuse in low-income/middle-income countries: moral duty or dangerous precedent? *Heart*. 2017 Dec;103(23):1846-1847. doi: 10.1136/heartjnl-2017-311572. PMID: 28566472
97. Balkin EM, **Kirkpatrick JN**, Kaufman B, Swetz KM, Sleeper LA, Wolfe J, Blume ED.; Pediatric Cardiology Provider Attitudes About Palliative Care: A Multicenter Survey Study. *Pediatr Cardiol*. 2017 Jun 29. doi: 10.1007/s00246-017-1663-0. PMID: 28664445
98. Wordingham SE, McIlvennan CK, Fendler TJ, Behnken AL, Dunlay SM, **Kirkpatrick JN**, Swetz KM. Palliative Care Clinicians Caring for Patients Before and After Continuous Flow-Left Ventricular Assist Device. *J Pain Symptom Manage*. 2017 Jul 12. pii: S0885-3924(17)30270-1. doi: 10.1016/j.jpainsymman.2017.07.007. PMID: 28711755
99. Steiner JM, **Kirkpatrick JN**, Heckbert SR, Habib A, Sibley J, Lober W, Randall Curtis J. Identification of adults with congenital heart disease of moderate or great complexity from administrative data. *Congenit Heart Dis*. 2017 Jul 24. doi: 10.1111/chd.12524. PMID: 28736836
100. Steiner JM, Cooper S, **Kirkpatrick JN**. Palliative care in end-stage valvular heart disease. *Heart*. 2017 Aug;103(16):1233-1237. doi: 10.1136/heartjnl-2016-310538. PMID: 28747535
101. Weerahandi H, Goldstein N, Gelfman LP, Jorde U, **Kirkpatrick JN**, Meyerson E, Marble J, Naka Y, Pinney S, Slaughter MS, Bagiella E, Ascheim DD. The Relationship between Psychological Symptoms and Ventricular Assist Device Implantation. *J Pain Symptom Manage*. 2017 Aug 12. pii: S0885-3924(17)30337-8. doi: 10.1016/j.jpainsymman.2017.05.002. PMID: 28807706
102. Carlson S, Kearney K, Li S, Fujioka M, Schwaegler B, **Kirkpatrick JN**. Preliminary Interpretations of Transthoracic Echocardiograms by Cardiology Fellows. *J Am Soc Echocardiogr*. 2017 Dec;30(12):1234-1238. PMID: 28870437
103. Gelfman LP, Bakitas M, Warner SL, **Kirkpatrick JN**, Goldstein NE. The State of Science on Integrating Palliative Care in Heart Failure. *J Palliat Med*. 2017 Jun;20(6):592-603. PMID: 29493362
104. Wordingham SE, McIlvennan CK, Fendler TJ, Behnken AL, Dunlay SM, **Kirkpatrick JN**, Swetz KM. Palliative Care Clinicians Caring for Patients Before and After Continuous Flow-Left Ventricular Assist Device. *J Pain Symptom Manage*. 2017 Oct;54(4):601-608. PMID: 28711755
105. Zhao H, O'Quinn R, Ambrose M, Jagasia D, Ky B, Wald J, Ferrari VA, **Kirkpatrick JN**, Han Y. Contrast-Enhanced Echocardiography Has the Greatest Impact in Patients with Reduced Ejection Fraction. *J Am Soc Echocardiogr*. 2018 Mar;31(3):289-296. PMID: 29111122
106. Steiner JM, Patton KK, Prutkin JM, **Kirkpatrick JN**. Moral Distress at the End of a Life: When Family and Clinicians Don't Agree on Implantable Cardioverter-defibrillator Deactivation. *J Pain Symptom Manage*. 2018 Feb;55(2):530-534. PMID: 29191724
107. **Kirkpatrick JN**, Smith JW. Dilemmas in Dual Disease: complexity and Futility in Prosthetic Valve Endocarditis and Substance Use Disorder. *Am J Bioeth*. 2018 Jan;18(1):76-78. PMID: 29313791

108. Eiser AR, **Kirkpatrick JN**, Patton KK, McLain E, Dougherty CM, Beattie JM. Putting the “informed” in the informed consent process for implantable cardioverter-defibrillators: Addressing the needs of the elderly patient. *Pacing Clin Electrophysiol*. 2018 Jan 24. [Epub ahead of print]. PMID: 29363143
109. Balkin EM, Sleeper LA, **Kirkpatrick JN**, Swetz KM, Coggins MK, Wolfe J, Blume ED. Physician Perspectives on Palliative Care for Children with Advanced Heart Disease: A comparison between Pediatric Cardiology and Palliative Care Physicians. *J Palliat Med*. 2018 Feb 7. [Epub ahead of print]. PMID: 29412772
110. Balkin EM, **Kirkpatrick JN**, Kaufman B, Swetz KM, Sleeper LA, Wolfe J, Blume ED. Pediatric Cardiology Provider Attitudes About Palliative Care: A Multicenter Survey Study. *Pediatr Cardiol*. 2017 Oct. PMID: 28664445
111. Blume ED, Hauptman PJ, Gauvreau K, Cooper S, Goodlin S, Swetz KM, Alpert C, Hummel SL, Josephson RA, Doherty C, Brenes Salazar J, Maurer MS, Cestoni A, Bohannon K, Light-McGroary KA, **Kirkpatrick JN**. Deactivation of Ventricular Assist Devices: Perspectives and Experiences of Adult Cardiovascular Providers. 2017 Jun. PMID: 28433668
112. Gorodeski EZ, Goyal P, Hummel SL, Krishnaswami A, Goodlin SJ, Hart LL, Forman DE, Wenger NK, **Kirkpatrick JN**, Alexander KP. Domain Management Approach to Heart Failure in the Geriatric Patient. *JACC* 2018 May.10.1016/j.jacc.2018.02.059
113. Beattie JM, **Kirkpatrick JN**, Patton KK. Hardwired for Life?: Implantable Defibrillator Dilemmas in Older Patients. *The American Journal of Medicine*. Ref. No.: 18-834
114. Mackensen GB, Lee JC, Wang DD, Pearson PJ, Blanke P, Dvir D, **Kirkpatrick JN**. Role of Echocardiography in Transcatheter Mitral Valve Replacement in Native Mitral Valves and Mitral Rings. *J Am Soc Echocardiogr*. 2018 Apr;31(4):475-490. doi: 10.1016/j.echo.2018.01.011.
115. **Kirkpatrick JN**, Nguyen HTT, Doan LD, Le TT, Thai SP, Adams D, Sanchez Ly, Sprague N, Inanfuku J, Quang R, Hahn R, Van Hoever AM, Nguyen T, Kirkpatrick TG, Banches J. Focused cardiac ultrasound by nurses in rural Vietnam. *J Am Soc Echocardiogr*. 2018 Aug 7. pii: S0894-7317(18)30281-5. doi: 10.1016/j.echo.2018.05.013.
116. Steiner JM, **Kirkpatrick JN**, Heckbert SR, Sibley J, Fausto JA, Engelberg RA, Randall Curtis J. Hospital resource utilization and presence of advance directives at the end of life for adults with congenital heart disease. *Congenital Heart Dis*. 2018 Sep 19. doi: 10.1111/chd.12638
117. Steiner JM, Stout K, Soine L, **Kirkpatrick JN**, Curtis JR. Perspectives on Advance Care Planning and Palliative Care Among Adults with Congenital Heart Disease. *Congenit Heart Dis*. 2019 May;14(3):403-409. doi: 10.1111/chd.12735. Epub 2018 Dec 21.
118. Nguyen VP, Qin A, **Kirkpatrick JN**. Three-dimensional echocardiography of mechanical circulatory support devices. *Echocardiography*. 2018 Nov 8. doi: 10.1111/echo.14186
119. **Kirkpatrick JN**, Pearlman AS. Ethical Challenges in the Practice of Echocardiography: What Is Right and How Do We Do It? *J Am Soc Echocardiogr*. 2018 Nov 17. pii: S0894-7317(18)30513-3. doi: 10.1016/j.echo.2018.09.015
120. Tilkemeier PL, Doukky R, **Kirkpatrick JN**, Desai MY, Nagueh SF. Coming-of-age: The ImageGuide™ Registry at three. *J Nucl Cardiol*. 2018 Sep 14. doi: 10.1007/s12350-018-1442-1.
121. Wieggers SE, Ryan T, Arrighi JA, Brown SM, Canaday B, Damp JB, Diaz-Gomez JL, Figueredo VM, Garcia MJ, Gillam LD, Griffin BP, **Kirkpatrick JN**, Klarich KW, Lui GK, Maffett S, Naqvi TZ, Patel AR, Poulin MF, Rose GA, Swaminathan M. 2019 ACC/AHA/ASE Advanced Training Statement on Echocardiography (Revision of the 2003 ACC/AHA Clinical Competence Statement on Echocardiography): A Report of the ACC Competency Management Committee. *J Am Coll Cardiol*. 2019 Feb 12. pii: S0735-1097(19)30477-2. doi: 10.1016/j.jacc.2019.02.003.

122. Kaufman BD, Hollander SA, Zhang Y, Chen S, Bernstein D, Rosenthal DN, Almond CS, Murray JM, Burgart AM, Cohen HJ, **Kirkpatrick JN**, Blume ED. Compassionate deactivation of ventricular assist devices in children: A survey of pediatric ventricular assist device clinicians' perspectives and practices. *Pediatr Transplant*. 2019 Feb 7:e13359. doi: 10.1111/petr.13359.
123. **Kirkpatrick JN**, Mahr C, Beckman J, Bjelkengren J, Dudzinski DM. Responding to Ventricular Assist Device Recalls: An Ethical Guide for Mechanical Circulatory Support Programs. *ASAIO J*. 2019 Apr 18. doi: 10.1097/MAT.0000000000001005. [Epub ahead of print] PMID: 31045923
124. Trang A, Kampangkaew J, Fernandes R, Tiwana J, Misra A, Hamzeh I, Blaustein A, Aguilar D, Shah T, Ballantyne C, Quinones M, Nagueh SF, Dokanish H, Virani SS, Deswal A, **Kirkpatrick JN**, Nambi V. Understanding by General Providers of the Echocardiogram Report. *Am J Cardiol*. 2019 Apr 24. pii: S0002-9149(19)30461-8. doi: 10.1016/j.amjcard.2019.04.022. [Epub ahead of print] PMID: 31104774
125. Chen T, Carlson S, Cheney A, Zwink T, Freeman RV, **Kirkpatrick JN**. Performance of Comprehensive Transesophageal Echocardiography: Quality Improvement Through Educational Intervention. *J Am Soc Echocardiogr*. 2019 Aug;32(8):1046-1048. doi: 10.1016/j.echo.2019.03.019. Epub 2019 May 23. No abstract available. PMID: 31130418
126. Li S, Beckman JA, Welch NG, Bjelkengren J, Masri SC, Minami E, Stempien-Otero A, Levy WC, O'Brien KD, Lin S, Farris SD, Cheng RK, Wood G, Koomalsingh K, **Kirkpatrick J**, McCabe J, Leary PJ, Chassagne F, Chivukula VK, Aliseda A, Mahr C. Accuracy of Doppler blood pressure measurement in continuous-flow left ventricular assist device patients. *ESC Heart Fail*. 2019 Aug;6(4):793-798. doi: 10.1002/ehf2.12456. Epub 2019 May 17. PMID: 31099483
127. Burke CR, **Kirkpatrick JN**, Otto CM. Goals of care in patients with severe aortic stenosis; *European Heart Journal* (2019) 00, 1–4 EDITORIAL doi:10.1093/eurheartj/ehz567
128. Chivukula VK, Beckman J; Li S; Masri C; Levy W; Cheng R; Farris S; Wood G; Dardas T; **Kirkpatrick J**; Koomalsingh K; Zimpfer D; Mackensen B; Chassagne F; Mahr C; Aliseda A. Left Ventricle Assist Device (LVAD) inflow cannula insertion depth influences thrombosis risk. *ASAIO Journal*. 2019 Aug; DOI: 10.1097/MAT.0000000000001068
129. Hollenberg SM; Stevenson LW; Ahmad T; Amin VJ; Bozkurt B; Butler J; **Kirkpatrick JN**; Davis LL; Drazner MH; Peterson PN; Reed BN; Roy CL; Storrow AB; 2019 ACC Expert Consensus Decision Pathway on Risk Assessment, Management, and Clinical Trajectory of Patients Hospitalized With Heart Failure. *J Am Coll Cardiol*. 2019 Oct 15;74(15):1966-2011. doi: 10.1016/j.jacc.2019.08.001. Epub 2019 Sep 13.
130. Asch FM, Miyoshi T, Addetia K, Citro R, Daimon M, Desale S, Fajardo PG, Kasliwal RR, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Ronderos RE, Sadeghpour A, Scalia GM, Takeuchi M, Tsang W, Tucay ES, Tude Rodrigues AC, Vivekanandan A, Zhang Y, Blitz A, Lang RM; WASE Investigators. Similarities and Differences in Left Ventricular Size and Function among Races and Nationalities: Results of the World Alliance Societies of Echocardiography Normal Values Study. *J Am Soc Echocardiogr*. 2019 Nov;32(11):1396-1406.e2. doi: 10.1016/j.echo.2019.08.012.
131. Campelia GD, **Kirkpatrick JN**. Reinterpreting Informed Decision-Making Through The Clinician-Patient Relationship. *Ann Thorac Surg*. 2019 Dec;108(6):1610-1611. doi: 10.1016/j.athoracsur.2019.08.007. No abstract available. PMID: 31761257
132. Campelia GD, Barg FK, **Kirkpatrick JN**, Hull SC. Care Labor in VAD Therapy: Some Feminist Concerns. *Perspect Biol Med*. 2019;62(4):640-656. doi: 10.1353/pbm.2019.0037. PMID: 31761798
133. Sullivan MF, **Kirkpatrick JN**. Palliative Cardiovascular Care: The Right Patient at the Right Time. *Clin Cardiol*. 2019;1–8. doi: 10.1002/clc.23307



134. **Kirkpatrick JN**, Grimm R, Johri AM, Kimura BJ, Kort S, Labovitz AJ, Lanspa M, Phillip S, Raza S, Thorson K, Turner J. Recommendations for Echocardiography Laboratories Participating in Cardiac Point of Care Cardiac Ultrasound (POCUS) and Critical Care Echocardiography Training: Report from the American Society of Echocardiography. *J Am Soc Echocardiogr*. 2020 Feb 28. pii: S0894-7317(20)30016-X. doi: 10.1016/j.echo.2020.01.008.
135. **Kirkpatrick JN**, Mitchell C, Taub C, Kort S, Hung J, Swaminathan M, ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak *Journal of the American College of Cardiology* (2020), doi: <https://doi.org/10.1016/j.jacc.2020.04.002>.
136. Zhang, L, Wang, B, Zhou, J, **Kirkpatrick, JN**, Xie, M, Johri, AM. Bedside Focused Cardiac Ultrasound in COVID-19 Infection From the Wuhan Epicenter: The Role of Cardiac Point of Care Ultrasound (POCUS), Limited Transthoracic Echocardiography and Critical Care Echocardiography, 2020 Apr 10. In Press Accepted Manuscript. doi: <https://doi.org/10.1016/j.echo.2020.04.004>
137. **Kirkpatrick, JN**, Mitchell, C, Taub, C, Kort, S, Hung, J, Swaminathan, M. ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak, *J Am Soc Echocardiogr*. 2020 Jun;33(6):648-653. doi: 10.1016/j.echo.2020.04.001. Epub 2020 Apr 3. PMID: 32503700
138. **Kirkpatrick JN**, Hull SC, Fedson S, Mullen B, Goodlin SJ. Allocating Scarce Resources and Triaging Patients During the COVID-19 Pandemic, *J Am Coll Cardiol*. 2020 Jul 7;76(1):85-92. doi: 10.1016/j.jacc.2020.05.006. Epub 2020 May 11. PMID: 32407772
139. Miyoshi T, Addetia K, Citro R, Daimon M, Desale S, Fajardo PG, Kasliwal RR, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Ronderos RE, Sadeghpour A, Scalia GM, Takeuchi M, Tsang W, Tucay ES, Tude Rodrigues AC, Vivekanandan A, Zhang Y, Blitz A, Lang RM, Asch FM; WASE Investigators. Left Ventricular Diastolic Function in Healthy Adult Individuals: Results of the World Alliance Societies of Echocardiography Normal Values Study *J Am Soc Echocardiogr*. 2020 Jul 30:S0894-7317(20)30375-8. doi: 10.1016/j.echo.2020.06.008. Online ahead of print. PMID: 32741597
140. Lam DH, Tiwana J, Li S, **Kirkpatrick JN**, Cheng RK. Appropriate use of multimodality stress testing for chest pain in new patient referrals to cardiologists. *Coron Artery Dis*. 2020 Aug 13. doi: 10.1097/MCA.0000000000000928. Online ahead of print. PMID: 32804780
141. Steiner JM, Dhami A, Brown CE, Stout KK, Curtis JR, Engelberg RA, **Kirkpatrick JN**. Barriers and Facilitators of Palliative Care and Advance Care Planning in Adults with Congenital Heart Disease. *Am J Cardiol*. 2020 Aug 28:S0002-9149(20)30895-X. doi: 10.1016/j.amjcard.2020.08.038. Online ahead of print. PMID: 32866444
142. Leedy, DJ., Vasbinder, A, Huang, HD., Fernandes, R, Covan, AJ, Gopal, AK, **Kirkpatrick, JN**, Libby EN, Cheng, RK. Assessment of Left Ventricular , Right Ventricular, and Left Atrial Strain in Light-Chain Amyloidosis. *J Am Coll Cardiol CardioOnc*. 2020 Nov, 2 (4) 647–649
143. Soulat-Dufour L, Addetia K, Miyoshi T, Citro R, Daimon M, Fajardo PG, Kasliwal RR, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Ronderos RE, Sadeghpour A, Scalia GM, Takeuchi M, Tsang W, Tucay ES, Tude Rodrigues AC, Vivekanandan A, Zhang Y, Diehl M, Schreckenber M, Mor-Avi V, Asch FM, Lang RM; WASE Investigators. Normal Values of Right Atrial Size and Function According to Age, Sex, and Ethnicity: Results of the World Alliance Societies of Echocardiography Study. *J Am Soc Echocardiogr*. 2020 Nov 17:S0894-7317(20)30722-7. doi: 10.1016/j.echo.2020.11.004. Online ahead of print.
144. Krishnaswami A, Beavers C, Dorsch MP, Dodson JA, Masterson Creber R, Kitsiou S, Goyal P, Maurer MS, Wenger NK, Croy DS, Alexander KP, Batsis JA, Turakhia MP, Forman DE, Bernacki GM, **Kirkpatrick JN**, Orr NM, Peterson ED, Rich MW, Freeman AM, Bhavnani

- SP; Innovations, Cardiovascular Team and the Geriatric Cardiology Councils, American College of Cardiology. Gerotechnology for Older Adults With Cardiovascular Diseases: JACC State-of-the-Art Review. *J Am Coll Cardiol.* 2020 Dec 1;76(22):2650-2670. doi: 10.1016/j.jacc.2020.09.606.
145. Li S, Beckman JA, Welch NG, Cheng RK, Rockom SW, Levy WC, O'Brien KD, Dardas TF, Lin S, Leary PJ, **Kirkpatrick J**, McCabe JM, Bjelkengren J, Chassagne F, Aliseda A, Zimpfer D, Mahr C. Accuracy of Doppler Blood Pressure Measurement in HeartMate 3 Ventricular Assist Device Patients. *ESC HF.* 2020 Dec; 7(6): 4241-6.
146. Driggin E, Morris AA, Maddox TM, Mullen JB, Ferdinand KC, Parikh SA, **Kirkpatrick JN**, Philbin Jr DM, Ky B, Vaduganathan M, Gluckman TJ, Gulati CM, Aggarwal NR, Kumbhani DJ, Bhave NM, Krittanawong C, Dehmer GJ, Sala-Mercado JA, Gilbert ON, Winchester DW, ACC Health Policy Statement on Cardiovascular Disease Considerations for COVID-19 Vaccine Prioritization, *Journal of the American College of Cardiology* (2021), doi: <https://doi.org/10.1016/j.jacc.2021.02.017>.

## 2. Book Chapters

1. **Kirkpatrick JN.** Chest Pain. In: Smith DS, Sullivan LE, Hay SF (eds.), *Field Guide To Internal Medicine.* Lippincott Williams & Wilkins, 24th Ed. Jun 2003.
2. **Kirkpatrick JN.** Valvular Heart Disease. In: Smith DS, Sullivan LE, Hay SF (eds.), *Field Guide To Internal Medicine.* Lippincott Williams & Wilkins, 24th Ed. Jun 2003.
3. **Kirkpatrick JN.** Echocardiography in Advanced Heart Failure (chapter 10). In: Kirklin JK, Banner NR, Jessup M. (eds.). *ISHLT Monograph Series.* International Society for Heart and Lung Transplantation, 2009;3(2);pp.101-116.
4. **Kirkpatrick JN,** Mor-Avi V, Lang RM. Advanced Evaluation of Left Ventricular Function with Three Dimensional Echocardiography. In: Badano L, Lang RM, Zamorano JL. (eds.), *Textbook of Real-Time Three Dimensional Echocardiography.* Springer-Verlag, London, Mar 2011 Notes: Chapter 6.
5. **Kirkpatrick JN.** Echocardiographic Evaluation of Ventricular Support Devices. In: St John Sutton MG, Wieggers SE (eds.), *Echocardiography in Heart Failure (Practical Echocardiography Series).* Elsevier Inc, Philadelphia. Oct 2011, Chapter 12.
6. **Kirkpatrick JN,** Lang RM. Future Applications of Hemodynamic Monitoring Using Echocardiography in the Critically Ill. In: Cholley B, De Backer D, Slama M, Vieillard-Baron A, Vignon P (eds.), *Hemodynamic Monitoring Using Echocardiography in the Critically Ill.* Springer, Feb 2011 Notes.
7. **Kirkpatrick JN,** Fedson SE. Medical Ethics. In: Baliga (eds.), *Cardiology Boards Review Book.* McGraw-Hill, Oct 2011.
8. **Kirkpatrick JN.** Cardiac Assist Devices Normal Findings, Device Failure, and Weaning Parameters. In: Otto, C (eds), *The Practice of Clinical Echocardiography,* 4<sup>th</sup> Ed. Elsevier Inc, Philadelphia. May 2012, Chapter 31; pp.597-612.
9. Pak E, Wald J, **Kirkpatrick JN.** Multimorbidity and end of life care in patients with cardiovascular disease. In: Rich MW, Boyd C, Pacala JT (eds), *Managing Chronic Conditions in Older Adults with Cardiovascular Disease, An Issue of Clinics in Geriatric Medicine.* Elsevier Inc. May 2016, Chapter 13.
10. **Kirkpatrick JN.** Echocardiography in Mechanical Circulatory Support: Normal Findings, Complications, and Speed Changes. In: Otto, C (ed), *The Practice of Clinical Echocardiography,* 5<sup>th</sup> Ed. Elsevier Inc, Philadelphia. 2017, Chapter 30.
11. Vaidya A and **Kirkpatrick JN.** The Right Ventricle. In: Otto, C (ed), *The Practice of Clinical Echocardiography,* 5<sup>th</sup> Ed. Elsevier Inc, Philadelphia. 2017, Chapter 30.

