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Sarah M. Hanigan, PharmD, BCPS (AQ-Cardiology), BCCP

Education

August 2004-May 2010 Doctor of Pharmacy, *summa cum laude*
Drake University, Des Moines, IA

Professional Experience

October 2020-present Clinical Assistant Professor
College of Pharmacy, University of Michigan, Ann Arbor, MI

2017-Sept 2020 Adjunct Clinical Professor
College of Pharmacy, University of Michigan, Ann Arbor, MI

August 2012-present Cardiology/Anticoagulation Clinical Specialist
Michigan Medicine, Ann Arbor, MI

- Cardiac intensive care, Advanced heart failure, Heart transplantation, General cardiology, Electrophysiology service
- Pharmacist-Assisted Anticoagulation Service, Lead Pharmacist
 - Coordination of implementation of the service to all adult inpatient services, completed in October 2013
 - Education of incoming pharmacists, development of annual competency, and continual update of education materials
 - Transition of the service into EPIC (June 2014) which included changes in documentation, discharge process and identification of patients
 - Continued evaluation and improvement of the service
- Anticoagulation Management Subcommittee of Pharmacy and Therapeutics Committee, Secretary
 - Agenda management
 - Update, development, and presentation of protocols and guidelines to the subcommittee
 - Presentation of approved guidelines to the Pharmacy and Therapeutics Committee

August 2012-2016 Adjunct Clinical Instructor
College of Pharmacy, University of Michigan, Ann Arbor, MI

Pharmacy Residency Training

July 2011-June 2012 ASHP Accredited Specialty Residency, Cardiology
Residency Program Director: Rob DiDomenico, PharmD, BCPS
The University of Illinois Hospital and Health Sciences System

July 2010-June 2011 ASHP Accredited Pharmacy Practice Residency

Residency Program Director: Patrick Fuller, PharmD, BCPS
Nebraska Medical Center/University of Nebraska Medical Center

Current Licensure and Certification

2018-present	Board Certified Cardiology Pharmacist
2017-present	Added Qualifications in Cardiology
2017-present	Advanced Cardiac Life Support Certification
2012-present	Board Certified Pharmacotherapy Specialist
2012-present	Michigan Pharmacist License (#5302041371)

Publications

Peer-reviewed Manuscripts

Cusick A, **Hanigan S**, Bashaw L, Johnson M, Heidemann L. A practical and cost-effective approach to the diagnosis of heparin-induced thrombocytopenia: a single-center quality improvement study. J Clin Outcomes Management. 2022 March;29(2):72-77.

Stettner S, Adie S, **Hanigan S**, Thomas M, Pogue K, Zimmerman C. Effect of replacing vendor QTc alerts with a custom QTc risk alert in inpatients. Appl Clin Inform. 2022 Jan;13(1):19-29.

Hanigan S, Barnes GD. DOAC drug level: Does “knowing” lead to safer care? Thromb Res. 2021 Dec;208:127-128.

Rohde JM, Saeed M, Barnes GD, **Hanigan S**, Lin J, Murali S, Somand DM, Wesorick DH, Adie S, Mack MR, Wesorick DH, Proudlock A. Inpatient Management of Acute Atrial Fibrillation and Atrial Flutter in Non-Pregnant Hospitalized Adults. Ann Arbor (MI): Michigan Medicine University of Michigan; 2021. Available on <https://www.ncbi.nlm.nih.gov/books/NBK579414/> PubMed PMID: 35412723 and from UMHS at <http://www.uofmhealth.org/provider/clinical-care-guidelines>

Hanigan S, Kong X, Haymart B, Kline-Rogers E, Kaatz S, Krol G, Shah V, Ali MA, Almany S, Kozlowski J, Froehlich J, Barnes G. Standard versus higher intensity anticoagulation for patients with mechanical aortic valve replacement and additional risk factors for thromboembolism. Am J Cardiol. 2021 Nov;159:100-106.

Stuart M, Jonson L, **Hanigan S**, Pipe SW, Li SH. Anti-Factor IIa (FIIa) heparin assay for patients on direct factor Xa (FXa) inhibitors. J Thromb Haemost. 2020 Jul;18(7):1653-1660.

