

# CHARLES DENNIS SWERDLOW

## CURRICULUM VITAE

2020 April 21

## PROFESSIONAL CONTACT INFORMATION

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## EDUCATION:

B.S. (Physics) Stanford University; 1968-1972  
M.D. Harvard-M.I.T. Program in Health Sciences and Technology (Harvard Medical School); 1972-1976  
Intern in Medicine, L.A. County-U.C.L.A., Harbor General Hospital; 1976-1977  
Resident in Medicine, L.A. County-U.C.L.A., Harbor General Hospital; 1977-79  
Fellow in Cardiology, Stanford University Medical; 1979-1981  
Fellow in Cardiac Electrophysiology, Stanford University Medical Center; 1981-1982

## LICENSURE:

California, G349913.

## BOARD CERTIFICATION:

Diplomate, American Board of Internal Medicine; 1979-  
Diplomate, Subspecialty of Cardiovascular Disease, American Board of Internal Medicine; 1981-  
Special Competency Examination in Cardiac Pacing, North American Society of Pacing and Clinical  
Electrophysiology; 1988  
Diplomate in Clinical Cardiac Electrophysiology, American Board of Internal Medicine; 1994-2004  
Recertification in Clinical Cardiac Electrophysiology; 2003-2014  
Recertification in Clinical Cardiac Electrophysiology; 2013-2024

## PROFESSIONAL EXPERIENCE:

### **Present Positions:**

Jan 2013- Professor of Medicine, Cedars Sinai Medical Center  
2000- Clinical Professor of Medicine, David Geffen School of Medicine, University of California  
Los Angeles  
1990- Attending Physician, Cedars Sinai Medical Center

### **Previous Positions:**

1981-1982 Assistant Clinical Professor of Medicine, Stanford University Medical Center  
1983-1984 Clinical Assistant Professor of Medicine, Clinical Faculty, University of Washington  
1983-1984 Director, Cardiac Electrophysiology Laboratory, Deaconess Hospital, Spokane, WA  
1983-1984 Director, Cardiac Arrhythmia Study Unit, Deaconess Hospital, Spokane, WA  
1984-1988 Assistant Professor of Medicine, Stanford University Medical Center, Stanford, CA  
1984-1988 Director, Clinical Electrophysiology Laboratory, Stanford University, Stanford, CA  
1984-1988 Director, Cardiac Arrhythmia Study Unit, Stanford University, Stanford, CA

- 1988-1992 Clinical Assistant Professor of Medicine, University of California, Los Angeles  
 1993-2000 Clinical Associate Professor of Medicine, University of California, Los Angeles  
 2006-2008 Co-director Clinical Cardiac Electrophysiology Fellowship, Cedars Sinai Medical Center  
 2006-2008 Co-Section Chief: Clinical Cardiac Electrophysiology, Cedars Sinai Medical Center

### **PROFESSIONAL ACTIVITIES:**

#### **Committee Services:**

##### **Other Committee Services:**

- 2010-2014 Heart Rhythm Society Annual Scientific Session Program Committee  
 2014- Association for the Advancement of Medical Instrumentation (AAMI) Cardiac Rhythm Management Device Committee  
 2014-2016 Heart Rhythm Society Research Committee: Young Investigators Subcommittee  
 2014- Association for the Advancement of Medical Instrumentation (AAMI) Cardiac Rhythm Management Device Committee  
 2016-2018 Heart Rhythm Society Quality Improvement Committee  
 2016-2019 Clinical Events Committee: Medtronic Worldwide Randomized Antibiotic Envelope Infection Prevention Trial (WRAP-IT)  
 2016-2018 American Board of Internal Medicine Committee on Maintenance of Certification for Clinical Electrophysiology  
 2017- Co-chair, Leads Working Group (WG1) of the Association for the Advancement of Medical Instrumentation (AAMI) Cardiac Rhythm Management Device Committee  
 2019- Liaison, Heart Rhythm Society to AAMI Leads Working Group (WG1)  
 2019- Heart Rhythm Society Interoperability Working Group

#### **Task Forces:**

- 2011-2012 Heart Rhythm Society Task Force on Pacemaker Mode Selection  
 2014-2015 Heart Rhythm Society Task Force on Testing and Programming of ICDs  
 2016-2017 Heart Rhythm Society Therapy Advisory Task Force for CIED Data Security  
 2016-2018 Heart Rhythm Society Task Force on CIED Lead Management and Extraction

#### **Professional Associations/Society Memberships:**

- 1979 Member, American Heart Association  
 1980 Member, American College of Physicians  
 1982 Member, North American Society of Pacing and Clinical Electrophysiology (Heart Rhythm Society after 1994)  
 1982 Fellow, American Heart Association Council on Clinical Cardiology  
 1985 Fellow, American College of Cardiology  
 2006 Fellow, Heart Rhythm Society

#### **Editorial Services:**

##### **Assistant Editor**

- 2019- Journal of Cardiovascular Electrophysiology

**Assistant Section Editor**

2017- Circulation Arrhythmia and Electrophysiology Challenge of the Week

**Editorial Board**

1996-2015 Journal of Cardiovascular Electrophysiology  
 2004- Heart Rhythm Journal  
 2006-2019 Pacing and Clinical Electrophysiology  
 2017- Circulation Arrhythmia and Electrophysiology  
 2019- Heart Rhythm O2  
 2019- Journal of Cardiovascular Electrophysiology

**Guest Editor**

2012- Circulation, including Series Co-Editor for Cardiac Implantable Electronic Devices (2013)  
 2014- Journal of American College of Cardiology  
 2015-2016 Heart Rhythm Journal

**Journal Reviewer**

1984- New England Journal of Medicine  
 1985- Circulation  
 1985-1996 American Journal of Cardiology  
 1992- Pacing and Clinical Electrophysiology  
 1994- Journal of the American College of Cardiology  
 1996- Journal of Cardiovascular Electrophysiology  
 2000-2006 Psychosomatic Medicine  
 2004- European Heart Journal  
 2004- Heart Rhythm Journal  
 2005- Journal of Interventional Cardiac Electrophysiology  
 2006- Europace  
 2008- Biomedical Engineering and Computational Biology  
 2010- IEEE Proceedings in Biomedical Engineering (IEEE: Institute of Electrical and Electronics Engineers)  
 2011- IEEE Reviews in Biomedical Engineering  
 2011- Circulation Arrhythmia and Electrophysiology  
 2015- JACC Clinical Electrophysiology  
 2015- Heart Rhythm Case Report Journal  
 2019- JACC Case Reports

**Consulting Activities:**

1993- Medtronic PLC

**HONORS AND SPECIAL AWARDS:**

1972 Phi Beta Kappa, Stanford Chapter  
 1976 Alpha Omega Alpha, Harvard Chapter  
 1997 Heart Saver Award, Save a Heart Foundation

- 2000 Medtronic Inc. Award, Contributions in the Area of Arrhythmia Event Detection and Dual-Chamber Algorithm Development
- 2006 Outstanding Teacher Award, Cedars-Sinai Medical Center, Division of Cardiology
- 2013 First Place, Electrophysiology Jeopardy. Heart Rhythm Society Electrophysiology Board Review Course