12. Chen T, **Kirkpatrick JN**. Echocardiography in Heart Failure. In: Sawyer, Vasan (eds), Encyclopedia of Cardiovascular Research and Medicine, 1<sup>st</sup> Ed. Elsevier Inc, Philadelphia. 2017
13. Steiner JM, **Kirkpatrick JN**. Palliative care and TAVR. In: Iribarne, Stefanescu, Schmidt, Nguyen (eds), American College of Cardiology Transcatheter Heart Valve Handbook 2018. Chapter 22

### 3. Published Books, Videos, Software, etc.

1. **Kirkpatrick JN**. Use of LV contrast to distinguish intracardiac masses from thrombus. E-clips. Echocardiography in Clinical Practice. A case-based learning tool for the practitioner. Lang RM, Vannan M, Khandheria BK (eds.). *American Society of Echocardiography*, 2009.
2. **Kirkpatrick JN**. Death Just Isn't What It Used to Be. Network for continuing Medical Education video #889, May 2010.
3. **Kirkpatrick JN**. *Echo Evaluation for Left Ventricular Assist Devices (LVAD)* [ASEUniversity.org](http://ASEUniversity.org)
4. **James Kirkpatrick**; Continuum of Care With Palliative Care: What You Need to Know About Payment Reform and Readmission Reduction. ACC Webinars OnDemand. Sept. 20, 2018.

### 4. Other Publications

1. **Kirkpatrick JN**. Catholicism and Healthcare Justice. Health and Development-Christian Community Health Fellowship (4), 20-24, 2002.
2. **Kirkpatrick JN**. Right to discontinue treatment-including pacemakers? Virtual Mentor--Clinical Ethics in Chicago. American Medical Association, Jun 2002.
3. **Kirkpatrick JN**. Putting it all together-the Art and Science of Medicine. Virtual Mentor--Clinical Ethics *American Medical Association Journal of Ethics* 8(7): 452-458, 2006 Notes: Case Commentary
4. **Kirkpatrick JN**. Ethics and the Metaphysics of Medicine: Reflections on Health and Beneficence (review). *Perspectives in Biology and Medicine* 49(3): 467-470, 2006.
5. **Kirkpatrick JN**, Kim AY. Ethical issues in heart failure: overview of an emerging need. *Perspectives in Biology & Medicine* 49(1): 1-9, Winter 2006
6. Nainggolan L. Postmortem device retrieval: Patients unaware of options. Heartwire Nov 2006 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
7. Mitka M: Death not necessarily end for heart devices. *JAMA* 297(2): 144-5, January 2007. Notes: **James N. Kirkpatrick** quoted.
8. Newswise: Ethics in Cardiovascular Medicine Expert Now Available. Newswise January 2007 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
9. **Kirkpatrick JN**, Fedson SE, Verdino R. Ethical Dilemmas in Device Treatment for Advanced Heart Failure. *Current Opinion in Supportive and Palliative Care* 1(4): 267-273, Dec 2007.
10. Rahmouni HW, **Kirkpatrick JN**, St John Sutton MG. Effects of cardiac resynchronization therapy on ventricular remodeling. *Current Heart Failure Reports* 5(1): 25-30, Mar 2008.
11. Stawicki SP, Shiroff AM, Hayden GE, Panebianco NL, **Kirkpatrick JN**, Horan, AD, Gracias VH, Dean AJ. Incidental findings on intensivists bedside ultrasonographic (INBU) examinations: Why should we care? *OPUS 12 Scientist* 2(3), 2008.
12. Stein R. Heart Pump Creates Life-Death Ethical Dilemmas. The Washington Post April 2008 Notes: published 4/24/2008 **Dr. Kirkpatrick** quoted.
13. **Kirkpatrick JN**, Lang RM. Heart failure: hemodynamic assessment using echocardiography. *Current Cardiology Reports* 10(3): 240-6, May 2008.

14. **Kirkpatrick JN**, Lang RM. Insights Into Myocardial Mechanics in Normal and Pathologic States Using Newer Echocardiographic Techniques. *Current Heart Failure Reports* 5: 143 - 150, 2008.
15. **Kirkpatrick JN**. Analyzing the "speckled band" to predict response to CRT: a Sherlockian conundrum. *Journal of the American Society of Echocardiography* 22(6): 685-7, Jun 2009.
16. **Kirkpatrick JN**. Using echo to evaluate patients with left ventricular assist devices (LVADs): adding non-invasive PVR into the diagnostic toolbox. *Journal of the American Society of Echocardiography* 22(9): 1063-9, Sep 2009.
17. **Kirkpatrick JN**, Wiegers SE, Lang, RM. Left Ventricular Assist Devices and Other Devices for End-Stage Heart Failure: Utility of Echocardiography. *Current Cardiology Reports* 12: 257-264, May 2010.
18. **\*Kirkpatrick JN**, Fields AV, Ferrari VA. Medical Ethics and the Art of Cardiovascular Medicine. *Lancet* 376(9740): 508-9, Aug 2010.
19. **Kirkpatrick JN**, Wiegers SE, Rame JE, Lang RM. Use of echocardiography to optimize left ventricular assist devices. *U.S. Cardiology* 7(2): 2-6, Sep 2010.
20. **Kirkpatrick JN**. Infective Endocarditis in the Intravenous Drug User. Virtual Mentor-Clinical Ethics *American Medical Association Journal of Ethics* Oct 2010 Notes: <http://virtualmentor.ama-assn.org/2010/10/ccas1-1010.html>
21. **Kirkpatrick JN**. ABCD's of Heart Failure: Echo-ing through the First Stage. *Journal of the American Society of Echocardiography* 23(10): 1035-1038, Oct 2010.
22. **Kirkpatrick JN**, Lang RM. Surgical Echocardiography of Heart Valves: A primer for the cardiovascular surgeon. *Seminars in Thoracic and Cardiovascular Surgery* 22(3): 200.e1-200.e22, Autumn 2010.
23. Baman TS, **Kirkpatrick JN**, Romero J, Gakenheimer L, Rovero A, Lange DC, Nosowsky R, Fuller K, Sison EO, Tangco RV, Abelardo NS, Samson G, Sovitch P, Machado CE, Kemp SR, Morgenstern K, Goldman EB, Oral H, Eagle KA. Response to Letter Regarding Article, "Pacemaker Reuse: An Initiative to Alleviate the Burden of Symptomatic Bradyarrhythmias in Impoverished Nations Around the World" *Circulation*. 123 e638, 2011
24. Beeler C: Conflicts of interest noted among medical guideline writers. WHYY Mar 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
25. Burton TM: Study Cites Cardiology Conflicts. The Wall Street Journal Mar 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
26. Salahi L.: Optimism linked to improved survival with coronary artery disease. ABC News/Health – Heart Health News Mar 2011 Notes: **James N. Kirkpatrick** quoted on online article.
27. Smith M: Conflicts Common Among Heart Guidelines Writers. MedPageToday.com Mar 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
28. Stiles S: Many AHA/ACC guidelines writers are conflict-free, says report: Why not all? Heartwire Mar 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
29. Wilson D: Study Finds Conflicts Among Panels' Doctors. The New York Times Mar 2011 Notes: Media Coverage of **James N. Kirkpatrick, M.D.**
30. American Society of Registered Nurses: Conflict of Interest "Half the Time" Between Firms, Heart Experts. American Society of Registered Nurses Apr 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
31. Beeler C: Blood pressure. Cholesterol. Guilt? Newsworks WHYY. Online Media Coverage of **James N. Kirkpatrick, M.D.** Apr 2011.
32. Burling S: Scrutinizing guidelines. The Philadelphia Inquirer Apr 2011 Notes: Media Coverage of **James N. Kirkpatrick, M.D.**
33. McCullough M: An End-of-Life dilemma. The Philadelphia Inquirer Apr 2011 Notes: Media Coverage of **James N. Kirkpatrick, M.D.**

34. Nauet R: Using guilt as prod to change behavior for heart health. PsychCentral Apr 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
35. O'Reilly KB. Financial ties to industry widespread on clinical guideline panels. AMEDNEWS/American Medical News Apr 2011 Notes: Online Media Coverage of James N. Kirkpatrick, M.D.
36. PhysOrg.com: Study shed light on end of life management of implanted defibrillators. PhysOrg.com Apr 2011 Notes: Online Media Coverage of **James N. Kirkpatrick, M.D.**
37. Stein J: Are You Sure You Need That Second Piece of Pie? Guilt as a Lifestyle Motivator. Los Angeles Times Apr 2011 Notes: Media Coverage of **James N. Kirkpatrick, M.D.**
38. Miller R: Conflicts of interest abound in diabetes/hyperlipidemia guidelines committees. The Heart.org Oct 2011 Notes: Media Coverage of **James N. Kirkpatrick, M.D.**
39. Caplan A, **Kirkpatrick JN**. Before you buy that defibrillator...Philadelphia Inquirer Jan 2012 Notes: January 11, 2012 and online via Philly.com [http://www.philly.com/philly/opinion/inquirer/20120111\\_](http://www.philly.com/philly/opinion/inquirer/20120111_)
40. **Kirkpatrick JN**, St John Sutton MG. Non-Cardiac Findings: Now You See Them... *Journal of the American Society of Echocardiography* 25(5): 558, May 2012.
41. Francis GS.: Too sick to understand: Doctor-patient device communication falls short. Heartwire – theheart.org forum Sep 2012 Notes: Media coverage of study by **James N. Kirkpatrick**.
42. **Kirkpatrick JN** quoted: Patients having devices lack information, says study. The Cardiomyopathy Association 11(3), Oct 2012 Notes: Dr. Kirkpatrick is quoted in 10/2/2012 posting online.
43. Kusterbeck S: Focus on satisfaction: Too much autonomy? Medical Ethics Advisor 28(10): 113-114, Oct 2012. Notes: **James N. Kirkpatrick** quoted.
44. **Kirkpatrick JN**, Kadakia MB, Vargas A. Management of conflicts of interest in cardiovascular medicine. *Progress Cardiovascular Disease* 55(3): 258-65, Nov 2012. PMID: 23217429
45. **Kirkpatrick JN**, Kim YY, Kaufman BD. Ethics priorities in adult congenital heart disease. *Progress Cardiovascular Disease* 55(3): 266-273, Nov 2012. PMID: 23217430
46. VanArtsdalen J, Goold SD, **Kirkpatrick JN**, Goldman E, Eagle K, Crawford T. Pacemaker Reuse for Patients in Resource Poor Countries: Is Something Always Better Than Nothing? *Progress in Cardiovascular Diseases* 55(3): 300-306, Nov-Dec 2012. PMID: 23217434
47. Mukulski J: Life After a Destination LVAD Implantation. Penn Med News Blog 2012. Notes: **James N. Kirkpatrick** quoted.
48. Beattie JM, **Kirkpatrick JN**. Informed consent for ICD implantation: a potential trigger to facilitate completion of a device-related advance directive. *Circulation: Cardiovascular Quality and Outcomes* 2012 Notes: URL: <http://circoutcomes.ahajournals.org/cgi/eletters/5/3/283#425>.
49. Fields AV, **Kirkpatrick JN**. Ethics of the Heart: ethical and policy challenges in the treatment of advanced heart failure. *Perspectives in Biology and Medicine* 55(1): 71-80, 2012.
50. Kadakia MB, **Kirkpatrick JN**, Silvestry FE. Echocardiography in Percutaneous Mitral Valve Interventions. *Curr Cardiovasc Imaging Rep*. MH PICARD, SECTION EDITOR (eds.). Springer Science+Business Media, LLC 5: 452-461, 2012.
51. **Kirkpatrick JN**, St John Sutton M. Assessment of ventricular remodeling in heart failure clinical trials. *Current Heart Failure Reports* 9(4): 328-36, Dec 2012 Notes: doi 10.1007/s11897-012-0116-6.
52. **Kirkpatrick JN**, Kaufman B. Why Should We Care About Ethical and Policy Challenges in Congenital Heart Disease? *World Journal for Pediatric and Congenital Heart Surgery* 4: 7-9, Jan 2013 Notes: doi:10.1177/2150135112454666 featured on MDLinx

53. Kusterbeck S. Reuse of devices in the developing world. *Medical Ethics Advisor* 29(1): 5-6, Jan 2013 Notes: **James N. Kirkpatrick** quoted.
54. Mikulski J. Yes or No? Penn News Today March 2013 Notes: 3/19/2013 [http://www.uphs.upenn.edu/news/News\\_Releases/2013/03/kirkpatrick/](http://www.uphs.upenn.edu/news/News_Releases/2013/03/kirkpatrick/) Notes: **James N. Kirkpatrick** quoted.
55. Medwire News Reporters: ICD switch-off a gray area for clinicians. medwire News March 2013 Notes: March 27, 2013 American College of Cardiology 2013; San Francisco, CA 9-11 March. [http://www.medwirenews.com/38/104001/Cardiology/ICD\\_switch-off\\_a\\_gray\\_area\\_for\\_clinicians.html](http://www.medwirenews.com/38/104001/Cardiology/ICD_switch-off_a_gray_area_for_clinicians.html). Notes: **James N. Kirkpatrick** quoted.
56. Kini V, **Kirkpatrick JN**. Ethical Challenges in Advanced Heart Failure. *Curr Opin Support Palliat Care* 7(1): 21-28, March 2013.
57. Kusterbeck S. Ethics of high-tech, high-cost interventions. *Medical Ethics Advisor* 29(4): 43-44, April 2013. Notes: **James N. Kirkpatrick** quoted.
58. Kusterbeck S. Communications, Negotiations are Necessary. *Medical Ethics Advisor* 2013 Notes: **Dr. Kirkpatrick** quoted.
59. Kini V, **Kirkpatrick JN**. Con: Patient's Desire for Termination of Destination LVAD Therapy Should Be Respected. *J Cardiothorac Vasc Anesth.* 27(5): 1051-2, October 2013
60. Stacey Kusterbeck. Guideline Committee Members May Have Conflicts of Interest. *Medical Ethics Advisor* March 2014 Notes: **James N. Kirkpatrick** quoted.
61. Lipman HI, Kalra A, **Kirkpatrick JN**. Foundations of medical decision-making for older adults with cardiovascular disease. *J Geriatr Cardiol.* 2015 Jul;12(4):335-9. doi: 10.11909/j.issn.1671-5411.2015.04.004.
62. Pak E, Wald J, **Kirkpatrick JN**. Multimorbidity and End of Life Care in Patients with Cardiovascular Disease. *Clin Geriatr Med.* 2016 May;32(2):385-97. doi: 10.1016/j.cger.2016.01.005.
63. Menkin E, **Kirkpatrick JN**. Navigating ‘The Conversation.’ Expert Analysis, ACC Online. Apr 27, 2016.
64. Kusterbeck S. Very Few Patients Address ICDs in Advance Care Planning. *Medical Ethics Advisor.* 2017 Jun;33(6):67-69. Notes: **Dr. Kirkpatrick** quoted.
65. **Kirkpatrick JN**. Professionalism Case Series: Patient Autonomy in End-of-Life Care. <http://www.acc.org>. July 26, 2017. Accessed [Insert Access Date]. <https://auth.acc.org/ACCFederatedLogin/PostSP?SP=DI&target=http://edu.acc.org/diweb/catalog/item/eid/cpc78>.
66. **Kirkpatrick JN**. Physician Conflict of Interest Disclosures to Journals for Device-Industry Ties Fall Short. <https://www.tctmd.com>. August 24<sup>th</sup>, 2018 <https://www.tctmd.com/news/physician-conflict-interest-disclosures-journals-device-industry-ties-fall-short>
67. Mulrow J, Doherty CL, Bernacki B, **Kirkpatrick J**, Rich MW, Alexander KP, Goodlin S. Palliative Care Considerations for Patients with Cardiovascular Disease Under Coronavirus Disease. <https://www.acc.org>. April 9, 2020 <https://www.acc.org/latest-in-cardiology/articles/2020/04/09/12/42/palliative-care-considerations-for-patients-with-cardiovascular-disease-under-coronavirus-disease-2019-covid-19>
68. Warraich, H, **Kirkpatrick, JN**. Acute Coronary Syndrome in an Older Adult with Recent or Ongoing Cancer Treatment: A Palliative Care Viewpoint. <https://www.acc.org>. January 9, 2020 <https://www.acc.org/latest-in-cardiology/articles/2020/01/03/08/01/acs-in-an-older-adult-with-recent-or-ongoing-cancer-treatment-palliative>
69. Mulrow, J, Doherty, CL, Bernacki, G, **Kirkpatrick, J**, Rich, MW, Alexander, KP, Goodlin, S, Palliative Care Considerations For Patients With Cardiovascular Disease Under COVID-19, *Journal of the American College of Cardiology, Cardiology Magazine* April 9, 2020.
70. **Kirkpatrick, JN, Bernacki, G**. Primary Prevention Statins in Older Patients The Good News or the Bad News First? *J Am Coll Cardiol.* 2020 Jul 7; 76(1): 28–30.

71. Mudigonda, P, **Kirkpatrick, JN**, Cheng, RK. Non-Invasive Cardiac Imaging for LVAD and OHT in Era of COVID-19. Expert Analysis, ACC online. August 5, 2020  
<https://www.acc.org/latest-in-cardiology/articles/2020/08/05/12/38/non-invasive-cardiac-imaging-for-lvad-and-oht-in-era-of-covid-19>
72. The Wide Variability in Ethics Consult Mandates in Medical Ethics Advisor, Your Practical Guide to Ethics Decision-Making, October 2020, Vol 36, No. 10; p.109-120
73. Deprescribing CV medications may benefit elderly patients with evolving treatment goals. Cardiology Today, October 20, 2020
74. Geriatric and Interventional Cardiology: Finding Intersectionality Through Case Based Learning. GCS Leadership Council and Members, Geriatric Cardiology Section Case Studies-20201015 2301-1, ACC WebEx, October 15, 2020

## 5. Manuscripts Submitted

1. Bernacki G, **Kirkpatrick JN**, Curtis, JR. Addressing cardiopulmonary resuscitation in patients with heart disease and novel coronavirus 2019 (COVID-19).
2. Young TJ, Gaieski DF, Kolansky DM, Khan AM, Perman SM, Merchant RM, **Kirkpatrick JN**. Provider Perspectives on the Duration of Cardiopulmonary Resuscitation After Cardiac Arrest.
3. Morcos M and **Kirkpatrick JN**. Left Atrial Thrombus (Contrast). Lang- ASE's Comprehensive Echocardiography, 3E
4. **Kirkpatrick JN**. Cardiac Assist Devices. Otto's Practice of Clinical Echocardiography 6e
5. Yamazaki, EM, Garcia-Rosendahl KM, MacMullen LE, Ecker AJ, **Kirkpatrick JN**, Goel N. Hemodynamic Profiles Predict Performance Resilience and Vulnerability to Sleep Loss and Stress.

## 6. Abstracts and Posters

1. **Kirkpatrick JN**, Gundry SR. Outcomes of Surgical Treatment of Total Anomalous Pulmonary Venous Return. Western Thoracic Surgical Society Meeting, Jun 1998.
2. **Kirkpatrick JN**, Gundry SR. Graft Ischemic Time and the Development of Coronary Artery Disease in Pediatric Heart Transplantation. American Society of Transplantation Meeting 1999.
3. Kaldjian LC, Jewel JF, Bernene JL, Wu B, Thomas-Geevarghese A, **Kirkpatrick JN**, Vaughn-Sarrazin M, Duffy TP. Aggressive palliation and physician-assisted suicide: Do house officers and established physicians think alike? Journal of General Internal Medicine 17(Suppl. 1): 173-174, Apr 2002.
4. Kaldjian LC, Wu B, **Kirkpatrick JN**, Thomas-Geevarghese A, Vaughn-Sarrazin M. Do house officers religious beliefs influence their ethical attitudes? A preliminary survey with implications for education in ethics and professionalism. Journal of General Internal Medicine 17(Suppl. 1): 228, Apr 2002.
5. Kaldjian LC, Wu B, **Kirkpatrick JN**, Thomas-Geevarghese A, Vaughan-Sarrazin M. Medical house officers' attitudes toward aggressive analgesia, terminal sedation, and assisted suicide in end-of-life care: Are there associations with training, demographic, and religious factors? Journal of General Internal Medicine 18(Suppl. 1): 245, Apr 2003.
6. **Kirkpatrick JN**, Ward RP, Lang RM, Bednarz JE, DeCara JM, Spencer KT. Comparison of modified acoustic quantification with echocardiographic contrast and radionuclide ventriculography for evaluation of left ventricular ejection fraction. Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions 43(5 Suppl. A): 374A, Mar 2004.