Hanigan S, Das J, Pogue K, Barnes GD, Dorsch MP. The real world use of combined P-glycoprotein and moderate CYP3A4 inhibitors with rivaroxaban or apixaban increases bleeding. J Thromb Thrombolysis 2020 May;49(4):636-43.

Adie S, Bitar A, **Hanigan S**, Pogue K, Koelling T, Dorsch MP. Real-world prevalence of adverse events after initiating sacubitril/valsartan compared with angiotensin-converting enzyme inhibitors or angiotensin receptor blockers in systolic heart failure. J Card Fail. 2019 May;25(5):412-413.

Grant PJ, Courey AJ, **Hanigan S**, Kolbe MS, Kronick SL, Obi A, Seagull FJ, Sood SL, Wakefield TW, Williams DM, Froehlich JB, Fontana R, Haft JW, Sonnenday CJ. Special Topics in Venous Thromboembolism [Internet]. Ann Arbor (MI): Michigan Medicine University of Michigan; 2019 Feb. Available from <http://www.ncbi.nlm.nih.gov/books/NBK544377/>. PubMed PMID: 31339682 and from UMHS at <http://www.uofmhealth.org/provider/clinical-care-guidelines>

Early CR, Park JM, Dorsch MP, Pogue KT, **Hanigan S**. Effect of metronidazole use on tacrolimus concentrations in transplant patients treated for *Clostridium difficile*. *Transpl Infect Dis*. 2016 Oct;18(5):714-720.

Ha NB, Yang K, **Hanigan S**, Kurtz B, Dorsch MP, Mak H, Nagel J. Impact of a guideline for the management of antimicrobial/warfarin interactions in the inpatient setting and across transition of care. *Ann Pharmacother*. 2016 Sep;50(9):734-40.

Kaminsky BM, Pogue KT, **Hanigan S**, Koelling TM, Dorsch MP. Effects of total dose infusion of iron intravenously in patients with acute heart failure and anemia (hemoglobin < 13 g/dl). *Am J Cardiol*. 2016 Jun;117(12):1942-6.

Hanigan S and DiDomenico RJ. Emerging therapies for acute and chronic heart failure: hope or hype? *J Pharm Pract*. 2016 Feb;29(1):46-57.

Crawford TC, Rohde JM, Hartley SE, **Hanigan S**, Lin J, Morgenstern LB, Seagull FJ, Somand DM, Wesorick DH. Management of Acute Atrial Fibrillation and Atrial Flutter in Non-Pregnant Hospitalized Adults. Ann Arbor, MI: Faculty Group Practice, University of Michigan Health System, 2013. [Available from the National Guideline Clearinghouse at www.guideline.gov and from UMHS at <http://www.uofmhealth.org/provider/clinical-care-guidelines>] [practice guideline].

Book Chapters

Gurm HS, Konerman MC, **Hanigan S**, Pogue K. Cardiac Intensive Care in Essential Pharmacology for Inpatient Care. 1st ed. Ann Arbor (MI): Gourock House International LLC; c2014.

Gurm HS, Konerman MC, **Hanigan S**, Pogue K. General Cardiology in Essential Pharmacology for Inpatient Care. 1st ed. Ann Arbor (MI): Gourock House International LLC; c2014.

Tilton J and **Hanigan S**. Electrophysiology clinic: policy and procedure; p. 67-69 in ACCP Ambulatory care: pharmacist's survival guide. 3rd ed. Lenexa (KS): American College of Clinical Pharmacy; c2013.