## **RESEARCH:**

### **Research Grants and Fellowships Received:**

#### **Active/Ongoing:**

- 2016-2021 NHLBI Small Business Innovation Research Grant, No. 2R44HL120529-02: In-Situ Lead Tester for Implantable Devices Phase II (\$1,390,071); Consultant, 15% FTE

#### **Inactive/Completed:**

- 1995-1997 American Heart Association Los Angeles Affiliate Local Grant-in-Aid, No. 1085-GI1: Optimal Biphasic Waveforms for Implantable Defibrillators (\$40,000), PI 15% FTE
- 1996-1997 SurvivaLink Corporation: Optimal Biphasic Waveforms for External Defibrillator (\$30,000); PI 10% FTE
- 1997-1998 St. Jude Medical Corporation: Optimal Multistep Waveform for Implantable Defibrillators (\$30,000); PI 10% FTE
- 2013-2014 NHLBI Small Business Innovation Research Grant, No.1R43HL120529-01. In-Situ Lead Tester for Implantable Devices Phase I (\$213,597); Consultant, 15% FTE

#### **Pending Grants:**

- Sept 1, 2020- NHLBI Small Business Innovation Research Grant. Implantable High Frequency Generator System for Lead Failure Detection Direct to Phase II (\$2,135,000, requested); Consultant, 15% FTE

### **Research Focus And Interests:**

My research focuses on the interface between basic science-engineering principles and clinical application to cardiac implantable electronic devices (CIEDs), especially implantable cardioverter defibrillators (ICDs).

### **IRB Approved Clinical Research Projects (2000- )**

- How Strong is the Weakest Electrical Pulse that You can Feel? (Physician-initiated), Single center, PI, 2000-2001
- Wavelet Electrogram Morphology Download Study (Medtronic), Multi-center, PI, 2000-2002
- Reduction of Pain from ICD Shocks by Prepulse Inhibition (Physician-initiated), Single center, PI, 2001-2002
- Electrogram Recordings During ICD Implantation (Physician-initiated), Single center, PI, 2005-2006
- PROSPECT: Predictors of Response to Cardiac Resynchronization Therapy (Medtronic), Multi-center, Co-I PI Tasneem Naqvi), 2005-2006
- Unfiltered Electrogram Recordings During ICD Implantation (Physician-initiated), Single center, PI, 2006-2007
- Effect of Electrophysiological Procedures on Nerve Growth Factor Expression (Physician-initiated), Single center, Co-I (PI Chen), 2006-2007
- ICD Pocket Oxygenation with an Optical Sensor (Medtronic), Multi-center, PI 2006-8
- Detection of T-wave alternans prior to Spontaneous Ventricular Tachyarrhythmias in Patients with Implantable Cardioverter Defibrillators (Physician-initiated), Single center, PI, 2008-2011

COMPASS-HF: Chronicle Offers Management to Patients with Advanced Signs and Symptoms of Heart Failure (Medtronic), Multi-center, Co-I (PI Lawrence Czer), 2009-2012

Reduce HF: Reducing Decompensation Events Utilizing Intra-Cardiac Pressures in Patients with Chronic Heart Failure with the Chronicle Implantable Cardioverter Defibrillator (Medtronic), Multi-center, Co-I (PI Lawrence Czer), 2011-2012

COMPASS-HF: Clinical Investigation Plan Extension Phase (Medtronic), Multi-center, Co-I (Lawrence Czer), 2012-2015

EchoCRT: Echocardiography Guided Cardiac Resynchronization Therapy (Biotronik), Multi-center, Co-I PI Eli Gang), 2012-3

CABANA: Catheter Ablation Versus Antiarrhythmic Drug Therapy for Atrial Fibrillation Trial (NIH), Multi-center, Co-I (PI Sumeet Chugh), 2012-2014

Medtronic Micra™ Transcatheter Pacing Study (Medtronic), Multi-center, Co-PI (Co-PI Michael Shehata), 2014-2015

Micra™ Transcatheter Pacing System Continued Access Study (Medtronic), Multi-center, Co-PI (Co-PI Michael Shehata), 2015-2016

Automated Diagnosis of ICD Lead Dislodgment (Physician-initiated), Single center, PI, 2016-2018

The Mechanisms of Reentry during Typical and Atypical AV nodal reentry and Accessory Pathway Mediated Reentry in Supraventricular Tachycardias (Physician-initiated Chart Review), Multi-center, Co-I (PI (Co-PI Michael Shehata), 2017

Failure of Implantable Defibrillator Treatment (Physician-initiated Chart Review), Multi-center, PI, 2017-2018

Tachy Prediction Download (Medtronic) Multi-center, Co-PI (Co-PI Michael Shehata), 2018-2020

DEEP Pivotal Trial: Pivotal Study of a Dual Epicardial & Endocardial Procedure Approach for Treatment of Subjects with Persistent or Long Standing Persistent Atrial Fibrillation with Radiofrequency Ablation (AtriCure), Multi-center, Co-I (PI Xunzhang Wang), 2018-2020

EV ICD (Medtronic) Multi-center, Co-PI (Co-PI Michael Shehata), 2020-

## **U.S. Patents**

### **U.S. Patents: Issued**

1. Chen PS, **Swerdlow CD**. 1996. Method and apparatus for improved prediction of transvenous defibrillation threshold. US 5564422, filed April 3, 1995; issued October 15, 1996.
2. Brewer JE, **Swerdlow CD**. 1999. Method and apparatus for external defibrillation using a device having a low capacitance and small time constant. US 5902323, filed April 11, 1997; issued May 11, 1999.
3. **Swerdlow CD**, Swerdlow NR, Brewer JE. Method and apparatus for reduction of pain from electric shock therapies. U.S. , 6,091,989 filed September 14, 1998; issued July 18, 2000.
4. Brewer JE, **Swerdlow CD**, Olson KF. 2000. Electrode triad for external defibrillation. US 6134479, filed February 3, 1999; issued October 17, 2000.
5. **Swerdlow CD**, Swerdlow NR, Brewer JE. 2002. Method and apparatus for reduction of pain from electric shock therapies. US 6438418, filed May 5, 2000; issued August 20, 2002.
6. **Swerdlow CD**, Shivkumar K. 2003. Defibrillation shock strength determination technology. US US6675042 B2, filed January 27, 2003; issued January 6, 2004.
7. **Swerdlow CD**, Swerdlow NR, Brewer JE. 2004. Method and apparatus for reduction of pain from electric stimulation therapies. US 6711442, filed April 8, 1999; issued March 23, 2004.
8. **Swerdlow CD**, Havel WL. 2006. Method and apparatus for validating a pacing train associated with