7. **Kirkpatrick JN**, DeCara JM, Lang RM, Spencer KT. Internist use of a hand carried ultrasound device for the screening of cardiovascular disease in the medically underserved. *Journal of The American College of Cardiology/American College of Cardiology Scientific Sessions* 43(5 Suppl. A): 409A, Mar 2004.
8. Ward RP, Leeper NJ, **Kirkpatrick JN**, Williams KA, Lang RM, Schwartz LB, Desai TR. Preoperative statins are associated with shorter length of stay and improved long term survival in patients undergoing vascular surgery. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 43(5 Suppl. A): 460A-461A, Mar 2004.
9. Ward RP, **Kirkpatrick JN**, Goonewardena SN, Lammertin G, Furlong KT, Balasia B, Spencer KT, Lang RM. Carotid intima-media thickness predicts complex aortic atheroma in patients referred for transesophageal echocardiography after stroke or TIA. *Circulation/American Heart Association Scientific Sessions* 110(17 Suppl. S): 1893 Oct 2004.
10. Brennan JM, Blair JE, Goonewardena S, Ronan A, Shah D, Vasaiwala S, Zhang JX, **Kirkpatrick JN**, Spencer KT. Estimation of central venous pressure by internal medicine residents using hand carried ultrasound devices compared to right heart catheterization. *Circulation/American Heart Association Scientific Sessions* 112(17 Suppl. S): 2795 Oct 2005.
11. **Kirkpatrick JN**, Collins KA, Heilig K, Wang YL, Lammertin G, Schlimme M, Hall J, Quigg R, Lang RM, Heilig C. Cardiac hypertrophy and renal disease in GLUT-1 overexpressing mice. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 47(4 Suppl. A): 38A, Feb 2006.
12. **Kirkpatrick JN**, Guger CJ, Fedson SE. Prevalence and predictors of advance directives in patients in the cardiac care unit. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 47(4 Suppl. A): 271A, Feb 2006
13. **Kirkpatrick JN**, Kim SS, Rajaguru S, Panutich MS, Burke MC, Knight BP. Practices and opinions of morticians regarding postmortem implantable device analysis and retrieval. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 47(4 Suppl. A): 14A, Feb 2006.
14. **Kirkpatrick JN**, Guger CJ, Arnsdorf MF, Fedson SE. Prevalence of advance directives in the CCU versus oncology services. *Circulation/American Heart Association Scientific Sessions* 113(21): E810-E811, May 2006.
15. **Kirkpatrick JN**, Ghani SN, Kim SS, Rajaguru S, Roberts M, Burke MC, Knight BP. Patients preferences regarding post-mortem implantable device analysis and retrieval: Potential for a "device advance directive" *Circulation/American Heart Association Scientific Sessions* 114(18 Suppl. S): 1981, Oct 2006.
16. Brennan JM, Blair J, Goonewardena S, Ronan A, Shah D, Vasaiwala S, **Kirkpatrick JN**, Spencer KT: Reappraisal of the use of IVC for estimating right atrial pressure. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 49(9 Suppl. A): 169A-170A, Mar 2007.
17. Farmer SA, **Kirkpatrick JN**, Heidenreich PA, Curtis JP, Wang Y, Groeneveld PW: Racial and ethnic differences in nationwide utilization of cardiac resynchronization therapy. *Circulation/American Heart Association Scientific Sessions* 116(16 Suppl. S): 3627 Oct 2007.
18. Farmer SA, **Kirkpatrick JN**, Heidenreich PA, Curtis JP, Wang YF, Groeneveld PW. Racial and ethnic differences in cardiac resynchronization therapy outside of published guidelines. *Circulation/American Heart Association Scientific Sessions* 116(16 Suppl. S): 3778 Oct 2007.



19. Dean A, Hayden G, Mark D, Ky B, Gracias V, **Kirkpatrick J**, Everett W. Bedside Ultrasonography Assessment of Mitral Valve Inflow Velocity and Tissue Doppler Are Similar to Echocardiography Measurements. *Academic Emergency Medicine* 2007.
20. Hayden G, Everett W, Mark D, Paszczuk A, Gracias V, **Kirkpatrick J**, Dean A. The Right Intercostal Window for IVC Measurement in Critically Ill Patients is an Alternative to Subxiphoid Views. *Academic Emergency Medicine* 2007.
21. Hayden GE, Worth WW, Ky B, McGovern S, Mark D, **Kirkpatrick JN**, Gracias VH, Dean AJ. Inferior vena cava measurements of intensivists and echocardiographers have small statistical differences. *World Congress on Ultrasound in Emergency and Critical Care* 2007.
22. Mark D, Hayden G, Paszczuk A, Ky B, Everett W, **Kirkpatrick J**, Dean A: Left Ventricular Ejection Fraction Estimation using Handheld Ultrasonography in Critically Ill Patients. *Academic Emergency Medicine* 2007.
23. **Kirkpatrick JN**, Romanelli J, Duffy KJ, Scott CH, Sutton MSJ, Wieggers SE, Keane MG. Women face higher risk for decline in left ventricular ejection fraction following orthotopic liver transplant. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 51(10 Suppl. A): A356, Mar 2008.
24. Ogbara J, Ky B, Fields AV, Rhamouni HW, Chirinos JA, Eberman KM, Keane MG, Silvestry FE, Glassberg HL, Farmer SA, Ferrari VA, Sutton MSJ, Wieggers SE, **Kirkpatrick JN**. Appropriateness of indications for transthoracic echocardiography by ordering physician specialty and predictors of management changing findings. *Circulation/American Heart Association Scientific Sessions* 117(21): 66 May 2008.
25. Testani J, Goldberg L, Chirinos JA, Khera A, **Kirkpatrick JN**. Inferior Vena Cava Inspiratory Collapsibility as a Predictor of Change in Renal Function During Hospitalization for Acute Decompensated Heart Failure. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 53(10 Suppl. 1): A162, Mar 2009.
26. Testani J, Ky B, Chirinos JA, Khera A, Keane MG, Ferrari VA, Sutton MS, **Kirkpatrick JN**. Clinical Categories of Pulmonary Artery Systolic Pressure by Echocardiography Versus Right Heart Catheterization in 619 Clinically-Performed Studies. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 53(10 Suppl. 1): A237, Mar 2009.
27. Anter E, Verdino RJ, St John Sutton MG, Callans DJ, Zado E, Marchlinski FE, **Kirkpatrick JN**. Cardiac Resynchronization Therapy Can Improve LV Function and Reduce Mitral Regurgitation in Patients with Refractory Heart Failure Early after Cardiac Surgery. *Heart Rhythm Society Scientific Sessions* May 2009.
28. Baman TS, **Kirkpatrick JN**, Lange DC, Oral H, Goldman EB, Eagle KA. Post-Mortem Cardiac Device Retrieval for Re-Use in Third World Nations: Views of Funeral Directors *Heart Rhythm Society Scientific Sessions* May 2009.
29. Chirinos J, Segers P, Gupta A, Swillens A, **Kirkpatrick J**, Keane M, Wieggers S, Ferrari V, St John Sutton M. Increased pulsatile systolic load in hypertension is associated with delayed left ventricular untwisting. *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* 53(10): A238, Mar 2009.
30. Chirinos JA, Segers P, Gupta A, Swillens A, **Kirkpatrick JN**, Keane MG, Ferrari VA, Wieggers SE, St John Sutton MG: Pulsatile Systolic Load is Associated With Delayed Left Ventricular Untwist in Hypertension *Journal of the American College of Cardiology, American College of Cardiology Scientific Sessions* Mar 2009.
31. Chirinos JA, Segers P, Gupta A, Swillens A, **Kirkpatrick JN**, Keane MG, Ferrari VA, Wieggers SE, St. John Sutton MG. Isometric Exercise-Induced Hemodynamic Load Strongly Predicts Left Ventricular Mass in Hypertension *Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions* Mar 2009.

32. Khera A, Testani J, **Kirkpatrick JN**. Inferior Vena Cava Collapsibility as a Predictor of Right- and Left-Sided Intracardiac Filling Pressures in 511 Clinical Studies. American Society of Echocardiography Scientific Sessions 2009.
33. Kini V, Logani S, Wieggers SE, St. John Sutton M, Chirinos JA, Keane MG, Ky B, Ferrari VA, Moss JD, Rahmouni HW, Farmer SA, Eberman K, **Kirkpatrick JN**. Blood Culture Results are not Associated with Vegetations on Transesophageal Echocardiography: Implications for the Appropriate Ordering of TEEs. American Society of Echocardiography Scientific Sessions 2009.
34. **Kirkpatrick JN**, Baman TS, Papini C, Eagle KA, Dixit S. Reuse of Pacemakers and Defibrillators in Developing Nations. American Society of Bioethics and Humanities Annual Meeting 2009.
35. Lange DC, **Kirkpatrick JN**, Oral H, Goldman EB, Eagle KA, Baman TS. Post-Mortem Cardiac Device Retrieval for Re-Use in Third World Nations: Views of the General Public and Patient Population Heart Rhythm Society Scientific Sessions 2009.
36. Mendelson B, **Kirkpatrick JN**, Litzky L, Verdino RJ. Feasibility of Post-Mortem Device Interrogation for Detection of Terminal Arrhythmias and/or Device Failure American Heart Association Scientific Sessions 2009.
37. Mendelson T, **Kirkpatrick JN**. Conflicts Of Interest In Clinical Practice Guidelines. American Heart Association Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke Conference 2009.
38. Ogbara J, Logani S, Ky B, Moss JD, Chirinos JA, Eberman K, Sutton B, Ryan G, Ferrari VA, Silvestry FE, Keane MG, St. John Sutton M, Wieggers SE, **Kirkpatrick JN**. Appropriateness and Clinical Utility in Carefully-Screened Transesophageal Echocardiograms. American Society of Echocardiography Scientific Sessions 2009.
39. Testani J, Yu A, McCauley B, Khera A, Owens A, **Kirkpatrick J**, St. John Sutton M, Wieggers S. Prevalence of Reduced Cardiac Index in a Post-Cardiac Transplant Population. Journal of Cardiac Failure/Heart Failure Society of America Scientific Sessions 15(6), 2009.
40. Testani J, McCauley B, Khera A, Yu A, Wieggers S, Owens A, St. John Sutton M, **Kirkpatrick J**. Effect of Right Ventricular Function on CardioRenal Interactions during the Treatment of Decompensated Heart Failure. Journal of Cardiac Failure/Heart Failure Society of America Scientific Sessions 15(6), 2009.
41. Yu AF, Wang Y, Marzec L, **Kirkpatrick JN**, Forfia PR. Differences in Accuracy of Doppler-Estimated Pulmonary Vascular Resistance Relate to the Degree of Left Atrial Pressure Contribution to Pulmonary Hypertension. Journal of Cardiac Failure/Heart Failure Society of America Scientific Sessions 16(8), Jan 2010.
42. Woksob L, Beach MC, Wieggers SE, **Kirkpatrick JN**. Medical practitioners' perspectives on guilt as a motivational tool. Communication, Medicine and Ethics 2010 meeting. Jun 2010.
43. **Kirkpatrick JN**, Hull S, Rame JE, Morris R. Ethical Dilemmas in Ventricular Assist Devices: A Paradigm for Ethical Discourse on Implantable Medical Devices. American Society for Bioethics and Humanities Annual Meeting Oct 2010.
44. **Kirkpatrick JN**, Patel R, Verdino J: Living Wills for Defibrillators. Patient Perspectives on End of Life Handling of ICDs. Journal of the American College of Cardiology/American College of Cardiology Scientific Sessions 55(10), 2010.
45. Testani J, Chen J, McCauley B, Khera A, St. John Sutton MG, Wieggers SE, **Kirkpatrick JN**. Right Ventricular Dysfunction is Associated with Improved Renal Outcomes during the Treatment of Decompensated Heart Failure. American Society of Echocardiography Scientific Sessions 2010.
46. Testani J, Chen J, McCauley B, St John Sutton MG, Wieggers SE, **Kirkpatrick JN**. Inferior Vena Cava Inspiratory Collapse is Poorly Correlated with Right Atrial Pressure but Significantly Predicts Outcomes in Patients with Decompensated Heart Failure: An Application of the Evaluation Study of Congestive Heart Failure and Pulmonary Artery

- Catheterization Effectiveness Trial Limited Dataset. American Society of Echocardiography Scientific Sessions 2010.
47. Baman TS, Gakenheimer L, Sovitch NE, Sovitch P, Romero J, **Kirkpatrick JN**, Wasserman B, Samson G, Jones H, Crawford T, Oral H, Eagle KE.: Feasibility of Device Acquisition with Adequate Battery Life for Potential Reuse in Underserved Nations. Heart Rhythm 2011 32nd Annual Scientific Sessions Apr 2011.
  48. Ferguson KM, Hull SC, Marble JF, Barg FK, **Kirkpatrick JN**. Caregiver Burden in LVAD-DT: A Pilot Study The International Society for Heart and Lung Transplantation 31st Annual Meeting and Scientific Sessions San Diego, CA Apr 2011.
  49. Gottlieb MG, Patel R, Verdino RJ, Baman TS, Eagle KA, **Kirkpatrick JN**. End of Life Management of ICDs: Patient Perspectives on Deactivation and Donation. American College of Cardiology 60th Annual Scientific Session Apr 2011.
  50. Gould AL, Woskob L, Jones NL, Beach MC, Wieggers SE, **Kirkpatrick JN**. Cardiovascular Patients' Perspectives on Guild as a Motivational Tool. American College of Cardiology 60th Annual Scientific Session Apr 2011.
  51. Patel RK, Emmi A, Wang Y, **Kirkpatrick JN**, Cooper JM. RV Only Pacing Can Produce a Q Wave in Lead I and an R wave in V1: Implications for Bi-ventricular Pacing. Heart Rhythm Society 2011 32nd Annual Scientific Sessions May 2011.
  52. Allen SF, Siddiqi O, Waldman L, Wieggers SE, Silvestry FE, **Kirkpatrick JN**, Szeto WY, Bavaria JE, Keane MG. Continued Aortic Root Dilation in Patients With Bicuspid Aortic Valves Following Isolated Aortic Valve Replacement American Society of Echocardiography Scientific Sessions Jun 2011.
  53. Rammohan HS, Raina A, Arkles J, Woo JY, St. John Sutton M, Wieggers SE, **Kirkpatrick JN**. Inferior Vena Cava Collapsibility is Predictive of Right Ventricular Failure Post-Left Ventricular Assist Device Placement American Society of Echocardiography Scientific Sessions Jun 2011.
  54. **Kirkpatrick JN**, Kellom K, Hull S, Rame JE, Barg FK. What Makes a Good Caregiver For a Destination Therapy LVAD Patient? Circ Cardiovasc Qual Outcomes. Presented at American Heart Association Quality of care and outcomes research conference, Atlanta, GA 5: A273, May 2012 Notes: May 2012.
  55. Vargas A, Mendelson TB, **Kirkpatrick JN**. Conflicts of Interest in Guidelines vs. Other Professional Society Statements. American Heart Association Quality of Care and Outcomes Research Conference, Atlanta, GA May 2012.
  56. **Kirkpatrick J**, Hull S, Kellom K, Henderson R, Barg F. Pumped up, but Not Prepared: Examining LVAD-DT Patients' Comprehension of Advance Directive Specifications. Journal of Cardiac Failure/Heart Failure Society of America Scientific Sessions 18(8): Supplement Page S37, Aug 2012.
  57. Kerolle S, Gould AL, Woskob L, Jones NL, Beach MC, Wieggers SE, **Kirkpatrick JN**. Cardiovascular Patients' Perspectives on Guilt as a Motivational Tool American Society of Bioethics and Humanities Annual Meeting Oct 2012 Notes: Poster session.
  58. **Kirkpatrick JN**, Aragam K, Crawford T, Lewis B. Reusing Pacemakers in the Developing World: moral imperative or conflict of values? American Society of Bioethics and Humanities Annual meeting Washington, DC. Panel Session 109, Oct 2012 Notes: 10/18/2012.
  59. Barg FK, **Kirkpatrick J**, Kellom K, Weiss E, Henderson R. LVAD-DT. An Irresistible Technology for the Treatment of Heart Failure. American Anthropological Association annual meeting, San Francisco, CA. 2012 Notes: 11/17/2012.
  60. Beattie JM, **Kirkpatrick JN**. Advance care planning and the management of implantable cardioverter defibrillators at the end of life. BMJ Supportive and Palliative Care 2(2): 189, 2012.

61. Zamani P, **Kirkpatrick JN**, Litzky LA, Verdino RJ. Longevity of Implantable Electrophysiology Devices Explanted from Patients Undergoing Autopsy in the Hospital Morgue. Heart Rhythm Society Scientific Sessions, Boston 2012 Notes: May, 2012.
62. Banchs J, Sanchez L, Sprague N, Bui YK, Main JC, **Kirkpatrick JN**. Point of Care Echocardiography in Rural Vietnamese Clinics. American Society of Echocardiography Scientific Sessions 2015, Boston, MA.
63. Kini V, Weiner RB, McCarthy F, Weigers SE, **Kirkpatrick JN**. Impact of Malpractice Concerns on Decisions to Order Echocardiography and Stress Tests. American Society of Echocardiography Scientific Sessions 2015, Boston, MA.
64. Blewer AL, Putt ME, Becker LB, Riegel BJ, Li J, Leary M, Shea JA, **Kirkpatrick JN**, Berg RA, Nadkarni VM, Groeneveld PW, Abella BS. Video-only cardiopulmonary resuscitation education for families before hospital discharge: a multicenter pragmatic clinical trial. American Heart Association Scientific Sessions 2015.
65. Moyer M, **Kirkpatrick JN**, Connor NR. Scripted nurse visits: A resource-efficient palliative care model for Destination VADs, Heart Failure Society of America Scientific Sessions 2015, National Harbor, MD.
66. Pak E, Zalewski C, Laverty-Wilson E, Wald, J, Rame JE, Atluri P, **Kirkpatrick JN**. How do Patients with Ventricular Assist Devices Die?- A Look at End of Life Outcomes, Heart Failure Society of America Scientific Sessions, 2015 National Harbor, MD.
67. **Kirkpatrick JN**, Gauvreau K, Hauptman PJ, Goodlin SJ, Cooper S, Josephson RA, Swetz KM, Maurer M, Hummel S, Ann Light-McGroary K, Brenes Salazar J, Doherty CL, Alpert C, Blume ED. What Is the Current State of Palliative Care for Patients With TAVR and VAD? A Survey of ACC Members. American College of Cardiology Scientific Sessions 2016, Chicago, IL, and Harborview Palliative Care Conference, Seattle, WA.
68. Blume ED, Gauvreau K, Cooper S, Hauptman PJ, Goodlin SJ, Bohannon K, Hummel S, Josephson RA, Doherty CL, Brenes-Salazar J, Maurer M, Light-McGroary K, Cestoni A, Alpert C, **Kirkpatrick JN**. Mind the Gap: Palliative Care Knowledge Among Cardiovascular Clinicians, American College of Cardiology Scientific Sessions 2016, Chicago, IL and Harborview Palliative Care Conference, Seattle, WA.
69. Alpert C, Hummel S, Gauvreau K, Bohannon K, Cooper S, Goodlin SJ, Josephson RA, Light-McGroary K, Swetz KM, Hauptman PJ, Cestoni A, Maurer M, Brenes-Salazar J, Doherty CL, Blume ED, **Kirkpatrick JN**. Deactivation of Ventricular Assist Devices: Who and When Results of an ACC Membership Survey. American College of Cardiology Scientific Sessions 2016, Chicago, IL, and Harborview Palliative Care Conference, Seattle, WA.
70. **Kirkpatrick JN**, Nguyen Hoi TT, Do Doan Loi, Le TT, Thai Son Pham, Adamds D, Sanchez LY, Sprague J, Inafuku J, Quang R, Hahn R, Van However A, Nguyen T, Kirkpatrick TG, Banchs J. Echocardiographic Screening in Older Adults and Health Insurance Decisions: A Report from the ASE-Vietnam National Heart Institute Collaborative Project. American Society of Echocardiography Scientific Sessions, 2016, Seattle, WA.
71. **Kirkpatrick JN**, Nguyen Hoi TT, Do Doan Loi, Le TT, Thai Son Pham, Adamds D, Sanchez LY, Sprague J, Inafuku J, Quang R, Hahn R, Van However A, Nguyen T, Kirkpatrick TG, Banchs J. Focused cardiac ultrasound by nurses in rural Vietnam: Results of the ASE-Vietnam National Heart Institute Collaborative Project. American Society of Echocardiography Scientific Sessions, 2016, Seattle, WA.
72. Carlson S, Kearney K, Li S, Fujioka M, Schwaegler B, **Kirkpatrick JN**. Accuracy of Preliminary Interpretations of Echocardiograms by Cardiology Fellows. American Society of Echocardiography Scientific Sessions, 2016, Seattle, WA.
73. Airhart S, Cheng R, **Kirkpatrick JN**, Masri SC. Tricuspid Annular Plane Systolic Excursion and Pulmonary Arterial Systolic Pressure Ratio as a Predictor of Early Right Heart