Abstracts/Posters

Stuart M, Johnson L, **Hanigan S**, Pipe SW, Li SH. Anti-IIa heparin assay for patients on direct oral anticoagulants. Poster presented at ISLH. May 2019, Vancouver, Canada

Golbus JR, Adie S, Dorsch MP, **Hanigan S**, Rooks B, Aaronson KD, Konerman MC. Higher intensity statin therapy reduces clinical endpoints after heart transplantation independent of lipid levels. Poster presented at ISHLT Annual Meeting. April 2019, Orlando, FL

Hanigan S, Das J, Pogue KT, Dorsch MP. Use of dual p-glycoprotein and moderate CYP3A4 inhibitors with rivaroxaban or apixaban increases bleeding. Poster presented at ACC Annual Meeting. March 2019, New Orleans, LA

Maes M, Dorsch MP, Pogue KT, Wu AH, **Hanigan S**. Comparison of high dose and low dose mineralocorticoid receptor antagonism in chronic heart failure. Poster presented at ASHP Midyear Clinical Meeting. December 2017, Orlando, FL

Sutter DA, Dorsch MP, Pogue KT, **Hanigan S**, Bleske BE. Effects of carvedilol versus other beta blockers on recurrent atrial fibrillation. Poster presented at ASHP Midyear Clinical Meeting. December

2014, Anaheim, CA

Williams JB, Kurtz B, Hamadi M, Pogue KT, **Hanigan S**, Renner E, Norville J, Froehlich J, Dorsch MP. Effect of a comprehensive anticoagulation management program on attainment of therapeutic INRs following orthopedic surgery. Poster presented at ACCP Annual Meeting. October 2014, Austin, TX

Hanigan S, Groo VL, DiDomenico RJ. Pharmacist-driven hospital-to-home transitional care vs. standard of care in patients hospitalized for heart failure. Poster presented at the University Health Consortium. December 2011, New Orleans, LA

Hanigan S, Oestreich JH, Dobesh PP. Comparison of management strategies in acute coronary syndrome patients based on clopidogrel use. Poster presented at the University Health Consortium. December 2010, Anaheim, CA

Hanigan S, delos Santos G, Bhavik N, Budris W. Drug interaction evidence: a passing grade? Poster presented at ASHP Midyear Meeting. December 2009, Las Vegas, NV

Other

Hanigan S. DOAC use in special populations. In: Jackevicius C, Patterson JH eds. Cardiology Self-Assessment Program, 2021 Book 2. Arrhythmias and Thrombosis. Lenexa, KS: American College of Clinical Pharmacy, 2021:51-74.

Hanigan S, Barnes GD. Managing anticoagulant-related bleeding in patients with venous thromboembolism. <http://www.acc.org>. Oct 8, 2019. <https://www.acc.org/latest-in-cardiology/articles/2019/10/07/14/29/managing-anticoagulant-related-bleeding-in-patients-with-venous-thromboembolism>.

Rollins A, **Hanigan S**, Pogue K, Renner E, Barnes G, Dorsch M. Identifying clinical predictors of switching from direct oral anticoagulants to warfarin. Clinical Medicine Insights: Therapeutics 2019;11 <https://doi.org/10.1177/1179559X19831287>.

Teaching Experience

Fall 2020, 2021	P706 Medication Use Evaluation Faculty Advisor, P3 students University of Michigan College of Pharmacy
January 2017-present	CAD/Arrhythmias/Angina P621 Pharmacotherapy for Primary Care University of Michigan College of Pharmacy, Ann Arbor, MI
Fall 2016-present	Pharm.D. Investigations Faculty Advisor P2-P4 Pharmacy student University of Michigan College of Pharmacy, Ann Arbor, MI
Winter 2016-present	Arrhythmias (3 hours recitation, 3 hour lab)
Winter 2018-present	Acute Coronary Syndrome (1.5 hour recitation)
Winter 2018-present	Acute Decompensated Heart Failure (1.5 hour recitation) P712 Therapeutic Problem Solving University of Michigan College of Pharmacy, Ann Arbor, MI