- T-shock delivery. US 2006/0247687, filed April 28, 2005; issued November 2, 2006.
9. **Swerdlow CD.** 2008. Shock timing technology. US 2008/0033494, filed May 18, 2007; issued February 7, 2008.
  10. **Swerdlow CD, Shivkumar K.** 2008. Defibrillation shock strength determination technology. US 2008/0051841, filed August 21, 2007; issued February 28, 2008.
  11. **Belk PA, Swerdlow CD.** 2010. Methods for the determination of T-shock vulnerable window from far-field electrograms in implantable cardioverter defibrillators. US 2010/0023072, filed July 24, 2008; issued January 28, 2010.
  12. **Belk PA, Swerdlow CD, Ruetz LL.** 2010. Determination of upper limit of vulnerability using a variable number of shocks. US 2010/0023073, filed July 24, 2008; issued January 28, 2010.
  13. **Belk PA, Gillberg JM, Cao J, Swerdlow CD.** 2011. Automatic determination of T-shock vulnerable window. US 8064996, filed April 9, 2009; issued November 22, 2011.
  14. **Swerdlow CD.** 2012. Shock timing technology. US 8150510 B2, filed May 18, 2007; issued April 3, 2012.
  15. **Gunderson BD, Wanasek KA, Swerdlow CD.** 2012. Identifying a lead related condition based on detecting noise subsequent to signal delivery. US 20110054558 A1, filed March 8, 2010; issued July 4, 2012.
  16. **Swerdlow CD, Shivkumar K.** 2013. Defibrillation shock strength determination technology. US 8401638 B2; issued March 19, 2013.
  17. **Belk PA, Swerdlow CD.** 2013. Methods for the determination of T-shock vulnerable window from far-field electrograms in implantable cardioverter defibrillators. US 8556586 B2; issued October 22, 2013
  18. **Belk PA, Swerdlow CD, Ruetz LL.** 2014. Determination of upper limit of vulnerability using a variable number of shocks. US 8644923 B2; issued February 4, 2014.
  19. **Gunderson BD, Wanasek KA, Swerdlow CD.** 2012. Identifying a lead related condition based on detecting noise subsequent to signal delivery. US 8,798,750, filed March 8, 2010; issued August 5, 2014.
  20. **Swerdlow CD.** Method and apparatus for detection of lead conductor anomalies using dynamic electrical parameters. US 8,825,158 B2 filed Aug 25, 2010; issued September 2, 2014
  21. **Kroll MW, Swerdlow CD.** Method for detecting and treating insulation lead-to-housing failures. US 8812103B2 filed June 1, 2012; issued August 19, 2014
  22. **Kroll MW, Swerdlow CD.** Method for detecting and localizing insulation failures of implantable device leads. US 9,427,577; filed March 15, 2013; issued March 1, 2016.
  23. **Kroll MW, Swerdlow CD.** Method for detecting and treating insulation lead-to-housing failures. US 9,427,577 filed March 15, 2013; issued August 30, 2016
  24. **Swerdlow CD.** Detection of implantable lead failures by differential EGM analysis. US 9,486,624 filed March 25, 2014; issued November 8, 2016
  25. **Swerdlow CD, Kroll MW.** Active surveillance of implanted medical leads for lead integrity. US 9,636,500, filed March 25, 2014; issued May 2, 2017
  26. **Kroll MW, Swerdlow CD.** Method and apparatus for implantable cardiac lead integrity analysis. US 9,675,799 B2, filed March 15, 2013; issued June 13, 2017
  27. **Swerdlow CD.** Detection of dislodgement of a defibrillation lead. US 9,814,876 B2 filed February 2, 2016; issued November 14, 2017
  28. **Kroll MW, Swerdlow CD.** Apparatus for detecting and localizing insulation failures of implantable device leads. US 9,675,799, filed Feb 26, 2016; issued Nov 21, 2017.

29. Kroll MW, **Swerdlow CD**. Method and apparatus for detection of lead conductor anomalies using dynamic electrical parameters. US 9,827,416 filed March 11, 2014; issued Nov 28, 2017.
30. Kroll MW, **Swerdlow CD**. Method and apparatus for implantable cardiac lead integrity analysis. US 9,827,485, filed March 24, 2016; issued June 5, 2018.
31. Kroll MW, **Swerdlow CD**. Method and apparatus for detecting and localizing partial conductor failures of implantable device leads. US 10,039,919, filed March 24, 2014; issued Aug 7, 2018.
32. **Swerdlow CD**. Detection of implantable lead failures by differential EGM analysis. US 10,195,420 B2, filed November 7, 2016; issued February 5, 2019.
33. **Swerdlow CD**. Detection of Lead Electrode Dislodgement using Cavitory Electrogram. Filed August 16, 2017; issued January 28, 2020.

#### **U.S. Patent Applications: Published**

34. Gunderson BG, **Swerdlow CD**. Detecting ventricular lead dislodgement. US Application 15/836,283; filed December 18, 2017.

#### **INVITED LECTURES AND PRESENTATIONS (2008-):**

1. Ethics & economical ICD therapy. 1st Annual National Sudden Cardiac Arrest Foundation Symposium: From Awareness to Prevention. San Diego, April 26, 2008.
2. ICD device troubleshooting. Stanford Cardiology Ventricular Arrhythmia and Sudden Death Symposium. San Francisco, March 14, 2008.
3. How and when to assess defibrillation efficacy? Heart Rhythm Society's 29<sup>th</sup> Annual Scientific Sessions, San Francisco CA, May 14, 2008.
4. Early identification of lead fracture and the potential to reduce inappropriate shocks. Heart Rhythm Society's 29<sup>th</sup> Annual Scientific Sessions, San Francisco, CA, May 15, 2008.
5. How to avoid EP lab disasters with ICD shock testing. Heart Rhythm Society's 29<sup>th</sup> Annual Scientific Sessions, San Francisco, CA, May 15, 2008.
6. Diagnosing the reason for ICD Shocks: What to do until the electrophysiologist comes? University of California Irvine Medical Center, Cardiology Lecture Series, October 2008.
7. Comparison of upper limit of vulnerability (ULV) and defibrillation testing to assess defibrillation efficacy. Heart Rhythm Society's 30<sup>th</sup> Annual Scientific Sessions, Boston, May 15, 2009.
8. Is there an optimal method for early diagnosis of ICD lead fractures or should we be more aggressive in extracting ICD leads under recall? Heart Rhythm Society's 30<sup>th</sup> Annual Scientific Sessions, Boston, MA, May 15, 2009.
9. Defibrillation threshold testing: ULV vs. DFT. University of California at San Diego Medical Center, Cardiac Electrophysiology Conference, May 28, 2009.
10. Should we induce VT at ICD implant? Cardiac Electrophysiology Lecture Series, Stanford University Medical Center August 21, 2009.
11. ICD shock reduction. Cardiology Grand Rounds. Stanford University Medical Center August 22, 2009.
12. Rhythm discrimination in ICDs. American Heart Association National Meeting. Orlando, FL, November 15, 2009.
13. Defibrillation basics: Sensing, testing, waveforms, efficacy. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 1st Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting;Extraction. San Francisco, December 5, 2009.
14. Nitty gritty of SVT-VT discrimination algorithms. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 1st Annual West Coast Symposium: ICD, CRT Implantation,