- Dysfunction After Left Ventricular Assist Device Implant. American Society of Echocardiography Scientific Sessions, 2016, Seattle, WA.
74. Webster LB, **Kirkpatrick JN**, Dudzinski D, Shannon, SE. Ethical Complexity of POLST Implementation: Should the POLST be treated differently than other physician's order? International Conference on Clinical Ethics Consultation, 2016, Washington, DC.
  75. Ortega-Legaspi JM, Airhart S, Nguyen H, Masri SC, Mokadam NA, Mahr C, **Kirkpatrick JN**. Echocardiographic Findings in Continuous-Flow Left Ventricular Assist Device Pump Thrombosis. Heart Failure Society of America Scientific Sessions, 2016, Orlando, FL.
  76. Airhart S, Cheng R, Dardas T, Kirkpatrick JN, Pal J, Smith J, Mokadam N, Mahr C, Masri C. Does Right Ventricular-Arterial Coupling Predict Early Right Heart Failure in LVAD Recipients? *J Heart Lung Transpl.* 2016;35(4), Supplement, pp S394-S395, International Society of Heart and Lung Transplantation Meeting, 2016, San Diego, CA.
  77. Dingfield L, **Kirkpatrick JN**, O'Connor N. Hospice Referral Patterns for Patients with Left Ventricular Assist Devices (LVAD). Annual Assembly of the American Academy of Hospital and Palliative Medicine, 2017, Phoenix, AZ.
  78. Swetz KM, Mancarella G, Dionne-Odom J, Wordingham SE, McIlvennan C, Goodlin S, Blume E, Alexander K, Cestoni A, Maurer M, Hauptman P, Bakitas M, **Kirkpatrick JN**. Describing Collaboration Between Cardiology and Palliative Care: A National Survey Study of Current Practices, Challenges and Barriers. American College of Cardiology Scientific Sessions, 2017, Washington, DC.
  79. LiK, **Kirkpatrick JN**, Cheng RK, Mokadam NA, Mahr C, Shively KB, Masri SC. Prolonged Right Ventricular Pre-ejection Time In Advanced Systolic Heart Failure Is A Marker Of Worse Right Ventricular Function. American Heart Association Scientific Sessions, Anaheim, CA 2017.
  80. Tiffany Chen, Selma Carlson, Amy Cheney, Todd Zwink, Rosario V. Freeman, **James N. Kirkpatrick**. Performance of Comprehensive Transesophageal Echocardiography: Quality Improvement Through Educational Intervention. American Society of Echocardiography Scientific Sessions, Nashville, TN 2018.
  81. James Lee, Quincy Pham, Tara Jones, G. Burkhard Mackensen, Rosario Freeman, **James Kirkpatrick**, Creighton Don. Adequacy of Immediate Post Procedure Transthoracic Echocardiogram for Transcatheter Aortic Valve Replacement Performed with Monitored Anesthesia Care. American Society of Echocardiography Scientific Sessions, Nashville, TN 2018.
  82. Hoai T.T. Nguyen, Le T.T, Keith A. Collins, Barry B. Canaday, Gregory H. Tatum, Susan A. Mayer, Eric L. Bonno, Jennifer Mercandetti, Michelle C. Fujioka, Carol M. Mortier, Debra A. Herring, Andrea M. Van Hoever, David Adams, Liza Y. Sanchez, Nova Sprague, Jill Inafuku, Rachel Quang, Tu Nguyen, Thanh G. Kirkpatrick, Rebecca Hahn, Jose Banchs, Loi Do Doan, Vinh N. Pham, **James N. Kirkpatrick**. Risk Factors, ECG and Small, Portable Echocardiography in Vietnam: A Report from ASE-Vietnam National Heart Institute Outreach Events. American Society of Echocardiography Scientific Sessions, Nashville, TN 2018.
  83. Alex Qin, Claudius Mahr, Jennifer Beckman, Nahush Mokadam, **James N. Kirkpatrick**. 2D vs. Novel 3D Assessment of Impella Temporary Mechanical Circulatory Support Devices. American Society of Echocardiography Scientific Sessions, Nashville, TN 2018.
  84. Li S, Beckman J, Chivukula V, Koomalsingh K, Smith J, Masri C, Dardas T, Cheng R, Stempien-Otero A, Lin S, Minami E, O'Brien K, Wood G, Farris S, **Kirkpatrick J**, Sheehan F, Leary P, Adedipe A, Nichol G, McCabe J, Rockom S, Aliseda A, Bansal N, Mokadam N, Mahr C. "Echocardiographic Estimates of Right Heart Pressures Fail to Approximate Invasive Hemodynamics in Continuous Flow VAD Patients." American Society for Artificial Internal Organs, Washington DC, 2018

85. Chivukula V, Beckman J, Li S, Mokadam N, Koomalsingh K, Smith J, Masri C, Dardas T, Cheng R, Stempien-Otero A, Lin S, Minami E, Wood G, Farris S, **Kirkpatrick J**, Sheehan F, Leary P, Rockom S, Mahr C, Aliseda A. “Hemodynamic Speed Optimization in VAD Support.” American Society for Artificial Internal Organs, Washington DC, 2018
86. Li S, Beckman J, Bjelkengren J, Mokadam N, Koomalsingh K, Smith J, Masri C, Dardas T, Cheng R, Stempien-Otero A, Lin S, O'Brien K, Wood G, Farris S, **Kirkpatrick J**, Sheehan F, Leary P, McLaughlin B, McCabe J, Rockom S, Aliseda A, Chivukula V, Mahr C. “Correlation of Doppler Opening Blood Pressure to Invasive Mean Arterial Pressure in Continuous Flow VADs.” American Society for Artificial Internal Organs, Washington DC, 2018
87. Beckman J, Chivukula V, Li S, Mokadam N, Koomalsingh K, Smith J, Masri C, Dardas T, Cheng R, Stempien-Otero A, Lin S, Minami E, Wood G, Farris S, **Kirkpatrick J**, Sheehan F, Rockom S, Aliseda A, Mahr C. “Atrial Fibrillation Increases Thrombogenicity of LVAD Support via Increased Platelet Shear Exposure and Residence Time.” American Society for Artificial Internal Organs, Washington DC, 2018
88. Aliseda A, Chivukula V, Beckman J, Li S, Mokadam N, Koomalsingh K, Smith J, Masri C, Dardas T, Cheng R, Stempien-Otero A, Lin S, Minami E, Wood G, Farris S, **Kirkpatrick J**, Sheehan F, Leary P, Rockom S, Mahr C. “Excessive LVAD Speed Causes Right Heart Pressure / Volume Overload and Precipitates RV Failure.” American Society for Artificial Internal Organs, Washington DC, 2018
89. Tatsuya Miyoshi, Karima Addetia, Alexandra Blitz, Roberto M. Lang, Federico M. Asch, **Kirkpatrick, JN**, On behalf of the WASE Investigators, “Comparison of Left Ventricular Stroke Volume in Healthy Adults Among Regions Around the World: Results from the World Alliance of Societies of Echocardiography (WASE) Normal Values Study”. EuroEcho2019, Vienna, Austria, 2019
90. Tatsuya Miyoshi, Karima Addetia, Alexandra Blitz, Roberto M. Lang, Federico M. Asch, **Kirkpatrick, JN**, On behalf of the WASE Investigators, “Left Ventricular Stroke Volume Differences among Echocardiographic Methods in Healthy Adults from the World Alliance of Societies of Echocardiography (WASE) Normal Values Study”. EuroEcho2019, Vienna, Austria, 2019
91. Singh A, Addetia K, Miyoshi T, Schreckenber g M, Blankenhagen M, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Soulat-Dufour L, Asch FM, Lang RM: Differences in left atrial dimensions by 3D analysis: Insights from a subset of the World Alliance of Societies of Echocardiography (WASE) Normal Values Study. American Society of Echocardiography Scientific Sessions, Denver, 2020.
92. Singh A, Addetia K, Miyoshi T, Schreckenber g M, Blankenhagen M, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Soulat-Dufour L, Asch FM, Lang RM: the evolving relationship of age and 3D left atrial phasic function using data from a subset of the World Alliance of Societies of Echocardiography (WASE) Normal Values Study. American Society of Echocardiography Scientific Sessions, Denver, 2020.
93. Soulat-Dufour L, Addetia K, Miyoshi T, Schreckenber g M, Blankenhagen M, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Asch FM, Lang RM: 2D/3D right atrial size according to age and gender: Results of the World Alliance of Societies of Echocardiography

- (WASE) Normal Values Study. American Society of Echocardiography Scientific Sessions, Denver, 2020.
94. Soulat-Dufour L, Lang RM, Miyoshi T, Schreckenberg M, Blankenhagen M, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Asch FM, Addetia K: Are there geographic differences in 2D/3D right atrial size? Results of the World Alliance of Societies of Echocardiography (WASE) Normal Values Study. American Society of Echocardiography Scientific Sessions, Denver, 2020.
  95. Soulat-Dufour L, Lang RM, Miyoshi T, Schreckenberg M, Blankenhagen M, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Asch FM, Addetia K: Impact of age on right atrial function: Results of the World Alliance of Societies of Echocardiography (WASE) Normal Values Study. American Society of Echocardiography Scientific Sessions, Denver, 2020.
  96. Addetia K, Miyoshi T, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: Normal Values for Right Ventricular Systolic Function Derived from an International, Multiethnic Cohort: Data from the WASE Study. ASE, 2021.
  97. Singh A, Miyoshi T, Addetia K, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: Right Ventricular Diastolic Parameters Relate to Gender, Age and Ethnic Groups: Data from the World Alliance of Societies of Echocardiography Study. ASE, 2021.
  98. Singh A, Singulane C, Miyoshi T, Prado A, Addetia K, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: Normal Values of 3D Left Atrial Volumes and Function: Data from the World Alliance of the Societies of Echocardiography Normal Values Study, ASE, 2021.
  99. Patel H, Miyoshi T, Addetia K, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: Normal Values of Aortic Size According to Age and Sex: Results of the World Alliance Societies of Echocardiography Study, ASE, 2021.
  100. Patel H, Miyoshi T, Addetia K, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick**

- JN, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: Normal Values of Cardiac Output and Stroke Volume According to Method, Age, Sex and Ethnicity: Results of the World Alliance of Societies of Echocardiography Study, ASE, 2021.**
101. Addetia K, Miyoshi T, Schreckenberg M, Blankenhagen M, Hitschrich N, Amuthan V, Citro R, Daimon M, Gutiérrez-Fajardo P, Kasliwal R, **Kirkpatrick JN**, Monaghan MJ, Muraru D, Ogunyankin KO, Park SW, Tude Rodrigues AC, Ronderos R, Sadeghpour A, Scalia G, Takeuchi M, Tsang W, Tucay ES, Zhang M, Mor-Avi V, Asch FM, Lang RM: 3D Echocardiography-Based Assessment of Left Ventricular Diastolic Function: A Report from World Alliance of Societies of Echocardiography (WASE) study. ASE, 2021.
102. Paddock A, Kim MM, Kersey C, Liu L, Kessler R, Adedipe A, **Kirkpatrick JN**, Huang G, Kwon Y: Cardiac Point-of-Care Ultrasound Publication Trends. ASE, 2021
103. Muraru D, Miyoshi T, Addetia K, Citro R, Daimon M, Desale S, Fajardo PG, Kasliwal RR, **Kirkpatrick JN**, Monaghan MJ, Ogunyankin KO, Park SW, Ronderos RE, Sadeghpour A, Scalia GM, Takeuchi M, Tsang W, Tucay ES, Tude Rodrigues AC, Vivekanandan A, Zhang Y, Blitz A, Lang RM, Asch FM, Badano L: Age- and Ethnicity-Specific Normative Values of TAPSE/PASP ratio from the World Alliance of Societies of Echocardiography (WASE) Study. ASE, 2021.

## 17. OTHER ACADEMIC/INSTITUTIONAL APPOINTMENTS

1993-1994	Instructor/Curriculum Coordinator, Academic Curriculum Institute, Los Angeles, California
1995	Volunteer Physician, Hospital de Valle De Angeles, Honduras
1998	Volunteer Physician, Ishaka Adventist Hospital, Uganda
1999	Volunteer Physician, Hospital Albert Schweitzer, Haiti
2001	Volunteer Physician, Center for Disease Control and Bach Mai Hospital, Hanoi, Vietnam
2006-2015	Volunteer Physician, Esperanza Health Center, Philadelphia, Pennsylvania
2006-2012	Associate Fellow, Center for Bioethics
2011-2015	Associate Fellow, University of Pennsylvania Center for Behavioral Health Research

## TEACHING POSITIONS

2006-2013	Fellows Echocardiography Conference: "Cardiac Masses", Cardiovascular Division of Medicine
2007-2010	Fellows Echocardiography Conference: "Septae and Shunts", Cardiovascular Division of Medicine
2007-2008	Stroke Grand Rounds: "Transesophageal Echocardiography", University of Pennsylvania Department of Neurology
2008-2010	Fellows Echocardiography Conference: "Strain", Cardiovascular Division of Medicine
2008-2015	Fellows Echocardiography Conference: "Echo Potpourri", Cardiovascular Division of Medicine



- 2008 "Reuse of Intracardiac Rhythm Management Devices: an Ethical Issue?" Bioethics Interest Group. University of Pennsylvania School of Medicine
- 2009-2015 Coordinator, Fellows Ethics Education Sessions. University of Pennsylvania Cardiovascular Division.
- 2009-2011 "Ethical Issues in Cardiovascular Medicine." Clinical Pastoral Care Education, Hospital of the University of Pennsylvania
- 2010 "Ethical Issues in Heart Failure" Ethics Grand Rounds. Hospital of the University of Pennsylvania, Department of Nursing. November 9, 2010
- 2010 "Reuse of Intracardiac Rhythm Management Devices." University of Pennsylvania Undergraduate Bioethics Interest Group
- 2011 "Cardioethics" University of Pennsylvania School of Medicine Bioethics Interest Group.
- 2011 "Cardiac Devices in the "Golden Years": All that Glitters" Hospital of the University of Pennsylvania Geriatrics Grand Rounds
- 2012 "Cardioethics: Getting to the Heart of Ethics" Department of Cardiology Grand Rounds Hospital of the University of Pennsylvania. January 26, 2012
- 2012 FR601 Bioethics and Professionalism 2012 "Conflicts of Interest in Clinical Practice Guidelines" February 21, 2012
- 2012 Empirical Bioethics Class 690 "Cardioethics" February 22, 2012
- 2012 "Palliative Care Issues in Cardiology: Naturally Complicated." University of Pennsylvania Interprofessional Palliative Care Seminar Series November 15, 2012
- 2012 Echocardiography Conference "Endocarditis"
- 2012 Echocardiography Conference "VAD Evaluation & Emergencies"
- 2012-2013 Echocardiography Conference: "RA/IVC/SVC"
- 2013 "New Cardiovascular Technologies and their Impact on End of Life Care Planning." Ethics Committee Educational Seminar, Hospital of the University of Pennsylvania Ethics Committee. February 7, 2013
- 2013 "Works in Progress" seminar. Department of Medical Ethics and Health Policy. May 1, 2013
- 2013 "Dilemmas of Devices: A Discussion About Pastoral Needs of Cardiac Patients and Their Families." Summer Clinical Pastoral Care Education Series, Hospital of the University of Pennsylvania
- 2013 "Echo and the Right Ventricle in Ventricular Assist Devices." Heart Failure Fellows Conference
- 2013 "Palliative Care Issues in Cardiology: Naturally Complicated." HUP Internal Medicine Resident Report. October 18, 2013
- 2013 "Cardiovascular Anatomy, Physiology and Pathophysiology for the Non-cardiologist." BSTA 510 Lecture: Intro to Human Health and Diseases
- 2014 "Size Matters: Appropriateness, Promises and Perils of Mini Echo Machines." Cardiology Grand Rounds, Cardiovascular Division, University of Pennsylvania. January 30, 2014
- 2014 "Ethics of Clinical Studies in Pulmonary Vascular Disease" The Alfred P. Fishman Symposium: New Treatment Approaches to Pulmonary Hypertension
- 2014 "Evaluation of Murmurs." Internal Medicine Resident Education Session. Hospital of the University of Pennsylvania. February 4, 2014
- 2014 "Empiricism in Cardioethics" Empirical Bioethics Today course lecture. School of Medicine, University of Pennsylvania. March 20, 2014
- 2014 "Conflicts of Interest in Clinical Practice Guidelines." FR601 Medical Student Lecture, University of Pennsylvania School of Medicine

- 2014 CV Pathophysiology Course, CV Physiologic Data Workshop. University of Pennsylvania School of Medicine. September 3, 2014
- 2015 "LVADs and Defibrillators and TAVR's, Oh My! Walking the Road with Patients who Have Implanted Cardiac Devices." Palliative Care Grand Rounds, Hospital of the University of Pennsylvania. May 19, 2015.
- 2015 "Delivering VAD News: Echo and VAD Emergencies." UW Fellows Didactic Conference. December 4, 2015
- 2016-present Cards A/Consult Didactic Lecture Series, Presenter, University of Washington
- 2017 "Truth Telling in Medicine." Harborview Medical Center Ethics Rounds. January 11, 2017
- 2017 "Advance Directives (AD) and Goals of Care (GOC) Discussions in Heart Failure" UW Fellows Didactic Conference. February 24, 2017
- 2017 "Informed Consent and Truth Telling: On a 'Need to know' basis, and YOU need to know!" UW Fellows Didactic Conference. April 21, 2017
- 2017 "Appropriate use of Imaging for CAD", University of Washington Cardiology A/Cardiology Consult Lecture Series. May 9, 2017
- 2017 "Ethics of Heart Failure Management." NW Heart Failure Collaborative, Project Echo. May 17, 2017
- 2017 "Update on Echocardiography in Heart Failure." CME Morning Rounds, University of Washington. May 23, 2017
- 2017 "Echo Trends." NW Heart Failure Collaborative, Project Echo. Dec 20, 2017
- 2017-2018 "Cardiac Stress Testing" UW Medicine Neighborhood Clinics.

### REVIEWING POSITIONS

- 2005-2006 Guest Editor/Perspectives in Biology and Medicine (Winter Edition)
- 2006- Reviewer/Echocardiography
- 2007 Reviewer/Perspectives on Biology and Medicine
- 2007 Reviewer/Bioinformatics and Genomics
- 2007- Reviewer/Journal of the American Society of Echocardiography
- 2008- Reviewer/American Journal of Cardiology
- 2008- Reviewer/Journal of Cardiac Failure
- 2009 Reviewer/European Journal of Heart Failure
- 2010 Reviewer/Heart Rhythm
- 2010- Reviewer/Circulation-Heart Failure
- 2010 Reviewer/Journal of Clinical Ethics
- 2010- Reviewer/Annals of Internal Medicine
- 2012-2013 Guest Editor/World Journal for Pediatric and Congenital Heart Surgery. Proceedings of Symposium on Ethical Challenges of Congenital Heart Disease, January 2013
- 2014- Reviewer/Journal of the American College of Cardiology-Imaging
- 2014- Reviewer/JAMA-Internal Medicine
- 2014- Reviewer/Journal of Palliative Care
- 2017- Reviewer/Circulation-Quality of Care and Outcomes

### LECTURE PRESENTATIONS

- Apr, 2003 "Clinical Ethics and Heart Failure: To Boldly Go Where..." Association of Black Cardiologists Heart Failure Symposium, Richmond, VA
- Mar, 2004 "Ethical Analysis in Clinical Electrophysiology: A Voyage Beyond 'Can'." South Atlantic Society of Electrophysiology for Allied Professionals annual meeting, Myrtle Beach, SC

- Sep, 2005 "Sherlockian Conundrums: 'Atypical Presentations of Cardiovascular and Respiratory Diseases' or 'Never Say, Elementary...'" Midwestern University, Downer's Grove, IL
- Jun, 2006 "Isolated Diastolic Dysfunction and Torsional Deformation." American Society of Echocardiography Scientific Sessions, Baltimore, MD
- Jun, 2006 "Echocardiographic Contrast Perfusion in the Differential Diagnosis of Cardiac Masses." American Society of Echocardiography Scientific Sessions, Baltimore, MD
- Jun, 2007 "Case of Echo and Heart Transplant." American Society of Echocardiography Annual Scientific Sessions, Seattle, WA
- Jun, 2007 "A View from the Apex: Aneurysms/Thrombi." American Society of Echocardiography Annual Scientific Sessions, Seattle, WA
- Jan, 2008 "Emerging Emergencies of Ethics and Implanted Cardiac Devices." Cooper University Hospital, UMDNJ Medical Center, Department of Emergency Medicine Grand Rounds, Camden, NJ
- Mar, 2008 "Echo for the Masses, Perfusion the Differential Diagnosis." 24th Annual International Conference on Recent Advances in Echocardiography and Allied Techniques, Chicago, IL
- May, 2008 "Outcomes Choices Framed in an Ethics Context." American Heart Association Conference: ECC Outcomes Consensus Conference. Washington, DC
- Jun, 2008 "Vena Contracta." American Society of Echocardiography Annual Scientific Sessions, Toronto, ON, Canada
- Nov, 2008 "A Tragic Case of Echo and Occam's Razor." 18th Annual International Conference on Echocardiography and Allied Techniques: Case Studies and Recent Advances in Echocardiography, New Orleans, LA
- Apr, 2009 "Considerations in Special Populations with Cardiovascular Disease." American College of Physicians Scientific Sessions, Philadelphia, PA
- May, 2009 Panel discussant: "Establishing an International Emergency Cardiopulmonary Bypass Network." International ECPB Network Conference. Philadelphia, PA
- Jun, 2009 "Aortic Stenosis with Normal Ejection Fraction". American Society of Echocardiography Scientific Sessions, Washington, DC
- Sep, 2009 "Looking out for the Patient--Ethics and Implanted Cardiac Devices." 15th Annual Workshop of the South Atlantic Society of Electrophysiology for Allied Health Professionals, Myrtle Beach, SC
- Jan, 2010 "Reuse of Pacemaker/Defibrillators in Developing Nations." University of Pennsylvania Penn Undergraduate Bioethics Interest Group, Philadelphia, PA
- Mar, 2010 "To the OR or not to the OR?" 26th Annual International Conference on Recent Advances in Echocardiography and Allied Techniques, Atlanta, GA
- Jun, 2010 "Overview of Echo and Ventricular Assist Devices." American Society of Echocardiography Scientific Sessions, San Diego, CA
- Jun, 2010 "The Right Atrium-The Forgotten Chamber." American Society of Echocardiography Scientific Sessions, San Diego, CA
- Nov, 2010 "3D for 3V" 20th Annual International Conference on Echocardiography and Allied Technique, Chicago, IL
- Mar, 2011 "Echo and Ventricular Assist Devices: Novel Applications of Emerging Imaging Modalities" Keith Hackney Memorial Lecture, Delaware Valley Echo Society, Philadelphia, PA
- May, 2011 "Device Reprocessing and Re-Implantation: Humanitarian Considerations and Potential for Cost Containment." Heart Rhythm 2011. 32nd Annual Scientific Sessions, San Francisco, CA

- Jun, 2011 "Mini Case Presentation on the Discussion of Quality Considerations." American Society of Echocardiography Scientific Sessions, Montreal, Quebec, Canada
- Jun, 2011 "TR and PR - Where Are We?" American Society of Echocardiography Scientific Sessions, Montreal, Quebec, Canada
- Jun, 2011 "Preliminary Reports - When and Why." American Society of Echocardiography Scientific Sessions, Montreal, Quebec, Canada
- Sep, 2011 "End of life: when the heart is taken out of the equation." Heart Failure Society of American Scientific Meeting, Boston, MA
- Sep, 2011 "Changing Goals of Care in Advanced Disease" 15th Annual Scientific Meeting Heart Failure Society of America, Boston, MA
- Nov, 2011 "Hemodynamic Measurements by Echocardiography and Current Dynamics in 'Cardioethics': Some Things Always Change." Mercy Health System Medical Grand Rounds Program, Conshohocken, PA
- Nov, 2011 "A Different Way of "Going Green": Reuse of Pacemakers" MacLean Conference, MacLean Center for Clinical Medical Ethics, Chicago, IL
- Feb, 2012 "Conflicts of Interest in Cardiovascular Clinical Practice Guidelines" Abington Memorial Hospital Medical Grand Rounds, Abington, PA
- Mar, 2012 "Interesting Case Studies" 28th Annual International Conference on Recent Advances In Echocardiography and Allied Techniques, Chicago, IL
- May, 2012 "Pre-implant Ethical Dilemmas in Mechanical Circulatory Support." Program for Biomedical Ethics Seminar Series. Yale-New Haven Hospital. New Haven, CT
- Jul, 2012 "Heart Failure: Transplant and Left Ventricular Assist Devices (LVAD) Can We Diagnose Transplant Rejection?" American Society Echocardiography 2012 Scientific Sessions, National Harbor, MD
- Jul, 2012 "Contrast Fundamentals Identification of Masses" American Society of Echocardiography 2012 Scientific Sessions. National Harbor, MD.
- Jul, 2012 "Diastole - Relax! Volume Status - Is Echo a Non-Invasive Swan?" American Society of Echocardiography 2012 Scientific Sessions. National Harbor, MD.
- Sep, 2012 "Cardiac Advanced Directives: How hard it can be?" Georgia Health Sciences University 2012 annual cardiac conference Registered Nurses symposium, Atlanta, GA
- Sep, 2012 "Resuscitating Ethics in Cardiac Arrest" Georgia Health Sciences University 2012 Annual Cardiac Conference, Atlanta, GA.
- Sep, 2012 "Destination Ethics: Conundrums in LVAD-DT" Georgia Health Sciences University 2012 Annual Cardiac Conference, Atlanta, GA
- Sep, 2012 "Symptom Burden and Palliation" Heart Failure Society of America 16th Annual Scientific Meeting, Seattle, WA
- Jan, 2013 "The Good, the VAD and the Echo: Imaging of Mechanical Circulatory Support" Cardiology Grand Rounds, Temple University, Philadelphia, PA. 1/25/2013
- Jan, 2013 "The Good, the VAD and the Echo: Imaging Mechanical Circulatory Support" Penn Presbyterian Medical Center Cardiology Grand Rounds, Philadelphia, PA. 1/17/2013
- Mar, 2013 "Cardiomyopathy After Pregnancy or...Got LVAD?" American College of Cardiology Annual Scientific Session, San Francisco, CA 3/9-11/2013
- Mar, 2013 "Mysterious Ways: God's Lessons for a Cardiologist through Heart Surgery" Medical Campus Outreach, Philadelphia, PA March 3, 2013.
- Apr, 2013 "Hand Carried Cardiac Ultrasound" Cardiovascular Centre at Hue Central Hospital, Hue, Vietnam. April 15, 2013.
- May, 2013 "EF Roulette: Comparing Different Imaging Modalities in Determining Left Ventricular Ejection Fraction." Heart Rhythm Society Scientific Sessions, May 10, 2013, Denver, CO

- Jun, 2013 "RV Function on LVAD Support: What does the Long Term Look Like?" Gordon Research Conference: Assisted Circulation. Renaissance Tuscany II Choco Resort in Lucca (Barge) Italy. June 25, 2013.
- Jun, 2013 "The importance of the RV in VAD patients" American Society of Echocardiography Scientific Sessions 2013 June 30, 2013, Minneapolis, MN
- Jul, 2013 "Echo Feature of LVADs/Impalas: How and What to Assess" American Society of Echocardiography Scientific Sessions 2013 July 1, 2013, Minneapolis, MN
- Sep, 2013 "Transitions", Christian Medical and Dental Association/Medical Campus Outreach Interned Fall retreat for Philadelphia Health Sciences Schools, Drexel College of Medicine, Philadelphia, PA
- Sep, 2013 "Legal Foundations of Autonomy and Shared Decision-Making" Promoting Patient-Centered Care: Challenges to Autonomy and Justice in a Technological Era. Heart Failure Society of America 2013 Scientific Sessions, Orlando, FL September 22-25, 2013
- Oct, 2013 "Ethics ICU/Devices/ECMO and Discontinuation of Care", Georgia Health Sciences University Annual Cardiac Conference, Atlanta, GA
- Nov, 2013 "Ethical Issues at the end of life end of life management of implantable cardiac devices" 25th Annual MacLean Center Conference, MacLean Center for Clinical Medical Ethics, University of Chicago, Chicago, IL
- Nov, 2013 "Portrait of an LVAD: Imaging in Mechanical Circulatory Support" Cardiology Grand Rounds, University of Chicago, Chicago, IL
- Jan, 2014 "Escape from the Appropriateness Police" Cardiovascular Institute Echocardiography Update, Philadelphia, PA Jan 12, 2014.
- Jan, 2014 "Portrait of an LVAD", Cardiovascular Imaging Rounds, Jan 13, 2014, Brigham and Women's Hospital, Boston, MA
- Mar, 2014 "Pocket-size Echo: The Good and the Bad of Being More Than Just an Ultrasonographic Stethoscope." American College of Cardiology 2014, Scientific Sessions, Joint Symposium of the Italian and Pennsylvania Chapters of the American College Cardiology.
- Apr, 2014 "Ethics of Clinical Studies in Pulmonary Vascular Disease." The Alfred P. Fishman Symposium: New Treatment Approaches to Pulmonary Hypertension, Philadelphia, PA
- Apr, 2014 "More than Plumbing and Electricity: Ethics and Meaning in Implantable Devices". Transplant Grand Rounds, Mayo Clinic, Rochester, MN
- Nov, 2014 "Death is not what it used to be." 26th Annual MacLean Center Conference, MacLean Center for Clinical Medical Ethics, University of Chicago, Chicago, IL
- Jun, 2014 "The Sunshine Act and Handing of Industry Relationships." American Society of Echocardiography Scientific Sessions, Portland, OR
- Jul, 2014 "When to Introduce Palliative Care" Debate. American Association of Heart Failure Nurses. Webinar Session, University of Pennsylvania Healthcare System.
- Apr, 2015 "Cardiac Palliative Care: Not so New horizons" Abington Hospital Grand Rounds, Abington, PA
- May, 2015 "Last exit off the cardiac freeway: ethical considerations in palliative care and cardiovascular implantable electronic devices", MacLean Center for Clinical Medical Ethics End of Life Seminar Series, University of Chicago, Chicago, IL
- Jun, 2015 "When is a ramp necessary?" American Society of Echocardiography Scientific Sessions, Boston, MA
- Jul, 2015 "Cardiac Devices and Ethical and Legal Implications for the Determination of Death." International Academy of Law and Mental Health, Vienna, Austria

- Aug, 2015 “Focused Cardiac Ultrasound: Ready for Vietnam?” Vietnam National Heart Institute-American Society of Echocardiography Symposium, Hanoi, Vietnam
- Aug, 2015 “Hemodynamic Measurements by Echocardiography.” Vietnam National Heart Institute-American Society of Echocardiography Symposium, Hanoi, Vietnam
- Aug, 2015 “Research Ethics.” Bach Mai Hospital, Hanoi, Vietnam
- Nov, 2015 “Imaging in the HVAD patient” University of Washington HeartWare Training.
- Apr, 2016 “An Older Adult with Advanced Heart Failure, Multiple Chronic Conditions and Frailty” American College of Cardiology Scientific Sessions 2016, Chicago, IL
- May, 2016 “Imaging in the HVAD patient” University of Washington HeartWare Training. Seattle, WA
- Jun, 2016 “How and when to discuss device deactivation” 26th International Symposium on Congenital Heart Disease in the Adult: Innovation Past and Present, Skamania, WA
- Jun, 2016 “Predicting Right Ventricular Failure: 2D? 3D? Strain?” American Society of Echocardiography Scientific Sessions, Seattle, WA
- Jun, 2016 Is This Right Ventricle Good Enough to Support An LVAD? American Society of Echocardiography Scientific Sessions, Seattle, WA
- Jun, 2016 Hanoi, Vietnam: Effect on the Delivery of Healthcare. American Society of Echocardiography Scientific Sessions, Seattle, WA
- Jun, 2016 “Truth Telling in Practice“ Medical Ethics in the 21st Century: A Practical Skill-Building Approach to Ethical Reasoning in Healthcare” Virginia Mason Clinic, Seattle, WA
- Jun, 2016 "Mechanical Circulatory Support Imaging Guidelines: The What, the How and the Why of performing really VAD Echocardiography" Delaware Valley Echo Society Meeting, Philadelphia, PA
- Jun, 2016 “Speed Change Echocardiography” Multimodality Imaging Conference, University of Pennsylvania, Philadelphia, PA
- Aug, 2016 “How To: Having Tough Discussions with Patients and Families—Critical Conversations” Panelist, Heart Failure Society of America Scientific Sessions, Orlando, FL
- Sept, 2016 “Impact of Symptom Burden and Episodic Distress” Heart Failure Society of America Scientific Sessions, Orlando, FL
- Oct, 2016 “Imaging in the HVAD Patient” University of Washington HeartWare Training. Seattle, WA
- Mar, 2017 “Palliative Care along the VAD Journey.” INTERMACS 11<sup>th</sup> Annual Meeting and Scientific Sessions, Atlanta, GA
- Apr, 2017 “Imaging in the HVAD Patient” University of Washington HeartWare Training. Seattle, WA
- Jul, 2017 “Ethical Aspects of Withdrawing Implantable Cardioverter-Defibrillator and Ventricular Assist Device Support from Patients Approaching Death” International Congress on Academy of Law and Mental Health, Prague
- Sept, 2017 “Sexuality and Intimacy in Patients with LVADs and their Partners: Uncovering the Un-discussed Facts”, University of Washington Cardiovascular Grand Rounds, Seattle, WA
- Oct, 2017 “Should we Still Assess Dyssynchrony?” Vietnam National Heart Association National Scientific Meeting 2017 Updates in Management of Heart Failure, Thanh Hoa City, Vietnam
- Oct, 2017 “Roles of Stress Echocardiography in Assessment of Patients with Valvular Heart Diseases” Vietnam National Heart Association National Scientific Meeting 2017 Updates in Management of Heart Failure, Thanh Hoa City, Vietnam

- Oct, 2017 “Quality in Heart Failure Echocardiography” Vietnam National Heart Association National Scientific Meeting 2017 Updates in Management of Heart Failure, Thanh Hoa City, Vietnam
- Nov, 2017 “The role of ultrasound imaging in the assessment of LVAD, Impella and other circulatory support devices.” American Heart Association Scientific Sessions, Anaheim, CA
- June 2018 “Ethical Challenges in the Practice of Echocardiography: What is Right and How Do We Do It?” Inaugural Richard E. Kerber Ethics/Humanitarian Lecture, ASE, Nashville, TN
- July 2018-19 “Negotiating Autonomy and Beneficence in Clinical Care”, Annual Summer Seminar in Healthcare Ethics, Seattle, WA
- Oct 2018 “Quality in Echocardiography” Vietnam National Heart Association National Scientific Meeting, Da Nang, Vietnam
- Oct 2018 “Perspectives on the Right Ventricle: Structural and Functional Assessment” Vietnam National Heart Association National Scientific Meeting, Da Nang, Vietnam
- July, 2019 “Cardiac Devices: The Meaning of the Machinery of Life-Prolongation” International Congress on Law and Mental Health, Rome, Italy
- July, 2019 ”Ethics, Humanities, and the Future of Mechanical Circulatory Support” International Congress on Law and Mental Health, Rome, Italy
- Sept, 2019 “Cardioethics: Cases from the trenches” University of Washington Cardiovascular and Bioethics Grand Grand Rounds, Seattle, WA
- Nov, 2019 “3D echocardiography in imaging the tricuspid valve” Vietnam National Heart Association/Vietnam National Heart Institute Congress, Hanoi, Vietnam
- Nov, 2019 “HFpEF: What are we are looking for?” Vietnam National Heart Association/Vietnam National Heart Institute Congress, Hanoi, Vietnam
- Nov, 2019 “POCUS is coming” for CVD screening” Vietnam National Heart Association/Vietnam National Heart Institute Congress, Hanoi, Vietnam
- Nov, 2019 “Echocardiography and Cardiac Masses” Bach Mai Hospital, Hanoi, Vietnam
- Nov, 2019 “Perspectives on the Right Ventricle: Structural and Functional Assessment” Bach Mai Hospital, Hanoi, Vietnam
- Feb, 2020 “Promoting Quality in Hand-held Cardiac Ultrasound - What is the Future?” American College of Cardiology Cardiovascular Summit
- Apr, 2020 Disability Ethics, UW LEND Fellows Conference, Seattle, WA
- Apr, 2020 COVID-19 and Echocardiography: Insights from the Frontlines. Brigham and Women’s Hospital Imaging Rounds
- Apr 2020 Role of Multimodality Imaging in Diagnosis and Management in Patients With COVID-19. Webinar Session, American College of Cardiology
- Apr, 2020 Practice Made Perfect: Addressing COVID-19 While Ensuring the Safety and Well-Being of our Geriatric Patients (Part 1). Bailey, A, **Kirkpatrick, JN**, Maurer, MS, Orr, N
- May, 2020 Practice Made Perfect: Addressing COVID-19 While Ensuring the Safety and Well-Being of our Geriatric Patients (Part 2). Bailey, A, **Kirkpatrick, JN**, Maurer, MS, Orr, N
- June, 2020 Echo is the first choice for LAA occlusion planning  
Gladiators arena: Great debates in cardiovascular CT (and echo). Society of Cardiac Computed Tomography Scientific Sessions
- June, 2020 Multimodality Imaging in Acute and Chronic COVID19: Echocardiography First. Society of Cardiac Computed Tomography Scientific Sessions
- July, 2020 Ethical Dilemmas Surrounding Care for Patients with COVID-19. Chief of Medicine Rounds at the University of Washington Medical Center.

- Aug, 2020 Mechanical Circulatory Support for the Right Ventricle. American Society of Echocardiography Scientific Sessions
- Aug, 2020 Point of Care US training for the clinician. American Society of Echocardiography Scientific Sessions
- Sept, 2020 Research Misconduct. UW Cardiology Grand Rounds
- Oct, 2020 HFrEF: Where should be going in 2020? Vietnam National Heart Association Congress
- Oct, 2020 The use of POCUS in different clinical settings. Vietnam National Heart Association Congress
- Oct, 2020 Why we all need more strain in life. Vietnam National Heart Association Congress

### **ORGANIZING ROLES IN SCIENTIFIC MEETINGS**

- Nov, 2008 Chair/Moderator, Abstract Session of the American Heart Association Scientific Sessions, New Orleans, LA
- Jun, 2009 Chair/Moderator. Valve Disease computer tutorial. American Society of Echocardiography Scientific Sessions, Washington, DC
- Jun, 2009 Chair/moderator. Moderated Oral Abstract Poster Session. American Society of Echocardiography Scientific Sessions, Washington, DC
- Mar, 2010 Faculty discussion facilitator, poster session. American College of Cardiology Scientific Sessions, Atlanta, GA
- Jun, 2010 Moderator, Moderated Oral Poster Session, Quality, Appropriateness, Lab Accreditation, Ergonomics, and Outcomes Research. American Society of Echocardiography Scientific Sessions, San Diego, CA
- Jun, 2011 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, Montreal, Quebec, Canada
- Jun, 2011 Co-chair How to Put the "Q" in Quality American Society of Echocardiography 22nd Annual Scientific Sessions, Montreal, Quebec, Canada
- Jun, 2011 Co-chair, Ethics in Echo. American Society of Echocardiography 22nd Annual Scientific Sessions, Montreal, Quebec, Canada
- Jun, 2012 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, National Harbor, Maryland
- Sep, 2012 Moderator, Management in Nursing Homes. Heart Failure Society of America 16th Annual Scientific Meeting, Washington State Convention Center, Seattle WA
- Jun, 2013 Moderator: "Echo in Patients with VADs" American Society of Echocardiography Scientific Sessions 2013, Minneapolis, MN
- Jun, 2013 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, Minneapolis, MN
- Jun, 2014 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, Portland, OR
- Jun, 2015 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, Boston, MA
- Jun, 2016 Moderator: "ASE Foundation Global Initiatives: Humanitarian Missions in Argentina and Vietnam." American Society of Echocardiography Scientific Sessions, Seattle, WA
- Jun, 2016 Abstract Reviewer. American Society of Echocardiography Scientific Sessions, Seattle, WA
- Mar, 2017 Organizer and Moderator, "Palliative Care for the 99%", Intensive, American College of Cardiology scientific Sessions 2017, Washington, DC



2015-present Abstract Reviewer. American Society of Echocardiography Scientific Sessions  
2016-present Moderator. American Society of Echocardiography Scientific Sessions  
Oct, 2018 Moderator. Vietnam National Heart Association Scientific Sessions, Da Nang, Vietnam  
Nov, 2019 Moderator. Vietnam National Heart Association/Vietnam National Heart Institute Congress, Hanoi, Vietnam  
Mar, 2020 Committee Member: ACC.20/World Congress of Cardiology Program, Cardiac Imaging (Echocardiography, Nuclear, PET, MR & CT)  
Aug, 2020 Committee Member: ASE Scientific Program  
Aug 2020 Senior Co-Chair, Episodes of Care #3, ASE Scientific Sessions 2020  
May, 2020 Committee Member: ACC.21 Program, Cardiac Imaging (Echocardiography, Nuclear, PET, MR & CT)  
Oct, 2020 Moderator and co-chair, POCUS training village. Vietnam National Heart Association Virtual Congress  
Oct, 2020 Panelist, Cardiology in 2020: Challenges and Opportunities. Vietnam National Heart Association Virtual Congress  
Oct, 2020 Chairperson: Future of Echocardiography. Vietnam National Heart Association Virtual Congress  
Oct, 2020 Frailty and Geriatric Considerations. Great Wall International Congress of Cardiology (Virtual)  
May, 2020 Abstract Reviewer, ACC.21  
June, 2021 Committee Member and Chair of Function Track, ASE Scientific Sessions Program 2021  
June, 2021 Abstract co-chair, ASE Scientific Sessions 2021

Applicant Name James Kirkpatrick

Address 1959 Pacific St

Seattle, WA 98125

[Click here to enter text.](#)

### 1. Business Activities

(a) If you or a member of your household was ***an officer or director of a business*** during the immediately preceding calendar year and the current year to date, provide the following:

Title	Business Name & Address	Business Type
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>

(b) If you or a member of your household ***did business under an assumed business name*** during the immediately preceding calendar year or the current year to date, provide the following information:

Business Name	Business Address	Business Type
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>

### 2. Honorarium

If you ***received an honorarium of more than \$100*** during the immediately preceding calendar year and the current year to date, list all such honoraria:

Received From	Organization Address	Service Performed
Cardiovascular Institute of Philadelphia	Cardiovascular Institute of Philadelphia P.O. Box 56598 Philadelphia, PA 19111 <a href="http://www.cviphiladelphia.org">www.cviphiladelphia.org</a>	Educational lecture
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>
<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>	<a href="#">Click here to enter text.</a>

### 3. Sources of Income

(a) Identify ***income source(s) that contributed 10% or more of the combined total gross household income*** received by you or a member of your household during the immediately preceding calendar year and the current year to date.

Source Name & Address	Received By	Source Type
University of Washington	self	salary
Hope Central Pediatrics	wife	salary

Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

(b) Does any income source listed above relate to, or could it reasonably be expected to relate to, business that has, or may, come before the Committee?

Yes  No

If "yes", describe: Click here to enter text.

Click here to enter text.

Click here to enter text.

(c) Does an income source listed above have a legislative or administrative interest in the business of the Committee?

Yes  No

If "yes", describe: Click here to enter text.

Click here to enter text.

Click here to enter text.

#### 4. Business Shared With a Lobbyist

If you or a member of your household ***shared a partnership, joint venture, or similar substantial economic relationship with a paid lobbyist***, were employed by, or employed, a paid lobbyist during please list the following:

(Owning stock in a publicly traded company in which the lobbyist also owns stock is not a relationship which requires disclosure.)

Lobbyist Name	Business Name	Type Business Shared
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

**Provide the information requested in items 5, 6, and 7 below only if:**

(a) Your response involves an individual or business if you or a member of your household did business with, or reasonably could be expected to relate to business that has or may come before the Health Technology Clinical Committee.

(b) The information requested involves an individual or business with a legislative or administrative interest in the Committee.

#### 5. Income of More Than \$1,000

List each source (***not amounts***) of income over \$1,000, other than a source listed under question 3 above, which you or a member of your household received during the immediately preceding calendar year and the current year to date:

Income Source	Address	Description of Income Source
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

**6. Business Investments of More Than \$1,000**

(Do not list the amount of the investment or include individual items held in a mutual fund or blind trust, a time or demand deposit in a financial institution, shares in a credit union, or the cash surrender value of life insurance.)

If you or a member of your household had a personal, beneficial interest or investment in a business during the immediate preceding calendar year of more than \$1,000, list the following:

Business Name	Business Address	Description of Business
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

**7. Service Fee of More Than \$1,000**

(Do not list fees if you are prohibited from doing so by law or professional ethics.)

List each *person for whom you performed a service for a fee of more than \$1,000* in the immediate preceding calendar year or the current year to date.

Name	Description of Service
Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.