- Programming, Troubleshooting;Extraction. San Francisco, December 5, 2009.
15. How to diagnose lead failure. 1st Annual ICD, Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society West Coast Symposium: CRT Implantation, Programming, Troubleshooting;Extraction. San Francisco, December 5, 2009.
  16. Atrial fibrillation ablation in patients with heart failure: Patient selection and expected results. USC Heart Failure Symposium 2010: An Update on Therapy: Heart Failure, Arrhythmias and Hypertension. Los Angeles, January 30, 2010.
  17. ICD technology for the clinician: Sensing, batteries, capacitors, waveforms, problems of miniaturization, MRI compatibility. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 2<sup>nd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 5, 2011.
  18. Systematic approach to ICD sensing problems. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 2<sup>nd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 5, 2011.
  19. Diagnosis and management of lead failures. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 2<sup>nd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 6, 2011.
  20. Defibrillation tests are required in all patients receiving an implantable cardioverter defibrillator. Heart Rhythm Society's 31st Annual Scientific Sessions. Denver, May 13, 2010.
  21. The Role of upper limit of vulnerability ICD shock testing: How to perform this technique properly. Heart Rhythm Society's 31st Annual Scientific Sessions. Denver, May 13, 2010.
  22. EP fellow boot camp: Challenging device-based cases for your practice and EP boards. Heart Rhythm Society's 31st Annual Scientific Sessions. Denver, May 15, 2010.
  23. Early diagnosis of ICD lead failure. Kaiser Permanente Cardiac Electrophysiology Conference, October 2010
  24. Catheter ablation of atrial fibrillation. Fifth Annual Cardiovascular Symposium, Los Robles Hospital. Thousand Oaks, April 30, 2011.
  25. Defibrillation testing: Who, when and how. Heart Rhythm Society's 32nd Annual Scientific Sessions. San Francisco, May 5, 2011.
  26. Methods of defibrillation assessment. Heart Rhythm Society's 32nd Annual Scientific Sessions. San Francisco, May 5, 2011.
  27. Differential diagnosis of lead failure. Heart Rhythm Society's 32nd Annual Scientific Sessions. San Francisco, May 5, 2011.
  28. ICD technology: Where are we now and where are we going? Heart Rhythm Society's 32nd Annual Scientific Sessions. San Francisco, May 5, 2011.
  29. EP fellows in training boot camp: Optimizing and troubleshooting cardiac implantable electrical devices for the beginning EP fellow. Heart Rhythm Society's 32nd Annual Scientific Sessions. San Francisco, May 5, 2011.
  30. Keynote Address: How and why devices [usually] work in treating arrhythmia—A perspective for engineers. American Society for Mechanical Engineering (ASME) 6th Frontiers in Biomedical Devices Conference, Irvine, CA, September 26, 2011
  31. Troubleshooting implantable cardiac defibrillators. 2011 Kaiser Permanente National Cardiovascular COAST Conference. Huntington Beach, December 3, 2011.
  32. Remote Follow-up: What are the Options? Riata ICD Lead Summit. January 20, 2012
  33. ICD technology for the clinician: Sensing, batteries, capacitors, waveforms, problems of



- miniaturization, MRI compatibility. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 3<sup>rd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 23, 2012.
34. Systematic approach to ICD sensing problems. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 3<sup>rd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 23, 2012.
  35. Diagnosis and management of lead failures. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 3<sup>rd</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 24, 2012.
  36. The Science behind DFT and ULV testing. Heart Rhythm Society 33<sup>rd</sup> Annual Scientific Sessions. Boston, May 11, 2012.
  37. Clinical presentations that may be confused with lead failure. Heart Rhythm Society 33<sup>rd</sup> Annual Scientific Sessions. Boston, May 11, 2012.
  38. Electrogram morphology algorithms: Has progress stopped? Heart Rhythm Society 33<sup>rd</sup> Annual Scientific Sessions. Boston, May 12, 2012.
  39. Intracardiac T-wave alternans. Cardiosim 2012: 18th World Congress Cardiac Electrophysiology & Cardiac Techniques. Nice, France. June 14, 2012.
  40. Primary prevention of sudden cardiac death in patients with heart disease: patient selection and long-term outcomes. Mayo School of Medicine Symposium: Arrhythmias & the Heart: A Cardiovascular Update. Maui, Hawaii, January 29, 2013
  41. Keys to selecting and managing patients receiving CRT systems. Mayo School of Medicine Symposium: Arrhythmias & the Heart: A Cardiovascular Update. Maui, Hawaii, January 30, 2013
  42. Application of the basics of ICD technology in the clinical setting. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 4<sup>th</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 23, 2013.
  43. Lead failure, lead technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 4<sup>th</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 24, 2013.
  44. How to interpret ICD diagnostics and electrograms. Heart Rhythm Society 34<sup>th</sup> Annual Scientific Sessions. Denver, May 9, 2013.
  45. ICD leads: Design, diagnostics and management. Northwest Electrophysiology Society Annual Meeting, Portland OR, June 14, 2013
  46. Troubleshooting devices I: Detection algorithms, electrogram interpretation. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 5<sup>th</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 21, 2014.
  47. Troubleshooting devices III: Leads management. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 5<sup>th</sup> Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 22, 2014.
  48. Engineering aspects of ICD systems. Heart Rhythm Society's 35<sup>th</sup> Annual Scientific Sessions. San Francisco, May 7, 2014.
  49. CIED performance. Heart Rhythm Society's 35<sup>th</sup> Annual Scientific Sessions. San Francisco, May 7, 2014.
  50. Lead failure: Clinical presentations and differential diagnosis Heart Rhythm Society's 35<sup>th</sup> Annual Scientific Sessions. San Francisco, May 9 2014
  51. Analysis of ICD tracings: Mini Board Review Boot Camp for EP Fellows. Heart Rhythm Society's

- 35th Annual Scientific Sessions. San Francisco, May 10, 2014.
52. Diagnostics for ICD lead failure. Mayo Clinic Rhythm Device Summit: Implantation, Management; Follow Up. Chicago, June 13, 2014.
  53. Troubleshooting cardiac resynchronization devices. Mayo Clinic Rhythm Device Summit: Implantation, Management; Follow Up. Chicago, June 13, 2014.
  54. ICD Troubleshooting. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, September 6, 2014
  55. Troubleshooting the problematic lead. Heart Rhythm Society-University of California at San Diego Lead Management Update. La Jolla, CA. September 20, 2014
  56. Contemporary ICD discrimination algorithms. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 6th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 13, 2015.
  57. Challenging ICD troubleshooting I. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 6th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 13, 2015.
  58. Troubleshooting: Lead management/diagnosis of lead fracture. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 6th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 13, 2015.
  59. The clinician's perspective. Stanford University Medical Center. Medicine 275B. Biomedical Innovation Incubator. April 28, 2015.
  60. Optimal programming of ICDs. Heart Rhythm Society's 36th Annual Scientific Sessions. Boston, May 13, 2015
  61. Lead Integrity Alert (LIA) is activated. Heart Rhythm Society's 36th Annual Scientific Sessions. Boston, May 14, 2015
  62. What the electrophysiologist needs to know about contemporary ICD technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 7th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 25, 2016.
  63. ICD implant testing: When is it Still Necessary? How Should it Be Done? Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 7th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 25, 2016.
  64. The 2015 HRS/EHRA/APHRS/SOLAECE Expert Consensus Statement on Optimal ICD Programming: How Should it Change Your Practice? Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 7th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 25, 2016.
  65. ICD Sensing Problems and Suspected Lead Failure. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 7th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, March 26, 2016.
  66. Optimal ICD programming. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 10, 2017.
  67. What the electrophysiologist needs to know about contemporary CIED technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 10, 2017.