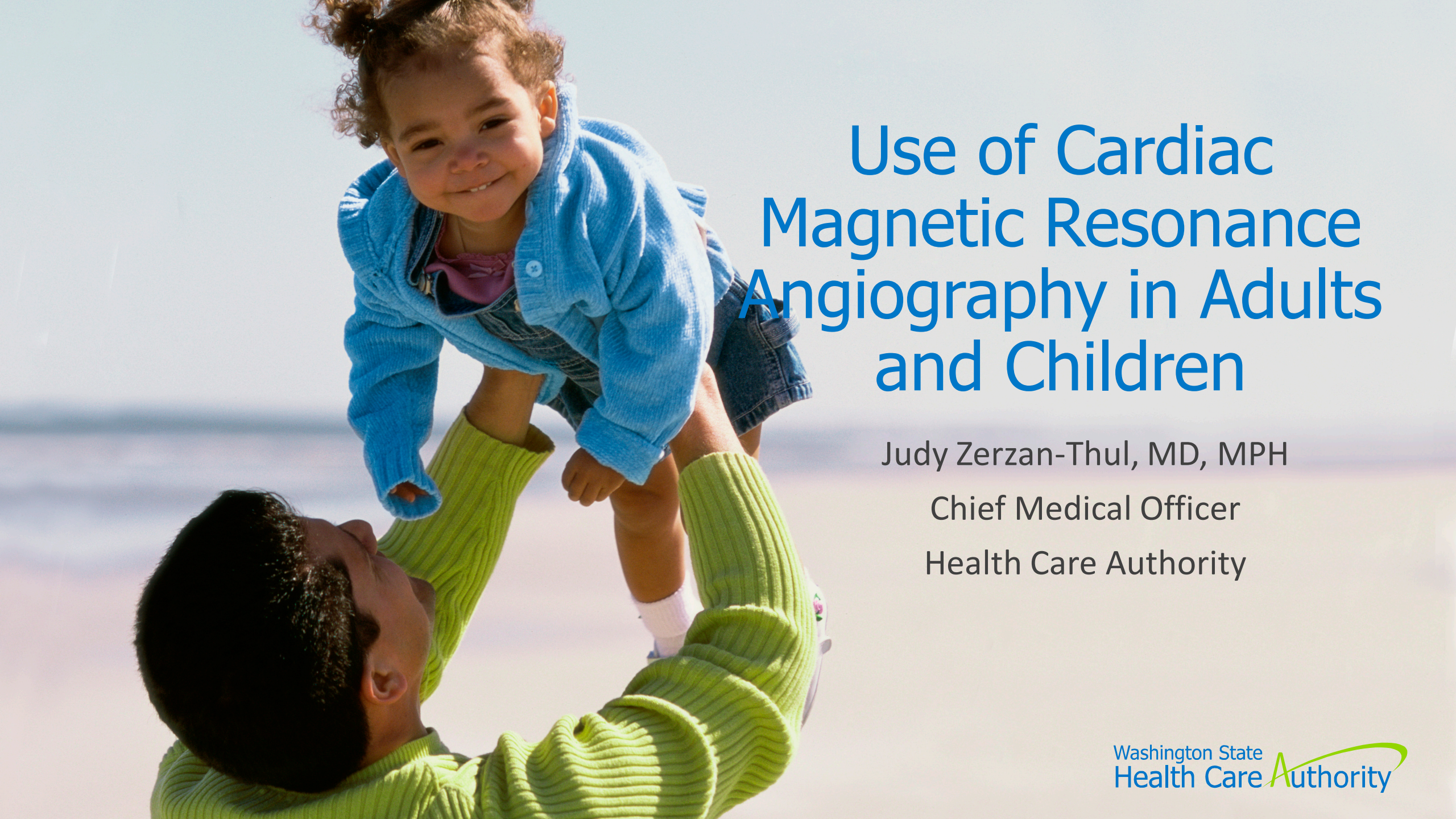
I certify that I have read and understand this Conflict of Interest Form and the information I have provided is true and correct as of this date.

Print Name James Kirkpatrick

Check One:  Committee Member  Subgroup Member  Contractor

Signature 

Date 7/27/24

A photograph of a man in a bright green sweater holding a young child in a blue jacket up in the air. The background is a bright, overexposed outdoor setting, possibly a beach or park. The child is smiling and looking towards the camera.

# Use of Cardiac Magnetic Resonance Angiography in Adults and Children

Judy Zerzan-Thul, MD, MPH

Chief Medical Officer

Health Care Authority

# Background

---

- ▶ Cardiac magnetic resonance angiography
  - ▶ Focuses more on blood vessels than tissue surrounding
  - ▶ Assesses cardiac or vascular anatomy, function, perfusion and tissue characteristics
- ▶ Compared to invasive coronary angiography or coronary CT angiography
- ▶ Stakeholder and legislative concerns
- ▶ Anecdotes about being used more often



# Agency Medical Director Concerns

---

Safety = Low

Efficacy = Medium

Cost = High

# Agency Utilization and Cost: 2017-2020

	2017	2018	2019	2020	Total (unique)
<b>Washington State – Combined Medicaid, PEBB/UMP, L&amp;I</b>					
<b>Individuals with at least one CMRA-related procedure/service</b>	654	688	764	777	<b>2,770</b>
<b>Female, count</b>	293	310	339	364	<b>1,256</b>
<b>Male, count</b>	361	378	425	413	<b>1,357</b>
<b>Amount paid, CMRA</b>	\$271,239	\$272,645	\$310,486	\$311,602	<b>\$1,165,971</b>



# Demographics in Medicaid

---

Age	Total (count)
20 years and below	445
21-44 years	695
45 years and above	818
Total	1,958

# Diagnosis and Procedure Codes

Code	Description	Medicaid FFS		L&I	
		Non-facility	Facility	Non-facility	Facility
75557	Cardiac magnetic resonance imaging for morphology and function without contrast material	\$187.81	EAPG pricing	\$607.91	\$607.91
75559	Cardiac magnetic resonance imaging for morphology and function without contrast material; with stress imaging	\$261.41	EAPG pricing	\$846.15	\$846.15
75561	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences	\$247.01	EAPG pricing	\$799.54	\$799.54
75563	Cardiac magnetic resonance imaging for morphology and function without contrast material(s), followed by contrast material(s) and further sequences; with stress imaging	\$292.81	EAPG pricing	\$947.79	\$947.79
75565	Cardiac magnetic resonance imaging for velocity flow mapping (List separately in addition to code for primary procedure)	\$31.00	EAPG pricing	\$100.35	\$100.35

# Key Questions – 5 Populations

---

- ▶ Adults with suspected coronary artery disease (symptoms)
- ▶ Adults with suspected coronary vessel anomalies
- ▶ Adults who have undergone coronary artery bypass graft surgery
- ▶ Adults being assessed for cardiac device lead placement
- ▶ Children with suspected or confirmed congenital heart disease

# Key Questions

---

1. What is the evidence for the **diagnostic validity (i.e., accuracy) and clinical utility (i.e., effectiveness)** of CMRA (with or without contrast) in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease?
2. What **direct harms** are associated with CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease?
3. Do important diagnostic validity (i.e., accuracy) outcomes, clinical utility (i.e., effectiveness) outcomes, or direct harms of CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease **vary by the following populations** or circumstances?
  - a. Sex (i.e., men, women)
  - b. Adults with atypical symptoms of CAD
  - c. Age, specifically in older adults
  - d. Adults and children with comorbidities
  - e. Setting (e.g., high-volume setting vs. low-volume setting)
4. What are the **cost-effectiveness** and other economic outcomes of CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease?

# Current State Agency Policies

---

- ▶ PEBB/SEBB
  - ▶ Regence cover with conditions
- ▶ Apple Health Managed Care and Fee For Service
  - ▶ Most cover with conditions
- ▶ Labor and Industries
  - ▶ Cardiac MRI covered with PA

# Other Payers

---

- ▶ Center for Medicare and Medicaid Services (CMS)
  - ▶ Medicare National Coverage Determination - None
  - ▶ Noridian Local Coverage Determination (LCD) - None
- ▶ Aetna- [http://www.aetna.com/cpb/medical/data/1\\_99/0094.html](http://www.aetna.com/cpb/medical/data/1_99/0094.html)
  - ▶ May be medically necessary for congenital heart disease or replace a more invasive test
  - ▶ Experimental and investigational for velocity flow mapping
- ▶ Cigna
  - ▶ Congenital heart disease, anomalous pulmonary veins, coarctation of the aorta

# Guidelines

---

- ▶ Both good quality
- ▶ UK National Institute for Health and Care Excellence
  - ▶ Do not use for diagnosing stable angina
- ▶ American College of Cardiology/American Heart Association
  - ▶ Can be useful in initial eval and follow up for congenital heart disease
  - ▶ Serial CMRI for quantitative assessment of RV size and function
  - ▶ Anomalous pulmonary veins or coronary arteries
  - ▶ Coarctation of aorta

# Evidence Considerations

## Adults with Suspected CAD

---

- ▶ Sensitivity 88% and specificity 72% based on pooled data from 23 studies
- ▶ Associated with fewer invasive tests (2)
- ▶ Not associated with reduced mortality or reduced cardiac events (2)
- ▶ Few adverse events (4)
- ▶ No differences by sex, single or multi-vessel disease, heart rate, BMI
- ▶ One cost-effectiveness study of very low COE and not limited to CMRA
  - ▶ 18% change in preexisting plan of clinical care
  - ▶ Per patient cost savings \$2308 from avoided procedures (11%) and additional diagnostic testing (7%)



# Evidence Considerations

## Adults with Suspected Coronary Anomalies

---

- ▶ Four studies high risk of bias because of patient selection, lack of blinding or no comparison group
- ▶ Highly concordant with surgical and angiography findings
- ▶ May identify vessel anomalies not found with other tests

# Evidence Considerations

## Adults who Have Undergone CABG

---

▶ No studies

# Evidence Considerations

## Adults Being Assessed for Cardiac Device Lead Placement

---

- ▶ Two studies with high risk of bias because of patient selection, lack of blinding and small sample sizes
- ▶ May be useful to visualize the appropriate vein

# Evidence Considerations

## Children with Suspected/Confirmed Congenital Heart Disease

---

- ▶ Eleven studies high risk of bias patient selection, lack of blinding, lack of comparator
- ▶ Highly concordant with surgical and angiography findings
- ▶ Can be diagnostic with no additional imaging needed
- ▶ Safe procedure with few adverse events related to MRA or anesthesia

# Agency Medical Directors Recommendations

---

- Cover with conditions for people with
  - Known/suspected anatomical issues
  - Cardiac or pericardial mass
  - Other imaging inconclusive and clear need to know anatomy
- Do not cover for diagnosis or evaluation of CAD
  - Includes do not add CMRA to cardiac stress MRI as it unlikely to improve diagnostic performance
  - Cardiac stress MRI outside scope



**Order of scheduled presentations:**

**Cardiac magnetic resonance angiography**

Name	
1	
2	
3	
4	
5	
6	

# Use of Cardiac Magnetic Resonance Angiography in Adults and Children

Washington Health Technology Clinical Committee Meeting  
November 19, 2021

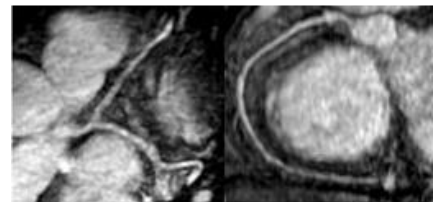
Presented by Beth Shaw, MSc, Megan Rushkin, MPH, and Valerie King, MD, MPH



0

## Technology of Interest

- Cardiac magnetic resonance imaging (CMRI) is an imaging modality that can assess cardiac or vascular anatomy, function, perfusion, and tissue characteristics during a single examination
- Cardiac magnetic resonance angiography (CMRA) is a specific CMRI technique for assessing the coronary vessels and major cardiac vessels such as the proximal aorta
  - CMRA can be used alone, or in combination with other CMRI techniques, such as stress perfusion or late gadolinium enhancement (LGE)



Source: Bettencourt N, Ferreira N, Chiribiri A, et al. 2013.  
doi: 10.1161/CIRCIMAGING.113.000280.

1

1



## Technology of Interest

- CMRI is generally considered safe
  - Not an invasive procedure
  - No exposure to ionizing radiation or iodinated intravenous contrast medium
  - Some contraindications and risks
    - Specific populations, for example, in people with implantable ferromagnetic devices or people with claustrophobia
    - Nephrogenic systemic fibrosis (NSF)
    - Allergic reactions, including anaphylaxis



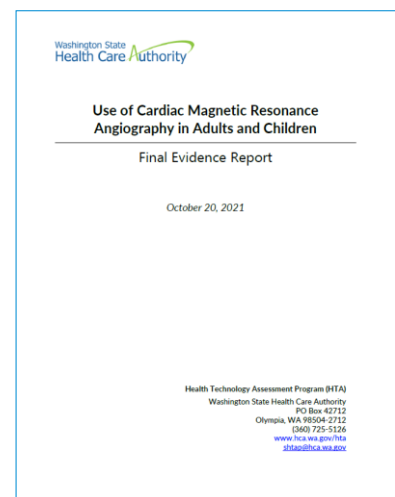
Source: [Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

2

2

## Aim of Report

- To review the effectiveness and cost-effectiveness of CMRA in adults and children, compared with invasive coronary angiography (ICA) or coronary computed tomography angiography (CCTA)
  - Accuracy and clinical utility of CMRA for diagnosis in routine clinical practice are unclear
  - Medium-level concerns about the safety and efficacy of CMRA and high-level concern about costs



3

3

# Methods

## PICO and Key Questions



4

## Key Questions

1. Diagnostic validity (i.e., accuracy) and clinical utility (i.e., effectiveness) of CMRA (with or without contrast) alone, or in combination with other CMRI techniques
2. Direct harms associated with CMRA
3. Variation in accuracy, effectiveness, or harms
  - Sex (i.e., male or female participants)
  - Adults with atypical symptoms of coronary artery disease (CAD)
  - Age, specifically in older adults
  - Adults and children with comorbidities
  - Setting (e.g., high-volume setting vs. low-volume setting)
4. Cost-effectiveness and other economic outcomes of CMRA

5

5

## PICOS

- Populations
  - Adult patients ( $\geq 18$  years of age) with symptoms of suspected (previously undiagnosed) CAD who present with:
    - Stable (nonemergent) typical or atypical symptoms suspicious for CAD
  - Adults with suspected coronary vessel anomalies
  - Adults who have undergone coronary artery bypass graft (CABG) surgery
  - Adults being assessed for cardiac device lead placement
  - Infants and children with suspected or confirmed congenital heart disease

6

6

## PICOS

- Intervention
  - CMRA (with or without contrast) alone, or in combination with other CMRI techniques
- Comparators
  - For diagnostic validity (i.e., accuracy):
    - ICA; CCTA
  - For clinical utility (i.e., effectiveness), safety, and cost-effectiveness:
    - ICA; other noninvasive testing; usual care; no testing

7

7

## PICOS

- Outcomes
  - For diagnostic validity (i.e., accuracy):
    - Sensitivity and specificity; positive and negative predictive values; intra- and inter-rater reliability
  - For clinical utility (i.e., effectiveness):
    - Myocardial infarction; cardiac-related mortality; all-cause mortality
    - Referral for treatment; referral for additional testing
  - For harms:
    - Harms directly related to CMRA; harms related to the process and outcomes of CMRA testing
  - For cost-effectiveness:
    - Cost-effectiveness outcomes; cost-utility outcomes

8

8

## PICOS

- Study designs
  - For KQ1–KQ4:
    - Randomized controlled trials
    - Nonrandomized, comparative studies with 10 or more participants in each group
  - Additional studies and data for KQ2 and KQ3 (harms):
    - Governmental or other large, multisite registries with 100 or more participants
    - Databases of procedure-related harms or device recalls (e.g., FDA MAUDE database, FDA Medical Device Recall database)
  - Additional studies and data for KQ4:
    - Cost-effectiveness studies and other formal comparative economic evaluations

9

9

## Methods

- Searched range of databases from 2000 to May 2021
- Dual independent screening
- Assessed risk of bias in all included studies
- Calculated relevant test performance statistics with 95% confidence intervals (CIs), based on reported or calculated 2 × 2 tables
- Applied GRADE to key outcomes
- Conducted a diagnostic test accuracy meta-analysis



P13 of full report;  
Appendices A & B

10

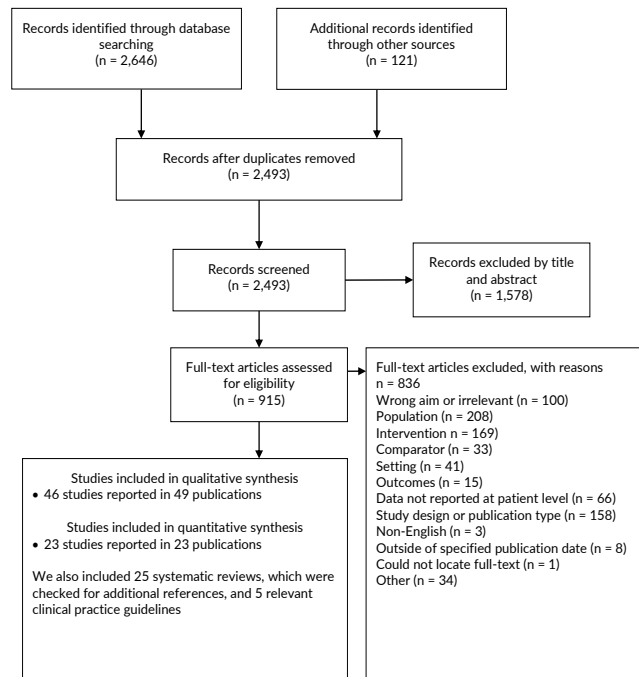
10

# Findings

## Overview



11

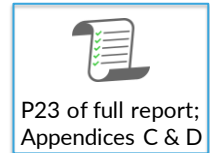


# Findings

## Adults With Suspected CAD



## Study Characteristics



- Identified 26 diagnostic test accuracy (DTA) studies but no eligible studies of clinical impact
  - Across the 26 included DTA studies
    - Publication dates ranged from 2000 to 2020
    - Sample sizes ranged from 10 to 628 and included over 1,113 total participants
    - Majority of participants were male (median, 70%; range from 60% to 87%), with no studies recruiting women only
    - Mean age ranged from 58 to 69 across studies
- Most studies were at low to moderate risk of bias
  - Concerns about patient selection, blinding, small samples, and conflicts of interest

14

14

## Diagnostic Test Accuracy Meta-Analysis

- Meta-analysis of DTA studies require a method that simultaneously synthesizes a pair of outcomes: sensitivity and specificity
  - Sensitivity is the ability of a test to classify an individual with a disease as having that disease (true-positive rate)
  - Specificity is the ability of a test to classify an individual without a disease as not having that disease (true-negative rate)
- Need to preserve this interdependence when combining in a meta-analysis
- Given the interdependent relationship between the 2 measures, they tend to be inversely correlated

15

15

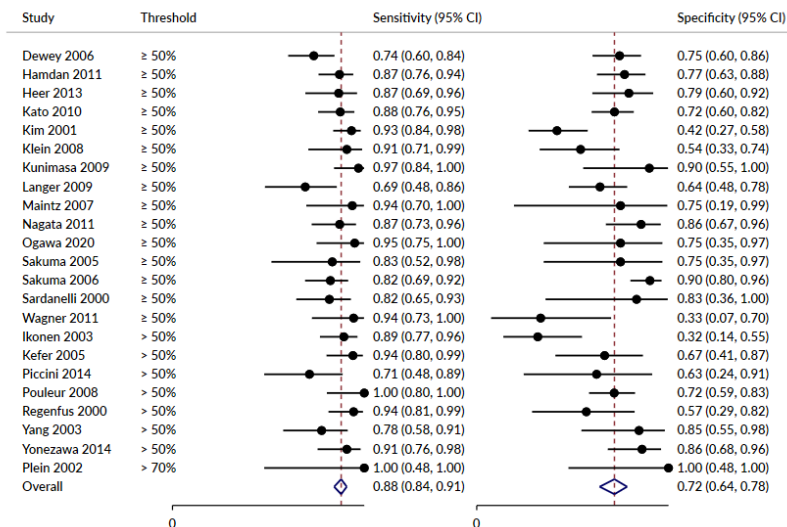
## Diagnostic Test Accuracy Meta-Analysis

- Used the bivariate and hierarchical summary receiver operating curve (HSROC) models to directly model sensitivity and specificity while accounting for the correlation across the 2 measures
- Included all DTA studies evaluating CMRA against our predefined reference standards (ICA or CCTA), where possible
  - 23 unique studies included
- Pooled data across studies where more than 3 studies reported the same reference standard
  - If more than 3 studies reported similar thresholds using the same reference standard, conducted analyses according to threshold

16

16

## Diagnostic Accuracy Results: CMRA vs. ICA (All Thresholds)



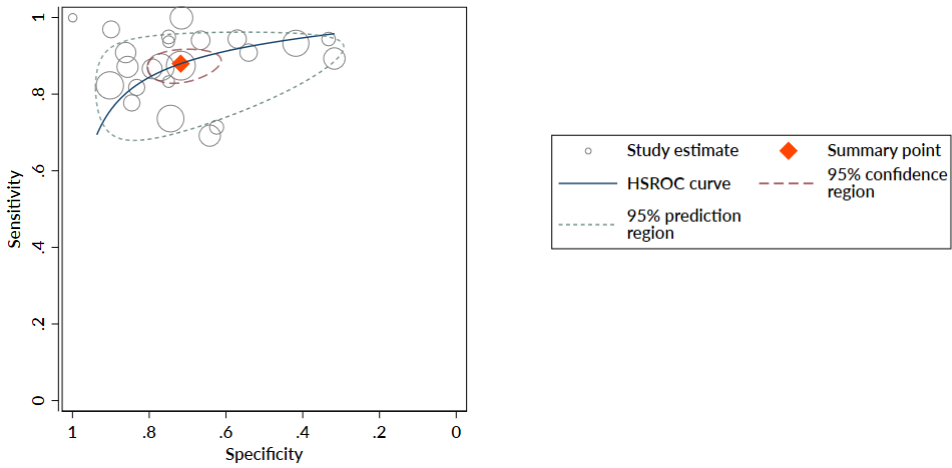
Abbreviations. CI: confidence interval; CMRA: cardiac magnetic resonance angiography; ICA: invasive coronary angiography.

17

17



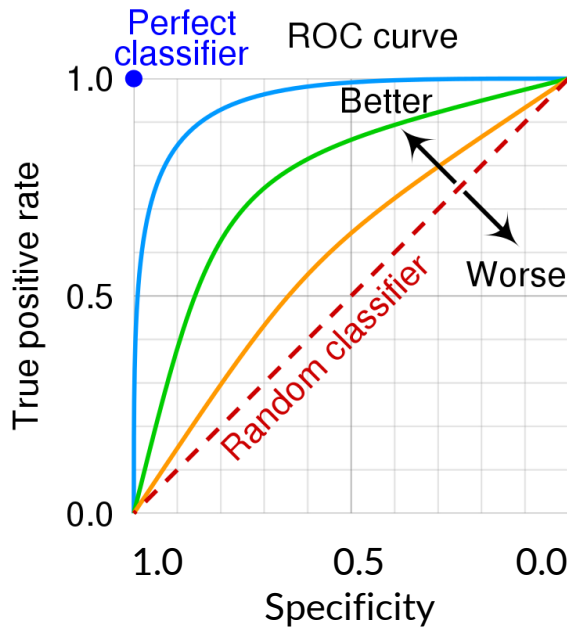
## HSROC Analysis for CMRA vs. ICA (All Thresholds)



Abbreviations. CMRA: cardiac magnetic resonance angiography; HSROC: hierarchical summary receiver operating curve; ICA: invasive coronary angiography

18

18

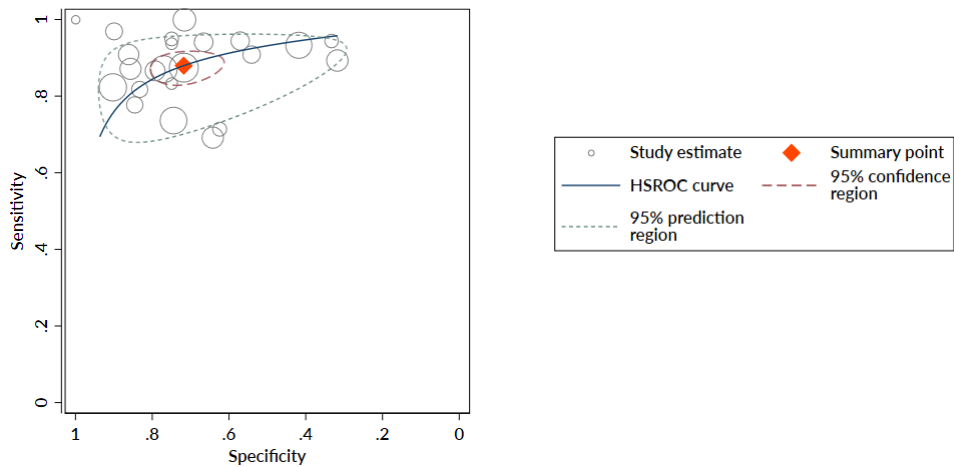


Source. Adapted from [https://en.wikipedia.org/wiki/Receiver\\_operating\\_characteristic#/media/File:Roc\\_curve.svg](https://en.wikipedia.org/wiki/Receiver_operating_characteristic#/media/File:Roc_curve.svg)

19

19

## HSROC Analysis for CMRA vs. ICA (All Thresholds)



Abbreviations. CMRA: cardiac magnetic resonance angiography; HSROC: hierarchical summary receiver operating curve; ICA: invasive coronary angiography

20

20

## GRADE Assessment: Diagnostic Performance

- CMRA has a sensitivity of 88% (95% CI, 84% to 91%) and a specificity of 72% (95% CI, 64% to 78%; high certainty of evidence [CoE], based on 23 nonrandomized studies [NRSs])
  - In a population of 1,000 adults with a 53% prevalence of CAD, CMRA testing would result in:
    - 466 patients being diagnosed correctly as having CAD
    - 64 patients incorrectly classified as not having CAD
    - 338 patients being diagnosed correctly as not having CAD
    - 132 patients incorrectly classified as having CAD
- CMRA has high levels of observer agreement, both within reviewers (intra-observer) and between observers (inter-observer; moderate CoE, based on 1 NRS)

21

21

## GRADE Assessment: Clinical Utility

- No eligible studies identified in this population

22

22

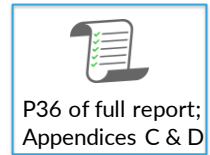
# Findings

Adults With Suspected Coronary Vessel Anomalies



23

## Study Characteristics



- Identified 3 DTA studies and 1 NRS of clinical impact
  - Across the 3 included DTA studies
    - Publication dates ranged from 2000 to 2008
    - Sample sizes ranged from 12 to 26, with a total of 63 participants
    - Majority of participants were male (range from 52% to 75%), with no studies recruiting women only
    - Mean age ranged from 38 to 50 across studies
  - All DTA studies were at high risk of bias
    - Concerns about patient selection, blinding, small samples, timing of tests, and lack of reporting generally
  - Single NRS in 19 adults, with no comparator group, at high risk of bias

24

24

## GRADE Assessment: Diagnostic Performance

- CMRA is highly concordant with surgical and ICA findings, and may identify vessel anomalies not identified using other tests, including ICA (low CoE, based on 3 NRSs)
- When compared with ICA, CMRA had a sensitivity of 88% (95% CI, 62% to 98%) and a specificity of 100% (95% CI, 66% to 100%) (low CoE, based on 1 NRS)

25

25

## GRADE Assessment: Clinical Utility

- CMRA may add information on the origin and course of the anomalies and can provide the information needed for clinical management, thus avoiding the need for conventional angiography (very low CoE, based on 1 NRS)

26

26

# Findings

Adults Who Have Undergone CABG Surgery



27

## Adults Who Have Undergone CABG Surgery

- No eligible studies identified in this population

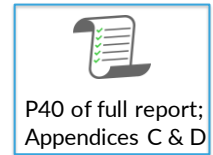


# Findings

Adults Being Assessed For Cardiac Device Lead Placement



## Study Characteristics



- Identified 2 studies evaluating the diagnostic performance of CMRA
  - Published in 2011 and 2014
  - Sample sizes of 14 and 19
  - Majority of participants were male (21 of 33; 64%)
  - Mean ages were 59 years and 70 years
  - Both studies were at high risk of bias
    - Concerns about patient selection, blinding, small samples, and the timing of tests
- No studies on clinical utility

30

30

## GRADE Assessment: Diagnostic Performance

- CMRA may be useful to visualize the appropriate vein for cardiac device lead placement (low CoE, based on 2 NRSSs)

31

31

## GRADE Assessment: Clinical Utility

- No eligible studies identified in this population

32

32

# Findings

Children With Suspected or Confirmed Congenital Heart Disease

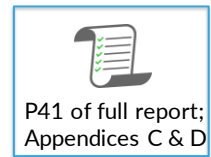


33



## Study Characteristics

- Identified 12 studies; 6 DTA studies and 6 NRSs
  - Across the 6 DTA studies
    - Published from 2002 to 2019
    - Sample sizes ranged from 21 to 100
    - Where reported, most studies had a majority of male participants
    - Mean age ranged from 4 to 15 years, with 1 study in infants (ranged 1 to 90 days)
  - All studies were at high risk of bias
    - Concerns about patient selection, blinding, small samples, timing of tests, and not all patients undergoing the reference standard



34

34

## Study Characteristics

- Across the 6 NRSs
  - Published from 2001 to 2018
  - Sample sizes ranged from 14 to 214
  - Where reported, most studies had a majority of male participants
  - Mean age ranged from 3 to 23
- All studies were at high risk of bias because of a lack of a comparator group

35

35

## GRADE Assessment: Diagnostic Performance

- CMRA was highly concordant with surgical, ICA, and CCTA findings, and may identify vessel anomalies not identified using other tests, including ICA (low CoE, based on 6 NRSs)
- There was a high interobserver agreement for CMRA in the visualization of coronary artery anomalies (very low CoE; based on 1 NRS)

36

36

## GRADE Assessment: Clinical Utility

- CMRA can be diagnostic in most cases, with no additional imaging needed. CMRA also identifies new findings or new diagnoses in the majority of cases where they are present (very low CoE, based on 6 NRSs)

37

37

# Findings

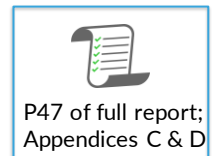
## Safety



38

## Study Characteristics

- Identified 2 additional studies evaluating the safety of CMRA in children
  - 250 children who underwent general anesthesia for CMRI for a variety of congenital conditions
  - 143 infants who underwent CMRI with general anesthesia or deep sedation, including CMRA as appropriate, for the evaluation of congenital heart disease
- Both studies were at high risk of bias because of a lack of a comparator group



39

39

## GRADE Assessment: Safety

- In adults, CMRA appears to be a safe procedure, with few adverse events related to the procedure or to the pharmacological agents (low CoE, based on 8 NRSs)
- In children, CMRA appears to be a safe procedure, with few adverse events related to the procedure or to general anesthesia (low CoE, based on 4 NRSs)

40

40

## FDA-Reported Harms

- Adverse events appear to be minimal in both adults and children
  - However, patients may be exposed to harm through the use of MRI (e.g., burns, loss of hearing, tinnitus) and other procedures associated with MRI (e.g., general anesthesia in young children, gadolinium contrast agents in people with diminished renal function)
  - MRI may also not be suitable for people who are unable to tolerate MRI (e.g., people with severe claustrophobia)

41

41

# Findings

## Variation by Patient or Setting Characteristics



42

## Variation by Patient or Setting Characteristics

- Very limited data in adults with suspected CAD only
  - No clear variation by patient characteristics (e.g., sex, single or multi-vessel disease)
  - No setting characteristics
  - Single studies only



P48 of full report;  
Appendices C & D

43

43

# Findings

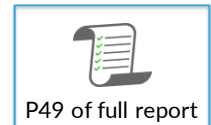
## Cost-Effectiveness and Economic Impact



44

## Cost-Effectiveness and Economic Impact

- We did not identify any eligible studies on the cost-effectiveness or economic impact of CMRA



45

45

# Findings

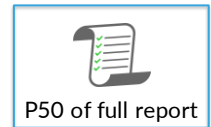
## Ongoing Studies



46

## Ongoing Studies

- We did not identify any eligible ongoing studies



47

47

# Findings

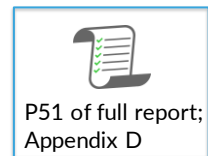
## Clinical Practice Guidelines and Selected Payer Coverage Determinations



48

### Clinical Practice Guidelines

- We identified:
  - 1 clinical practice guideline and 2 appropriateness criteria documents developed by the American College of Radiology (ACR) on the use of CMRA in adults with suspected CAD
  - 2 guidelines for the use of CMRA in adults with congenital heart disease, relevant to the subgroup of adults with suspected coronary vessel anomalies
- We assessed:
  - 2 of the guidelines as being of good methodological quality
  - 3 of the guidelines as being of moderate methodological quality because patient involvement and editorial independence were not clear
- No eligible clinical practice guidelines for other populations



49

49



## Adults With Suspected CAD

Organization Methodological Quality	Excerpted Recommendation(s)	Status
National Institute for Health and Care Excellence (NICE) Good	<ul style="list-style-type: none"> <li>Do not use MR coronary angiography for diagnosing stable angina</li> </ul>	Current
Expert Panel on Cardiac Imaging, American College of Radiology Moderate	<ul style="list-style-type: none"> <li>MRA coronary arteries without and with IV contrast may be appropriate in patients with chronic chest pain and with a high probability of CAD</li> </ul>	Current
Expert Panel on Cardiac Imaging, American College of Radiology Moderate	<ul style="list-style-type: none"> <li>MRA coronary arteries without and with IV contrast may be appropriate in patients with chronic chest pain in whom a noncardiac etiology is unlikely and who have a low to intermediate probability of CAD</li> </ul>	Current

50

50

## Adults With Congenital Heart Disease

- More consensus for this population, with many supportive recommendations for the use of CMRA in the evaluation, diagnosis and monitoring of adults with known or suspected congenital heart disease

51

51

## Clinical Practice Guidelines

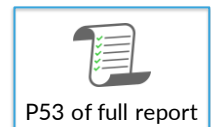
- In summary, recommendations from good and moderate methodological guidelines support the use for CMRA in adults with congenital heart disease, including coronary vessel anomalies
- Use of CMRA for adults with suspected CAD is less clear, with only conditional recommendations from the ACR and a 'do not do' recommendation from NICE

52

52

## Selected Payer Coverage Determinations

- We did not identify any current Medicare national coverage determinations or any local coverage determinations relevant to Washington State on the use of CMRA in a population of interest
- Each of the 3 private payers that we reviewed (Aetna, Cigna, and Regence) had coverage policies for CMRA
- Overall, the private payer policies cover the use of CMRA for congenital heart disease or vessel anomalies, but do not consider the use of CMRA for other indications to be medically necessary



53

53

# Conclusions



54

## Adults With Suspected CAD

- When compared with ICA, CMRA is a good test for adults with suspected CAD, with an overall estimated accuracy of 89%
  - Pooled estimates of sensitivity and specificity are 88% and 72%
- No direct evidence on the effectiveness of CMRA in changing clinical practice or in improving outcomes for patients with CAD
- Economic impact of CMRA in patients with suspected CAD when compared to standard care is also unknown

55

55

## Other Populations

- In other populations, where anatomical imaging of the vessels is clinically important, CMRA does appear to be a useful test
- CMRA also appears to be a useful tool in informing and changing clinical pathways and actions in adults and children whose vascular anatomy needs to be visualized, which would be expected to lead to improved surgical and other outcomes
- However, no evidence on patient outcomes was identified

56

56

## Safety

- Adverse events appear to be minimal in both adults and children
- In general, the use of MRI is considered a safe procedure
  - Patients are not exposed to the harmful effects of ionizing radiation of other imaging modalities, such as computed tomography
  - Patients may also avoid the risks associated with invasive testing, including radiation exposure and test-related complications, or with surgery when CMRA is used as an alternative

57

57

## Clinical Practice Guidelines and Payer Policies

- Clinical practice guidelines and payer policies are also in agreement on the use of CMRA in adults with congenital heart disease, including coronary vessel anomalies; however, there is no clear consensus on the use of CMRA for adults with suspected CAD

58

58

## Summary

- CMRA performs well as a test to visualize the cardiac vessels, and can therefore be a useful test when clinicians need to understand the vascular anatomy of the heart
- CMRA also appears to be a safe alternative for many patients
- However, there is a lack of data on the impact of using CMRA on patient outcomes and clinical decision making and on the cost-effectiveness of CMRA in the populations of interest
- Overall, there is a lot of uncertainty around the clinical impact of the findings given the paucity of clinical outcome studies

59

59

Questions?



60



61

# HTCC Coverage and Reimbursement Determination Analytic Tool

HTA's goal is to achieve *better health care outcomes* for enrollees and beneficiaries of state programs by paying for proven health *technologies that work*.

To find best outcomes and value for the state and the patient, the HTA program focuses on three questions:

1. Is it safe?
2. Is it effective?
3. Does it provide value (improve health outcome)?

The principles HTCC uses to review evidence and make determinations are:

## Principle One: Determinations are evidence-based

HTCC requires scientific evidence that a health technology is safe, effective and cost-effective<sup>1</sup> as expressed by the following standards<sup>2</sup>:

- Persons will experience better health outcomes than if the health technology was not covered and that the benefits outweigh the harms.
- The HTCC emphasizes evidence that directly links the technology with health outcomes. Indirect evidence may be sufficient if it supports the principal links in the analytic framework.
- Although the HTCC acknowledges that subjective judgments do enter into the evaluation of evidence and the weighing of benefits and harms, its recommendations are not based largely on opinion.
- The HTCC is explicit about the scientific evidence relied upon for its determinations.

## Principle Two: Determinations result in health benefit

The outcomes critical to HTCC in making coverage and reimbursement determinations are health benefits and harms<sup>3</sup>:

- In considering potential benefits, the HTCC focuses on absolute reductions in the risk of outcomes that people can feel or care about.
- In considering potential harms, the HTCC examines harms of all types, including physical, psychological, and non-medical harms that may occur sooner or later as a result of the use of the technology.
- Where possible, the HTCC considers the feasibility of future widespread implementation of the technology in making recommendations.
- The HTCC generally takes a population perspective in weighing the magnitude of benefits against the magnitude of harms. In some situations, it may make a determination for a technology with a large potential benefit for a small proportion of the population.

<sup>1</sup> Based on Legislative mandate: RCW 70.14.100(2).

<sup>2</sup> The principles and standards are based on USPSTF Principles at: <http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm>

<sup>3</sup> The principles and standards are based on USPSTF Principles at: <http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm>

- In assessing net benefits, the HTCC subjectively estimates the indicated population's value for each benefit and harm. When the HTCC judges that the balance of benefits and harms is likely to vary substantially within the population, coverage or reimbursement determinations may be more selective based on the variation.
- The HTCC considers the economic costs of the health technology in making determinations, but costs are the lowest priority.

**Using evidence as the basis for a coverage decision**

Arrive at the coverage decision by identifying for Safety, Effectiveness, and Cost whether (1) evidence is available, (2) the confidence in the evidence, and (3) applicability to decision.

**1. Availability of evidence:**

Committee members identify the factors, often referred to as outcomes of interest, that are at issue around safety, effectiveness, and cost. Those deemed key factors are ones that impact the question of whether the particular technology improves health outcomes. Committee members then identify whether and what evidence is available related to each of the key factors.

**2. Sufficiency of the evidence:**

Committee members discuss and assess the evidence available and its relevance to the key factors by discussion of the type, quality, and relevance of the evidence<sup>4</sup> using characteristics such as:

- Type of evidence as reported in the technology assessment or other evidence presented to committee (randomized trials, observational studies, case series, expert opinion);
- The amount of evidence (sparse to many number of evidence or events or individuals studied);
- Consistency of evidence (results vary or largely similar);
- Recency (timeliness of information);
- Directness of evidence (link between technology and outcome);
- Relevance of evidence (applicability to agency program and clients);
- Bias (likelihood of conflict of interest or lack of safeguards).

Sufficiency or insufficiency of the evidence is a judgment of each clinical committee member and correlates closely to the GRADE confidence decision.

Not Confident	Confident
Appreciable uncertainty exists. Further information is needed or further information is likely to change confidence.	Very certain of evidentiary support. Further information is unlikely to change confidence

<sup>4</sup> Based on GRADE recommendation: <http://www.gradeworkinggroup.org/FAQ/index.htm>



### 3. *Factors for Consideration - Importance*

At the end of discussion a vote is taken on whether sufficient evidence exists regarding the technology's safety, effectiveness, and cost. The committee must weigh the degree of importance that each particular key factor and the evidence that supports it has to the policy and coverage decision. Valuing the level of importance is factor or outcome specific but most often include, for areas of safety, effectiveness, and cost:

- Risk of event occurring;
- The degree of harm associated with risk;
- The number of risks; the burden of the condition;
- Burden untreated or treated with alternatives;
- The importance of the outcome (e.g. treatment prevents death vs. relief of symptom);
- The degree of effect (e.g. relief of all, none, or some symptom, duration, etc.);
- Value variation based on patient preference.

## Clinical committee findings and decisions

### Efficacy considerations

- What is the evidence that use of the technology results in more beneficial, important health outcomes? Consider:
  - Direct outcome or surrogate measure
  - Short term or long term effect
  - Magnitude of effect
  - Impact on pain, functional restoration, quality of life
  - Disease management
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to no treatment or placebo treatment?
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to alternative treatment?
- What is the evidence of the magnitude of the benefit or the incremental value?
- Does the scientific evidence confirm that use of the technology can effectively replace other technologies or is this additive?
- For diagnostic tests, what is the evidence of a diagnostic tests' accuracy?
  - Does the use of the technology more accurately identify both those with the condition being evaluated and those without the condition being evaluated?
- Does the use of the technology result in better sensitivity and better specificity?
- Is there a tradeoff in sensitivity and specificity that on balance the diagnostic technology is thought to be more accurate than current diagnostic testing?
- Does use of the test change treatment choices?

### Safety

- What is the evidence of the effect of using the technology on significant morbidity?
  - Frequent adverse effect on health, but unlikely to result in lasting harm or be life-threatening, or;
  - Adverse effect on health that can result in lasting harm or can be life-threatening?
- Other morbidity concerns?
- Short term or direct complication versus long term complications?
- What is the evidence of using the technology on mortality – does it result in fewer adverse non-fatal outcomes?

### Cost impact

- Do the cost analyses show that use of the new technology will result in costs that are greater, equivalent or lower than management without use of the technology?

### Overall

- What is the evidence about alternatives and comparisons to the alternatives?
- Does scientific evidence confirm that use of the technology results in better health outcomes than management without use of the technology?

### Next step: Cover or no cover

If not covered, or covered unconditionally, the chair will instruct staff to write a proposed findings and decision document for review and final adoption at the following meeting.

### Next step: Cover with conditions

If covered with conditions, the committee will continue discussion.

- 1) Does the committee have enough information to identify conditions or criteria?
  - Refer to evidence identification document and discussion.
  - Chair will facilitate discussion, and if enough members agree, conditions and/or criteria will be identified and listed.
  - Chair will instruct staff to write a proposed findings and decision document for review and final adoption at next meeting.
- 2) If not enough or appropriate information, then Chair will facilitate a discussion on the following:
  - What are the known conditions/criteria and evidence state
  - What issues need to be addressed and evidence state

The chair will delegate investigation and return to group based on information and issues identified. Information known but not available or assembled can be gathered by staff ; additional clinical questions may need further research by evidence center or may need ad hoc advisory group; information on agency utilization, similar coverage decisions may need agency or other health plan input; information on current practice in community or beneficiary preference may need further public input. Delegation should include specific instructions on the task, assignment or issue; include a time frame; provide direction on membership or input if a group is to be convened.

## Clinical committee evidence votes

### First voting question

The HTCC has reviewed and considered the technology assessment and information provided by the administrator, reports and/or testimony from an advisory group, and submissions or comments from the public. The committee has given greatest weight to the evidence it determined, based on objective factors, to be the most valid and reliable.