68. ICD implant testing: When is it still necessary? How Should it Be Done? Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 10, 2017.
69. Challenging CRT cases. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 10, 2017.
70. Advisory leads and troubleshooting: ICD sensing problems and suspected lead failure. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 11, 2017.
71. Implantable cardioverter defibrillators: What the practicing cardiologist should know. Cardiology Grand Rounds, Mayo Clinic, Scottsdale AZ, March 2, 2017
72. Implantable cardioverter defibrillators: What the practicing cardiologist should know about limitations and performance. Cardiology Grand Rounds. Emory University, Atlanta, GA, April 24, 2017
73. Transvenous ICD leads: Design, performance; diagnostics. Electrophysiology Conference, Duke University Medical Center, Durham NC, April 24, 2017
74. Implantable cardioverter defibrillators: What the practicing cardiologist should know about limitations and performance. Cardiology Grand Rounds, Duke University Medical Center, Durham NC, April 25, 2017
75. The future of transvenous leads: lead design, construction, failure; understanding the mechanisms of lead failure. Heart Rhythm Society's 38th Annual Scientific Sessions, May 10, 2017, Chicago IL
76. How device diagnostics can aid in making good decisions: a case where the lead is not the issue. Heart Rhythm Society's 38th Annual Scientific Sessions, May 12, 2017, Chicago IL
77. How I use device diagnostics to make the best decisions for my CIED patients. Heart Rhythm Society's 38th Annual Scientific Sessions, May 13, 2017, Chicago IL
78. ICD in athletes: how to achieve the best clinical outcomes and avoid complications. 44th International Congress on Electrophysiology. Portland OR, June 24, 2017.
79. Innovations in clinical electrophysiology. 44th International Congress on Electrophysiology. Portland OR, June 24, 2017.
80. How does defibrillation work? Insights from how defibrillation fails. University of Pennsylvania 12th International Symposium on Ventricular Arrhythmias. Philadelphia, PA, October 13, 2017.
81. What the electrophysiologist needs to know about contemporary CIED technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 16, 2018.
82. Using ICD diagnostics and electrograms to approach clinical issues. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 16, 2018.
83. Optimal ICD programming. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 16, 2018.
84. Challenging CRT cases. Optimal ICD programming. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 9th Annual West Coast Symposium: ICD, CRT

- Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 17, 2018.
85. New developments in cardiac pacing (leadless pacing, His-bundle pacing, CRT) Cardiology Grand Rounds. Mayo Clinic. Scottsdale AZ. March 1, 2018.
  86. New horizons in device therapy: State of the art. Heart Rhythm Society's 39th Annual Scientific Sessions, May 9, 2018, Boston MA
  87. How to recognize malfunctioning leads. Heart Rhythm Society's 39th Annual Scientific Sessions, May 12, 2018, Boston MA
  88. How to optimally program ICDs. Mayo School of Medicine Cardiac Device Summit. Laguna Niguel, CA. June 29, 2018.
  89. The Great Debate: His Bundle pacing should be used instead of an LV lead for patients with a CRT indication. Mayo School of Medicine Cardiac Device Summit. Laguna Niguel, CA. June 30, 2018.
  90. A lead alert is triggered. Is this lead fractured? Mayo Clinic Cardiac Device Summit. Laguna Niguel, CA. June 30, 2018.
  91. Selected topics in ICD troubleshooting: Case based approach. Mayo Clinic Cardiac Device Summit. Laguna Niguel, CA. July 1, 2018.
  92. Role of emerging device technology for SCD prevention: VEST Trial, subcutaneous ICD and more. Mayo School of Medicine Symposium: Arrhythmias & the Heart Cardiology Update 2019. Maui, Hi. January 29, 2019.
  93. ICD management: recurrent shocks, appropriate or inappropriate; What to do for non-electrophysiologists? Mayo School of Medicine Symposium: Arrhythmias & the Heart Cardiology Update 2019. Maui, Hi. January 29, 2019.
  94. His bundle pacing and other "physiological pacing" methods: Is it ready for prime time? Mayo School of Medicine Symposium: Arrhythmias & the Heart Cardiology Update 2019. Maui, Hi. January 31, 2019.
  95. What the electrophysiologist needs to know about contemporary CIED technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 10th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 15, 2019.
  96. Using ICD diagnostics and electrograms to approach clinical issues. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 10th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 15, 2019.
  97. Troubleshooting suspected ICD lead failure. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 10th Annual West Coast Symposium: ICD, CRT Implantation, Programming, Troubleshooting and Extraction. La Jolla, February 16, 2019.
  98. Troubleshooting: Understanding the post implant nuances. Heart Rhythm Society's 40th Annual Scientific Sessions: Boston MA May 11, 2019
  99. Diagnostics for ICD leads: What can we learn from alerts based on electrograms and impedance trends? What Else Do We Need to Know? Mayo Clinic and University of Bordeaux Complex Ablation and Device Tracing Summit 2019. Atlanta GA September 26, 2019
  100. ICD leads diagnostics: Focus on lead impedance. Virginia Commonwealth University Electrophysiology Grand Rounds. Richmond, VA, November 20, 2019
  101. What the practicing cardiologist should know about ICDs. Virginia Commonwealth University Cardiology Grand Rounds. Richmond, VA, November 21, 2019
  102. Diagnosing lead failure on device interrogation. University of Washington Lead Management Update Symposium. December 6, 2020

103. Lead failure and leads diagnostics (including new lead technology). Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 11th Annual West Coast Symposium: ICD. La Jolla, March 6, 2020.
104. What the electrophysiologist needs to know about contemporary CIED leads technology. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 11th Annual West Coast Symposium: ICD. La Jolla, March 6, 2020.
105. Using ICD diagnostics and electrograms to approach clinical issues. Heart Rhythm Society-University of California at San Diego and Heart Rhythm Society 11th Annual West Coast Symposium: ICD. La Jolla, March 6, 2020.

## **TEACHING ACTIVITIES:**

### **Clinical Teaching at Cedars Sinai**

#### **Cardiac Electrophysiology Lab**

Supervision and teaching of fellows in the Clinical Cardiac Electrophysiology (CCEP) program. 6-12 hours/week, 45-48 weeks/year, 1990-

#### **Consultative Cardiac Electrophysiology**

Supervision and teaching of fellows in Cardiology and Clinical Cardiac Electrophysiology (CCEP). 1-3 hours/week, 45-48 weeks/year, 1990-

### **Non-Clinical Teaching**

#### **Cedars Sinai**

#### **Clinical Cardiac Electrophysiology (CCEP) Fellowship Program**

Didactic Core Curriculum Lectures (4-6/year), 2009-

Fellowship Conferences (Participation)

- Electrophysiology Case Presentation Conference (weekly), 1990-
- Journal Club (monthly), 2009-
- Cardiac Implantable Electronic Device Conference (monthly), 2016-

#### **Mentorship (Clinical Cardiac Electrophysiology Fellows)**

Bich Lien Nguyen MD, July 2008-June 2009

Sandeep Govindan Nair MD, Jan-June 2017

Junaid Ahmed Bakhtiyar Zaman MA, BMBCH, MRCP, PHD, CCDS, ECES, Jan 2017-Jul 2018

#### **Other Lectures (2008-)**

1. Debate: ICDs are effective and underutilized. Cedars Sinai Heart Institute and ACC California Chapter Symposium on Controversies and Advances in the Treatment of Cardiovascular Disease, the Ninth in the Series, September 4, 2008.
2. Debate: The conventional ICD is a useful therapy that is here to stay. Cedars Sinai Heart Institute and ACC California Chapter Symposium on Controversies and Advances in the Treatment of Cardiovascular Disease, the Ninth in the Series, October 2, 2009.
3. The ICD patient with shocks: What to do until the electrophysiologist arrives? Arrhythmia Symposium at Cedars-Sinai Heart Institute. Los Angeles, December 11, 2009.
4. ICDs and CIEDs: What the cardiologist should know. Cardiology Grand Rounds. August 24, 2010.
5. Catheter ablation should be considered first-line therapy for rhythm control of atrial fibrillation. Cardiology Grand Rounds. March 1, 2011.

6. ICDs What every care provider needs to know. Arrhythmia Symposium at Cedars-Sinai Heart Institute. Los Angeles, December 7, 2012.
7. Debate: The subcutaneous defibrillator will replace the transvenous defibrillator ICD. Cedars Sinai Heart Institute and ACC California Chapter Symposium on Controversies and Advances in the Treatment of Cardiovascular Disease, the Fourteenth in the Series, November 21, 2014
8. Debate: Athletes with ICDs: Should they be allowed to play? Cedars Sinai Heart Institute and ACC California Chapter Symposium on Controversies and Advances in the Treatment of Cardiovascular Disease, the Fifteenth in the Series, November 20, 2015
9. Debate: Time for the subcutaneous device to replace the transvenous defibrillator? Cedars Sinai Heart Institute and ACC California Chapter Symposium on Controversies and Advances in the Treatment of Cardiovascular Disease, the Sixteenth in the Series, November 18, 2016
10. Remote monitoring of device patients: Contemporary practice and future opportunities. Arrhythmia Symposium at Cedars-Sinai Heart Institute. Los Angeles, December 2, 2016.

#### **UCLA**

1. ICD leads: Design and diagnostics for lead failure. University of California at Los Angeles Electrophysiology Grand Rounds. Los Angeles, August 15, 2013

#### **Board Review Lectures**

1. CRT based questions in board format for Mini Board Review. Heart Rhythm Society 34<sup>th</sup> Annual Scientific Sessions. Denver, May 10, 2013.
2. Indications for ICD and CRT. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, August 24, 2013
3. Mini Board Review: ICD questions. Heart Rhythm Society's 36th Annual Scientific Sessions. Boston, May 16, 2015
4. ICD troubleshooting cases. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, August 24, 2013
5. ICD Troubleshooting. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, August 14, 2016.
6. Device Workshop 1. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, August 14, 2016
7. Device Workshop 2. Mayo Clinic Electrophysiology Board Review Course, Rochester MN, August 14, 2016
8. Bradycardia-arrhythmias and pacemaker therapy. The ACC Cardiovascular Overview and Board Review for Certification and Recertification. Chicago, IL. September 6, 2018.
9. The implantable cardioverter defibrillator and cardiac resynchronization. The ACC Cardiovascular Overview and Board Review for Certification and Recertification. Chicago, IL. September 6, 2018.
10. Test your knowledge: Electrophysiology cases Part II. The ACC Cardiovascular Overview and Board Review for Certification and Recertification. Chicago, IL. September 6, 2018.

#### **Course Faculty and Lectures**

1. ICD troubleshooting workshops: Parts 1 & 2 (total 4 hours) Josephson-Wellens: How to Approach Complex Arrhythmias for EP Fellows. Boston (Jan) and San Francisco (July), biannually 2005-2016.
2. SVT-VT discrimination: Humans vs. ICDs. St Jude Medical Lyceum. Sylmar, CA March 2009
3. Minimizing shocks to improve survival in ICD patients. Cardiology Lecture Series. French Hospital, San Luis Obispo, October 28, 2010.
4. Lectures and 3-hour Workshops in Device Management: Beyond the Basics (Course Directors Paul

Wang & David Hayes), annually 2011-2020.

- The science behind defibrillation threshold testing. Scottsdale, Az, March 11, 2011.
  - ICD troubleshooting workshop. Scottsdale, Az, March 11, 2011; Coral Gables, Fl. March 10, 2012; Austin, TX, February 27, 2015.
  - Engineering of devices and leads. Scottsdale, Az, March 2, 2013.
  - How does it work? Understanding the hardware of CIEDs. Scottsdale, Az, February 28, 2014.
  - ICD sensing and detection abnormalities. Scottsdale, Az, March 1, 2014.
  - Understanding the Hardware of CIEDs. Austin, TX, February 28, 2015.
  - ICD troubleshooting workshops: Parts 1 & 2: Phoenix, AZ, March 4-5, 2015; Phoenix, AZ, March 3-4, 2017; Dallas, TX, March 2-3, 2018, Denver, CO, March 1-2, 2019; Chicago, IL, February 28-29, 2020.
5. Complex electrogram analysis. St Jude Medical's 8th Annual EP Fellows Conference. San Francisco, May 2, 2011.
  6. Complex device management: The other intracardiac electrogram. St Jude Medical's 8th Annual EP Fellows Conference. San Francisco, May 3, 2011.
  7. How to avoid ICD shocks: Algorithms and appropriate programming. Electrophysiology Innovations (EPI) Congress 2011. Washington DC, September 11, 2011.
  8. How to fix a high DFT — And should we even bother to check? Electrophysiology Innovations (EPI) Congress 2011. Washington DC, September 11, 2011.
  9. Ablation should be first-line therapy for paroxysmal atrial fibrillation. Medtronic CRDM Collaborative Medicine Program, Las Vegas, NV, March 3, 2012
  10. Strategies to reduce ICD shocks. Medtronic CRDM Collaborative Medicine Program, Carlsbad, CA, October 20, 2012
  11. Innovations in cardio devices. MedTech Innovate Seminars 2013, Anaheim, CA, February 14, 2013
  12. Engineering of devices and leads. Device Management: Beyond the Basics. Scottsdale, Az, March 2, 2013.
  13. How does it work? Understanding the hardware of CIEDs. Device Management: Beyond the Basics. Scottsdale, Az, February 28, 2014.
  14. ICD sensing and detection abnormalities. Device Management: Beyond the Basics. Scottsdale, Az, March 1, 2014.
  15. Leads management. West Coast EP Fellows Cardiovascular Summit. Los Angeles, CA. November 15, 2014.
  16. Leads management and leadless devices. West Coast EP Fellows Cardiovascular Summit. Los Angeles, CA. October 24, 2015.
  17. Optimal ICD Programming & Testing. West Coast Cardiovascular Summit Las Vegas, NV October 3, 2015.
  18. Leads management: Reliability, diagnostics, & replacement: Is there a Future Without Leads? West Coast EP Fellows Cardiovascular Summit. Los Angeles, CA. November 6, 2016.
  19. Managing lead alerts. 2017 Lead Extraction Symposium. Minneapolis, MN, October 28, 2017.
  20. Leads management: Reliability, diagnostics, & replacement. West Coast EP Fellows Cardiovascular Summit. Los Angeles, CA. November 4, 2017.
  21. Leadless pacing. 2018 Electrophysiology Conference: Straight Talk from the Experts. Vail, Co. February 25, 2018.
  22. Lead alerts in the diagnosis of lead failure: Tips and pitfalls for the practicing electrophysiologist.