**Discussion document:** What are the key factors and health outcomes and what evidence is there? (Applies to the population in the PICO for this review)

Safety outcomes	Importance of outcome	Safety evidence/ confidence in evidence
Adverse events		
Burns		
Loss of hearing		
Tinnitus		
Adverse effects of anesthesia		

Efficacy – effectiveness outcomes	Importance of outcome	Efficacy / Effectiveness evidence
Clinical utility		
Sensitivity		
Specificity		
Hierarchical summary receiver operating curve (HSROC)		
Interobserver agreement		

Cost outcomes	Importance of outcome	Cost evidence
Cost		
Cost effectiveness		

Special population / Considerations outcomes	Importance of outcome	Special populations/ Considerations evidence
Age		
Race		
Gender		
Ethnicity		
Gender		

**For safety:**

Is there sufficient evidence that the technology is safe for the indications considered?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

**For efficacy/ effectiveness:**

Is there sufficient evidence that the technology has a meaningful impact on patients and patient care?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

**For cost outcomes/ cost-effectiveness:**

Is there sufficient evidence that the technology is cost-effective for the indications considered?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

**Discussion**

Based on the evidence vote, the committee may be ready to take a vote on coverage or further discussion may be warranted to understand the differences of opinions or to discuss the implications of the vote on a final coverage decision.

- Evidence is insufficient to make a conclusion about whether the health technology is safe, efficacious, and cost-effective;
- Evidence is sufficient to conclude that the health technology is unsafe, ineffectual, or not cost-effective
- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for all indicated conditions;

- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for some conditions or in some situations

A straw vote may be taken to determine whether, and in what area, further discussion is necessary.

### **Second Vote**

Based on the evidence about the technologies' safety, efficacy, and cost-effectiveness, it is

\_\_\_\_\_ Not covered \_\_\_\_\_ Covered unconditionally \_\_\_\_\_ Covered under certain conditions

### **Discussion item**

Is the determination consistent with identified Medicare decisions and expert guidelines, and if not, what evidence is relied upon.

### **Next step: proposed findings and decision and public comment**

At the next public meeting the committee will review the proposed findings and decision and consider any public comments as appropriate prior to a vote for final adoption of the determination.

- 1) Based on public comment was evidence overlooked in the process that should be considered?
- 2) Does the proposed findings and decision document clearly convey the intended coverage determination based on review and consideration of the evidence?

### **Next step: final determination**

Following review of the proposed findings and decision document and public comments:

### **Final vote**

Does the committee approve the Findings and Decisions document with any changes noted in discussion?

If yes, the process is concluded.

If no, or an unclear (i.e., tie) outcome chair will lead discussion to determine next steps.

**Medicare Coverage**

[see page 8 of the final report]

- **Centers for Medicare and Medicaid Services (CMS) National Coverage Determination**

There is no national coverage determination.

**Clinical Practice Guidelines**

[see page 51 of the final report]

Organization Methodological Quality	Excerpted Recommendation(s)	Status
<b>A. Adults With Suspected CAD</b>		
National Institute for Health and Care Excellence (NICE) <sup>59</sup>  Good	<ul style="list-style-type: none"> <li>• Do not use MR coronary angiography for diagnosing stable angina</li> </ul>	Current
Expert Panel on Cardiac Imaging, American College of Radiology <sup>57</sup>  Moderate	<ul style="list-style-type: none"> <li>• MRA coronary arteries without and with IV contrast may be appropriate in patients with chronic chest pain and with a high probability of CAD</li> </ul>	Current
Expert Panel on Cardiac Imaging, American College of Radiology <sup>58</sup>  Moderate	<ul style="list-style-type: none"> <li>• MRA coronary arteries without and with IV contrast may be appropriate in patients with chronic chest pain in whom a noncardiac etiology is unlikely and who have a low to intermediate probability of CAD</li> </ul>	Current
<b>B. Adults With Suspected Coronary Vessel Anomalies</b>		
American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines <sup>55</sup>  Good	<ul style="list-style-type: none"> <li>• CMR can be useful in the initial evaluation and serial assessment of selected patients [adults] with congenital heart disease based on anatomic complexity and clinical status.</li> <li>• Imaging studies should be performed and interpreted by individuals with expertise in CHD imaging.</li> <li>• In patients with ACHD who have or who are at risk of developing RV enlargement and dysfunction, serial CMR is recommended for quantitative assessment of RV size and function.</li> <li>• CMR or CTA is recommended for evaluation of partial anomalous pulmonary venous connection</li> <li>• Initial and follow-up aortic imaging using CMR or CTA is recommended in adults with coarctation of the aorta, including those who have had surgical or catheter intervention</li> <li>• CMR is useful to quantify ventricular size and function, pulmonary valve function, pulmonary artery anatomy, and left heart abnormalities in patients with repaired tetralogy of Fallot</li> </ul>	Current

	<ul style="list-style-type: none"> <li>• Baseline and serial imaging with either echocardiography or CMR should be performed in adults with d-TGA with arterial switch who have neo-aortic dilation, valve dysfunction or PA or branch PA stenosis or ventricular dysfunction</li> <li>• It is reasonable to perform anatomic evaluation of coronary artery patency (catheter angiography, or CT or MR angiography) in asymptomatic adults with dTGA with arterial switch</li> <li>• Adults after Fontan palliation should be evaluated annually with either echocardiography or CMR.</li> <li>• CMR is reasonable in adults with CCTGA to determine systemic RV dimensions and systolic function</li> <li>• Coronary angiography, using catheterization, CT, or CMR, is recommended for evaluation of anomalous coronary artery</li> </ul>	
<p>Expert Panel on Cardiac Imaging, American College of Radiology<sup>56</sup></p> <p>Moderate</p>	<ul style="list-style-type: none"> <li>• MRA chest without and with IV contrast is usually appropriate for adults with suspected or known congenital heart disease <ul style="list-style-type: none"> <li>o This procedure is complementary to the transthoracic echocardiogram and may be performed as an alternative to MRI heart function and morphology if only great-vessel anatomical information is needed and no information is needed about intracardiac anatomy, heart function, and flow</li> <li>o Occasionally, it may be complementary to MRI heart function and morphology without IV contrast</li> </ul> </li> <li>• MRA chest without IV contrast may be appropriate for adults with suspected or known congenital heart disease <ul style="list-style-type: none"> <li>o This procedure is complementary to the transthoracic echocardiogram and may be performed as an alternative to MRA chest without and with IV contrast or CTA chest with IV contrast</li> </ul> </li> </ul>	<p>Current</p>

*Abbreviations. ACHD: adult congenital heart disease; CAD: coronary artery disease; CCTGA: congenitally corrected transposition of the great arteries; CHD: coronary heart disease; CMR: cardiac magnetic resonance; CMRA: cardiac magnetic resonance angiography; CT: computed tomography; CTA: computed tomography angiography; d-TGA; d-transposition of the great arteries; IV: intravenous; MR: magnetic resonance; MRA: magnetic resonance angiography; MRI: magnetic resonance imaging; PA: pulmonary artery; RV: right ventricle.*

## Final key questions

# Use of Cardiac Magnetic Resonance Angiography in Adults and Children

## Background

### Technology of Interest

Cardiac magnetic resonance angiography (CMRA) is an imaging modality that provides a mechanism to assess cardiac or vascular anatomy, function, perfusion, and tissue characteristics in a highly reproducible manner, during a single examination.<sup>1</sup> Images can be acquired in patients with various body types, in a time-efficient fashion, without an invasive procedure or exposure to either ionizing radiation or iodinated intravenous contrast medium.<sup>1</sup>

### Clinical Need and Target Populations

CMRA may be useful for identifying coronary artery anomalies and aneurysms, and may be used to assess cardiac structure and function, blood flow, and cardiac and extracardiac conduits, in children and adults with simple and complex congenital heart disease.<sup>1</sup>

CMRA can also be used to determine coronary artery patency in adults with coronary artery disease (CAD), and as a diagnostic modality for patients with suspected anomalous coronary anatomy.<sup>1</sup> CMRA has been used in the assessment of multivessel CAD, especially in patients presenting with a dilated cardiomyopathy in the absence of a clinical history of myocardial infarction.<sup>1</sup>

CMRA is generally considered safe, but there are important safety concerns related to the administration of the gadolinium contrast agents.<sup>1</sup> Harms range from mild and moderate reactions to severe anaphylactic reactions to the contrast agent, as well as the rare complication of nephrogenic systemic fibrosis, particularly among older people, individuals with a history of renal disease or dysfunction, or patients with a prior renal transplant.<sup>1</sup>

## Policy Context

There have been a number of CMRA technological advances in the past decade; however, its accuracy and clinical utility for diagnosis in routine clinical practice are unclear. This topic was selected because of medium-level concerns about the safety and efficacy of CMRA and high-level concern about costs.

The objective of the health technology assessment (HTA) is to evaluate the diagnostic validity (i.e., accuracy), clinical utility (i.e., effectiveness), safety, and cost-effectiveness of CMRA in adults with suspected or confirmed CAD, and in children with congenital heart disease. This evidence review will help inform Washington's independent Health Technology Clinical Committee as the committee determines coverage regarding the use of CMRA in adults with CAD and children with congenital heart disease.

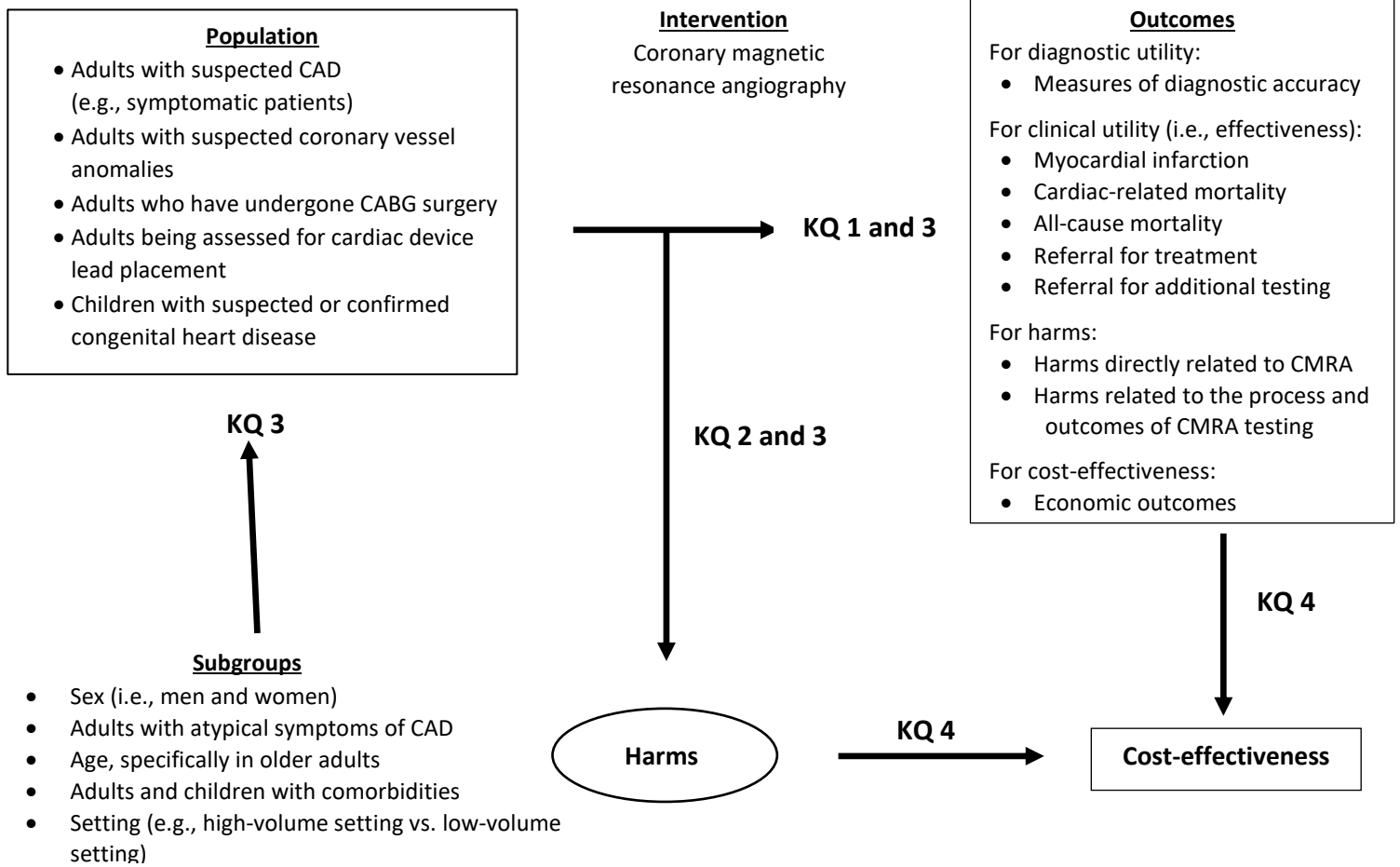


## Key Questions

1. What is the evidence for the diagnostic validity (i.e., accuracy) and clinical utility (i.e., effectiveness) of CMRA (with or without contrast) in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease? The use of CMRA will be assessed in the following populations:
  - a. Adults with suspected CAD (e.g., symptomatic patients)
  - b. Adults with suspected coronary vessel anomalies
  - c. Adults who have undergone coronary artery bypass graft (CABG) surgery
  - d. Adults being assessed for cardiac device lead placement
  - e. Children with suspected or confirmed congenital heart disease
2. What direct harms are associated with CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease? The harms of CMRA will be assessed in the following populations:
  - a. Adults with suspected CAD (e.g., symptomatic patients)
  - b. Adults with suspected coronary vessel anomalies
  - c. Adults who have undergone CABG surgery
  - d. Adults being assessed for cardiac device lead placement
  - e. Children with suspected or confirmed congenital heart disease
3. Do important diagnostic validity (i.e., accuracy) outcomes, clinical utility (i.e., effectiveness) outcomes, or direct harms of CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease vary by the following populations or circumstances?
  - a. Sex (i.e., men, women)
  - b. Adults with atypical symptoms of CAD
  - c. Age, specifically in older adults
  - d. Adults and children with comorbidities
  - e. Setting (e.g., high-volume setting vs. low-volume setting)
4. What are the cost-effectiveness and other economic outcomes of CMRA in adults with suspected or confirmed CAD and children with suspected or confirmed congenital heart disease? The economic outcomes of CMRA will be assessed in the following populations:
  - a. Adults with suspected CAD (e.g., symptomatic patients)
  - b. Adults with suspected coronary vessel anomalies
  - c. Adults who have undergone CABG surgery
  - d. Adults being assessed for cardiac device lead placement
  - e. Children with suspected or confirmed congenital heart disease

## Analytic Framework

Figure 1. Analytic Framework



**Abbreviations.** CABG: coronary artery bypass graft; CAD: coronary artery disease; CMRA: cardiac magnetic resonance angiography.

## Detailed Inclusion and Exclusion Criteria

Study Component	Inclusion	Exclusion
<b>Populations</b>	<ul style="list-style-type: none"> <li>• Adult patients (≥ 18 years of age) with symptoms of suspected (previously undiagnosed) CAD who present with               <ul style="list-style-type: none"> <li>○ Stable (nonemergent) typical or atypical symptoms suspicious for CAD (e.g., chest pain, chest tightness, chest burning, shoulder pain, palpitations, jaw pain, or non-chest pain symptoms, such as dyspnea or worsening effort tolerance)</li> </ul> </li> <li>• Adults with suspected coronary vessel anomalies</li> <li>• Adults who have undergone CABG surgery</li> <li>• Adults being assessed for cardiac device lead placement</li> <li>• Infants and children with suspected or confirmed congenital heart disease</li> </ul>	<ul style="list-style-type: none"> <li>• Studies including adults asymptomatic for CAD or adults presenting with an acute cardiac emergency</li> <li>• Studies in pregnant women</li> <li>• Studies in people with atrial fibrillation or heart failure</li> <li>• Studies assessing the use of CMRA in populations other than those specified (e.g., heart transplant patients, assessment of fetal cardiac abnormalities)</li> <li>• Studies assessing the use of MRA for vessels other than coronary vessels</li> </ul>
<b>Interventions</b>	<ul style="list-style-type: none"> <li>• Cardiac magnetic resonance angiography (with or without contrast)</li> </ul>	<ul style="list-style-type: none"> <li>• Other cardiac imaging techniques</li> <li>• MR for cardiac imaging without angiographic evaluation</li> <li>• Novel uses of CMRA</li> <li>• Outdated CMRA equipment or methods of CMRA</li> <li>• Use of CMRA for screening or for monitoring purposes</li> <li>• Use of CMRA for preoperative assessment</li> </ul>
<b>Comparators</b>	<p>For diagnostic validity (i.e., accuracy):</p> <ul style="list-style-type: none"> <li>• Invasive coronary angiography</li> <li>• Coronary computed tomography angiography</li> </ul> <p>For clinical utility (i.e., effectiveness), safety, and cost-effectiveness :</p> <ul style="list-style-type: none"> <li>• Invasive coronary angiography</li> <li>• Other noninvasive testing</li> <li>• Usual care</li> <li>• No testing</li> </ul>	<ul style="list-style-type: none"> <li>• Comparisons of CMRA techniques, algorithms, analytic methods or protocols</li> <li>• Studies without a comparator intervention (except for harms)</li> <li>• Studies with indirect comparisons</li> <li>• Studies with an outdated comparator or a comparator intervention not available in the US</li> <li>• Studies evaluating CMRA for risk prediction or prognostic assessment</li> <li>• Studies published prior to 2000</li> </ul>
<b>Outcomes</b>	<p>For diagnostic validity (i.e., accuracy):</p> <ul style="list-style-type: none"> <li>• Sensitivity and specificity</li> <li>• Positive and negative predictive values</li> <li>• Intra- and inter-rater reliability</li> </ul>	<p>Other outcomes not listed</p> <ul style="list-style-type: none"> <li>• Economic outcomes from studies performed in non-US countries</li> </ul>

Study Component	Inclusion	Exclusion
	<p>For clinical utility (i.e., effectiveness):</p> <ul style="list-style-type: none"> <li>• Primary outcomes                             <ul style="list-style-type: none"> <li>○ Myocardial infarction</li> <li>○ Cardiac-related mortality</li> <li>○ All-cause mortality</li> </ul> </li> <li>• Secondary outcomes                             <ul style="list-style-type: none"> <li>○ Referral for treatment</li> <li>○ Referral for additional testing</li> </ul> </li> </ul> <p>For harms:</p> <ul style="list-style-type: none"> <li>• Harms directly related to CMRA (e.g., severe reaction to the contrast dye, radiation exposure)</li> <li>• Harms related to the process and outcomes of CMRA testing (e.g., anxiety requiring sedation during testing, psychological consequences of testing, work days lost)</li> </ul> <p>For cost-effectiveness:</p> <ul style="list-style-type: none"> <li>• Cost-effectiveness outcomes (e.g., cost per improved outcome) or cost-utility outcomes (e.g., cost per QALY, ICER)</li> </ul>	<ul style="list-style-type: none"> <li>• Economic outcomes from studies performed in the US that were published more than 5 years ago</li> </ul>
<b>Timing</b>	<ul style="list-style-type: none"> <li>• Any point in the diagnostic workup, including in the emergency setting</li> <li>• After CABG surgery</li> <li>• Prior to cardiac lead placement</li> </ul>	<ul style="list-style-type: none"> <li>• Timing other than those stated</li> </ul>
<b>Setting</b>	<ul style="list-style-type: none"> <li>• Any outpatient or inpatient clinical setting in countries categorized as very high on the UN Human Development Index<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Emergency settings</li> <li>• Nonclinical settings (e.g., studies in healthy volunteers, animal models of disease)</li> <li>• Countries categorized other than very high on the UN Human Development Index<sup>2</sup></li> </ul>
<b>Study Design</b>	<p>For Key Questions 1–4:</p> <ul style="list-style-type: none"> <li>• Randomized controlled trials</li> <li>• Nonrandomized, comparative studies with 10 or more participants in each group</li> </ul> <p>Additional studies/data for Key Questions 2 and 3 (harms):</p> <ul style="list-style-type: none"> <li>• Governmental or other large, multisite registries with 100 or more participants</li> <li>• Databases of procedure-related harms or device recalls (e.g., FDA MAUDE database, FDA Medical Device Recall database)</li> </ul> <p>Additional studies/data for Key Question 4:</p>	<ul style="list-style-type: none"> <li>• Abstracts, conference proceedings, posters, editorials, letters</li> <li>• Nonrandomized, comparative studies with fewer than 10 participants in each group</li> <li>• Studies without a comparator (except for harms)</li> <li>• Proof-of-principle studies (e.g., technology development or technique modification)</li> <li>• Registries with fewer than 100 participants</li> </ul>

Study Component	Inclusion	Exclusion
	<ul style="list-style-type: none"> <li>• Cost-effectiveness studies and other formal comparative economic evaluations</li> </ul> <p>For effectiveness, we will search for RCTs and only include observational studies in the absence of RCTs.</p> <p>Studies published in publicly available FDA reports will also be included, if they meet the additional criteria reported above.</p>	
<b>Publication</b>	<ul style="list-style-type: none"> <li>• Studies in peer-reviewed journals, technology assessments, or publicly available FDA or other US government reports</li> <li>• Published in English</li> <li>• Published since January 2000</li> </ul>	<ul style="list-style-type: none"> <li>• Studies with abstracts that do not allow study characteristics to be determined</li> <li>• Studies that cannot be located</li> <li>• Duplicate publications of the same study that do not report different outcomes or follow-up times, or single site reports from published multicenter studies</li> <li>• Studies in languages other than English</li> </ul>

**Abbreviations.** CABG: coronary artery bypass graft; CAD: coronary artery disease; CMRA: cardiac magnetic resonance angiography; FDA: US Food and Drug Administration; ICER: incremental cost-effectiveness ratio; MAUDE: Manufacturer and User Facility Device Experience; MR: magnetic resonance; MRA: magnetic resonance angiography; MR: magnetic resonance; QALY: quality-adjusted life year; RCT: randomized controlled trial; UN: United Nations.

## References

1. Hundley WG, Bluemke DA, Finn JP, et al. ACCF/ACR/AHA/NASCI/SCMR 2010 expert consensus document on cardiovascular magnetic resonance: a report of the American College of Cardiology Foundation Task Force on Expert Consensus Documents. *J Am Coll Cardiol*. 2010;55(23):2614-2662. doi: 10.1016/j.jacc.2009.11.011.
2. United Nations. Human Development Index. 2020; <http://hdr.undp.org/en/content/download-data>. Accessed March 3, 2021.