- 2018 Electrophysiology Conference: Straight Talk from the Experts. Vail, Co. February 25, 2018.
23. Update on lead alerts. 2018 Lead Extraction Symposium. Minneapolis, MN, September 22, 2018.
  24. Device diagnostics case. 2018 Lead Extraction Symposium. Minneapolis, MN, September 22, 2018.
  25. Update on leads diagnostics. West Coast Fellows Cardiovascular Summit. Los Angeles, CA November 3, 2018.
  26. Troubleshooting suspected ICD lead failure. Hoag Memorial Hospital Symposium: Advances In Arrhythmia Management. Newport, CA, April 5, 2019.
  27. The wearable cardioverter defibrillator: Technology, clinical evidence, indications. American College of Cardiology, California Chapter. Los Angeles, CA June 20, 2019.
  28. Leads diagnostics: How good are they for troubleshooting suspected ICD lead failure? Lovelace Medical Center, Albuquerque, NM, July 11, 2019.
  29. Wearable cardioverter defibrillators. ACC Southern California Chapter Conference. Los Angeles, CA, June 20, 2019.
  30. Solving lead-device issues. Lead Extraction Symposium. Minneapolis, MN, October 19, 2019.
  31. Is there a future for cardiac electronic devices without leads? West Coast EP Fellows Cardiovascular Summit. Los Angeles, CA. January 10, 2020.
  32. Lead impedance in the diagnosis of lead failure. Kaiser Permanente Southern California Electrophysiology Conference (given remotely), April 21, 2020.



## BIBLIOGRAPHY/PUBLICATIONS:

### Research Papers

#### A.) Research Papers – Peer-Reviewed

1. Mason, JW, **Swerdlow CD**, Winkle RA, Griffin JC, Ross DL, Keefe DL, Clusin WT. Programmed ventricular stimulation in predicting vulnerability to ventricular arrhythmias and their response to antiarrhythmic therapy. *American Heart Journal* 103:633-638, 1982.
2. Ross DL, Keefe DL, **Swerdlow CD**, Echt DS, Griffin JC, Winkle RA, Mason JW. Efficacy of drug combinations in preventing induction of refractory ventricular tachycardia at electrophysiologic study. *Circulation* 66:1205-1210, 1982.
3. **Swerdlow CD**, Winkle RA, Griffin JC, Ross DL, Mason JW. Decreased incidence of antiarrhythmic drug efficacy at electrophysiologic study associated with use of a third extrastimulus. *American Heart Journal* 104:1004-1010, 1982.
4. Fogoros R, Anderson KA, Winkle RA, **Swerdlow CD**, Mason JW. Amiodarone: Clinical efficacy and toxicity in 96 patients with recurrent, drug-refractory arrhythmias. *Circulation* 68:88-94, 1983.
5. Mason JW, **Swerdlow CD**, Mitchell LB. Efficacy of verapamil in chronic, recurrent ventricular tachycardia. *American Journal of Cardiology* 51:1614-1617, 1983.
6. **Swerdlow CD**, Gong G, Echt DS, Winkle RA, Griffin JC, Ross DL, Mason JW. Clinical factors predicting antiarrhythmic drug efficacy at electrophysiologic study in patients in ventricular tachycardia. *Journal of the American College of Cardiology* 1:409-416, 1983.
7. **Swerdlow CD**, Winkle RA, Mason JW. Determinants of survival in patients with ventricular tachyarrhythmias. *New England Journal of Medicine* 308:1436-1442, 1983.
8. **Swerdlow CD**, Winkle RA, Mason JW. Prognostic significance of the number of induced ventricular complexes during assessment of antiarrhythmic therapy for ventricular tachyarrhythmias. *Circulation* 68:400-405, 1983.
9. **Swerdlow CD**, Yu EO, Jacobson E, Mann S, Winkle RA, Griffin JC, Ross DL, Mason JW. Safety and efficacy of intravenous quinidine. *American Journal of Medicine* 75:36-42, 1983.
10. Winkle RA, Bach, Jr. SM, Echt DS, **Swerdlow CD**, Imran M, Mason JW, Boyer PE, Stinson EB. The automatic implantable defibrillator: local ventricular bipolar sensing to detect ventricular tachycardia and fibrillation. *American Journal of Cardiology* 52:265-270, 1983.
11. Connolly ST, Mitchell LB, **Swerdlow CD**, Mason JW, Winkle RA. The clinical efficacy and electrophysiology of imipramine in patients with ventricular tachycardia. *American Journal of Cardiology* 53:516-521, 1984.
12. Freedman RA, **Swerdlow CD**, Echt DS, Winkle RA, Soderholm-Difatte V, Mason JW: Facilitation of ventricular tachyarrhythmia induction by isoproterenol. *American Journal of Cardiology* 54:765-770, 1984.
13. Abrams J, Allen J, Allin D, Anderson J, Anderson S, Blanski L, Chadda K, DiBianco R, Favrot L, Gonzalez J, Horowitz L, Laddu A, Lee R, MacCosbe P, Morganroth J, Narula O, Singh B, Singh J, Steck J, **Swerdlow CD**, Turlapaty P, Waldo A. Efficacy and safety of esmolol vs. propranolol in the treatment of supraventricular tachyarrhythmias: A multicenter double-blind clinical trial. *American Heart Journal* 110:913-922, 1985.
14. **Swerdlow CD**, Peterson JL. Prospective comparison of Holter monitoring and electrophysiologic study in patients with coronary artery disease and sustained ventricular tachyarrhythmias. *American Journal of Cardiology* 56:577-580, 1985.
15. **Swerdlow CD**, Freedman RA, Peterson J, Clay D. Determinants of prognosis in ventricular tachyarrhythmia patients without induced sustained arrhythmias. *American Heart Journal* 111:433-437, 1986.

16. **Swerdlow CD**, Mason JW, Stinson EB, Oyer PE, Winkle RA, Derby GC. Results of operations for ventricular tachycardia in 105 patients. *Journal of Cardiovascular Surgery* 92:105-113, 1986.
17. **Swerdlow CD**, Peterson J, Turlapaty P. Clinical electrophysiology of flestolol, a potent ultrashort-acting beta blocker. *American Heart Journal* 111:49-53, 1986.
18. Adhar GC, **Swerdlow CD**, Lance BL, Clay D, Bardy GH, Greene HL. Tocainide for drug-resistant sustained ventricular tachyarrhythmias. *Journal of the American College of Cardiology* 11:124-131, 1987.
19. Fischell TA, Stinson EB, Derby GC, **Swerdlow CD**. Long-term follow-up after surgical correction of Wolff-Parkinson-White syndrome. *Journal of the American College of Cardiology* 9:283-287, 1987.
20. Lerman BB, Greenberg M, Overholt ED, **Swerdlow CD**, Fellows TD, Dimarco JT. Differential electrophysiologic properties of decremental retrograde pathways in long RP'-tachycardia. *Circulation* 76:21-23, 1987.
21. Liem LB, Clay DA, Franz MR, **Swerdlow CD**. Electrophysiology and antiarrhythmic efficacy of intravenous pirmenol in patients with sustained ventricular tachyarrhythmias. *American Heart Journal* 113:1390-1396, 1987.
22. **Swerdlow CD**, Bardy GH, McAnulty J, Kron J, Lee JT, Graham E, Peterson J, Greene HL. Determinants of induced sustained arrhythmias in survivors of out-of-hospital ventricular fibrillation. *Circulation* 76:1053-1060, 1987.
23. **Swerdlow CD**, Liem LB, Franz MR. Summation and inhibition by ultra-rapid train pacing in the human ventricle. *Circulation* 76:1101-1109, 1987.
24. **Swerdlow CD**, Peterson J, Liem LB, Blake K, Franz MR, Laddu A. Electropharmacology of flestolol for supraventricular tachycardia without associated structural heart disease. *American Journal of Cardiology* 60:1055-1060, 1987.
25. Adhar GC, **Swerdlow CD**, Lance BL, Clay D, Bardy GH, Greene HL. Tocainide for drug-resistant sustained ventricular tachyarrhythmias. *Journal of the American College of Cardiology* 11:124-131, 1988.
26. Franz MR, **Swerdlow CD**, Liem LB, Schaefer J. Cycle-length dependence of human action potential duration in vivo: Effects of single extrastimuli, sudden sustained rate acceleration and deceleration; different steady-state frequencies. *Journal of Clinical Investigation* 82:972-979, 1988.
27. Freedman RA, **Swerdlow CD**, Soderholm-Difatte V, Mason JW. Prognostic significance of arrhythmia inducibility or noninducibility at initial electrophysiologic study on survivors of cardiac arrest. *American Journal of Cardiology* 61:578-582, 1988.
28. Freedman RA, **Swerdlow CD**, Soderholm-Difatte V, Mason JW. Prognostic value of arrhythmias induced at electrophysiologic study in cardiac arrest survivors. *Journal of the American College of Cardiology* 12:973-978, 1988.
29. Liem LB, Mason DM Jr., **Swerdlow CD**. Strength-interval relation for ventricular function refractoriness. *American Journal of Cardiology* 61:88-92, 1988.
30. Liem LB, **Swerdlow CD**. Value of electropharmacologic testing in patients with idiopathic dilated cardiomyopathy and sustained ventricular tachyarrhythmias. *American Journal of Cardiology* 62:611-616, 1988.
31. Liem LB, **Swerdlow CD**, Franz MR. Distinctive features of ventricular fibrillation and ventricular tachycardia detected by monophasic action potential recording in human subjects. *Journal of Electrophysiology* 2:484-492, 1988.
32. Liem LB, Yee YG, **Swerdlow CD**, Kates, RE. Pharmacodynamics of procainamide in patients with ventricular tachyarrhythmias. *Journal of Clinical Pharmacology* 28:984-989, 1988.
33. Lo YA, Cutler JE, Blake K, Wright AM, Kron J, **Swerdlow CD**. Angiographic coronary

- morphology in survivors of cardiac arrest. *American Heart Journal* 115:781-785, 1988.
34. Lo YA, Cutler JE, Wright A, Kron J, Blake K, **Swerdlow CD**. Long-segment coronary ulcerations in survivors of sudden cardiac death. *American Heart Journal* 115:1444-1447, 1988.
  35. **Swerdlow CD**, Peterson J, Liem LB. Effect of flestolol on ventricular rate during atrial fibrillation in Wolff-Parkinson-White syndrome. *American Journal of Cardiology* 62:78-82, 1988.
  36. Schnittger I, Lee JT, Hargis J, Wyndham CR, Echt DS, **Swerdlow CD**, Griffin JC. Long-term results of antitachycardia pacing in patients with supraventricular tachycardia. *Pacing and Clinical Electrophysiology* 12:936-941, 1989.
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  39. **Swerdlow CD**, Kass RM, Hwang C, Gang E, Chen PS, Peter CT. Effects of voltage and respiration on impedance in nonthoracotomy defibrillation pathways. *American Journal of Cardiology* 73:688-692, 1994.
  40. **Swerdlow CD**, Chen PS, Kass RK, Allard JA, Peter C. Discrimination of ventricular tachycardia from sinus tachycardia and atrial fibrillation in a tiered-therapy cardioverter-defibrillator. *Journal of the American College of Cardiology* 23:1342-1355, 1994.
  41. **Swerdlow CD**, Olson W, Chen PS, Ahern T, Gang E, Kass R, Mandel W, Peter T. Incidence and significance of underdetection of ventricular tachycardia by algorithms to enhance specificity in an advanced antiarrhythmic device. *Journal of the American College of Cardiology* 24:416-424, 1994.
  42. **Swerdlow CD**, Kass RM, Hwang C, Chen PS, Raissi S. Effect of capacitor size and pathway resistance on defibrillation threshold for implantable defibrillators. *Circulation* 90:1840-1846, 1994.
  43. Hwang C, **Swerdlow CD**, Kass R, Gang E, Mandel W, Peter T, Chen PS. Upper limit of vulnerability predicts transvenous defibrillation threshold. *Circulation* 90:2308-2315, 1994.
  44. Ong JJC, Hsu PC, Lin L, Yu A, Kass RM, Peter CT, **Swerdlow CD**. Arrhythmias following cardioverter-defibrillator implantation: Comparison of epicardial and transvenous systems. *American Journal of Cardiology* 75:137-140, 1995.
  45. **Swerdlow CD**, Davie S, Kass RM, Chen PS, Hwang C, Mandel WJ, Gang ES, Raissi S, Peter CT. Optimal electrode configuration for pectoral transvenous implantable defibrillator without an active can. *American Journal of Cardiology* 76:370-374, 1995.
  46. Jones, GK, **Swerdlow CD**, Reichenbach D, Lones M, Dolack G, Poole J, Kudenchuk P, Bardy G. Anatomical findings in patients having had a chronically indwelling coronary sinus defibrillation lead. *Pacing and Clinical Electrophysiology* 18:2062-2067, 1995.
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- and upper limit of vulnerability. *Pacing and Clinical Electrophysiology* 19:2103-2111, 1996.
51. **Swerdlow CD**, Martin DJ, Kass RM, Davie S, Mandel WJ, Gang ES, Chen PS. Zone of vulnerability to T-Wave shocks in humans. *Journal of Cardiovascular Electrophysiology* 8:145-154, 1997.
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  59. **Swerdlow CD**, Schoels W, Dijkman B, Jung W, Sheth NV, Olson WH, Gunderson BD. Detection of atrial fibrillation and flutter by a dual-chamber implantable cardioverter-defibrillator. *Circulation* 101:878-885, 2000.
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