May 2014-present	Clinical Skills Jumpstart: Anticoagulation (1.5 hour lecture) P4 Advanced Pharmacy Practice Experience University of Michigan College of Pharmacy, Ann Arbor, MI
2013-present	Pharmacy Practice Residency and Specialty Residency Preceptor PGY-1 residents, PGY-2 Critical Care residents, PGY-2 Cardiology residents (Michigan Medicine and Ann Arbor VA)
2013-present	Advanced Pharmacy Practice Experience (P4) Preceptor Cardiology 5 week clerkship – (primary preceptor 2-5 weeks depending on month) <ul style="list-style-type: none"> • Preceptor or co-preceptor for 2-10 students per year
2013-present	Introductory Pharmacy Practice Experience (P3) Preceptor 4-hrs/week during fall and/or spring semester <ul style="list-style-type: none"> • 1-6 students/year
2013, 2015, 2016, 2021	P680 Seminar Preceptor P4 Advanced Pharmacy Practice Experience University of Michigan College of Pharmacy, Ann Arbor, MI
February 2012	Pharmacokinetics of Antiarrhythmics (1.5 hour lecture) Applied Pharmacokinetics Course University of Illinois at Chicago College of Pharmacy, Chicago, IL
February 2012	Shock Syndromes: Diagnosis and Treatment (2 hour lecture) Critical Care Elective University of Illinois at Chicago College of Pharmacy, Chicago, IL
Jan-March 2011	Physical Assessment Lab Instructor Pharmaceutical Care II – Physical Assessment University of Nebraska College of Pharmacy, Omaha, NE
October 2010	Pharmacokinetics Lab Instructor University of Nebraska College of Pharmacy, Omaha, NE

Presentations

August 2021	Immunosuppression for heart transplant Heart failure/transplant fellow and faculty lecture Michigan Medicine, Ann Arbor MI
November 2020	SGLT-2 Inhibitors for Heart Failure Heart failure/transplant fellow and faculty lecture Michigan Medicine, Ann Arbor MI
November 2020	Managing Tough Anticoagulation Cases: What Would You Do? Panel Discussant AHA 2020 Scientific Sessions, Virtual Meeting
October 2020	SGLT-2 Inhibitors and Cardiovascular Disease

	<p>CME accredited Physicians, pharmacists, mid-level practitioners, nurses Michigan Chapter of ACC (Virtual Meeting)</p>
August 2020	<p>Immunosuppression for heart transplant Heart failure/transplant fellow and faculty lecture Michigan Medicine, Ann Arbor MI</p>
November 2019	<p>Management of acute pulmonary embolism: a panel discussion CME accredited Physicians, pharmacists, mid-level practitioners, nurses Update in Pulmonary and Critical Care Medicine, Plymouth, MI</p>
September 2019	<p>Direct oral anticoagulants in the hospitalized patient: everything the CNS needs to know Clinical nurse specialists MI-CNS Educational Series, Ann Arbor, MI</p>
August 2019	<p>Immunosuppression for heart transplant Heart failure/transplant fellow and faculty lecture Michigan Medicine, Ann Arbor MI</p>
June 2019	<p>Anticoagulation: clinical review and workflow Inpatient nursing inservice Michigan Medicine, Ann Arbor, MI</p>
May 2019	<p>Immunosuppression for heart transplant Heart failure/transplant fellow and faculty lecture Michigan Medicine, Ann Arbor MI</p>
August 2017	<p>Medications after heart transplantation Pre- and post-transplant patient lecture and discussion Michigan Medicine, Ann Arbor, MI</p>
April 2017	<p>Should empagliflozin and liraglutide be included in cardiovascular guidelines? CPE accredited lecture Physicians, pharmacists, mid-level practitioners, nurses 2017 Take Heart CV Team Symposium, Livonia, MI</p>
June 2016	<p>Updates to the pharmacist-assisted anticoagulation service Pharmacist lecture Michigan Medicine, Ann Arbor, MI</p>
April 2012	<p>Pharmacist-driven hospital-to-home transitional care vs. standard of care in patients hospitalized for heart failure Oral abstract presentation Great Lakes Pharmacy Resident Conference, West Lafayette, IN</p>
September 2011	<p>Mineralocorticoid receptor antagonists for acute heart failure syndrome ACPE accredited lecture Pharmacists, mid-level practitioners, nurses University of Illinois Hospital and Health Sciences System, Chicago, IL</p>

April 2011	Comparison of management strategies in acute coronary syndrome patients based on clopidogrel use Oral abstract presentation Midwest Pharmacy Resident Conference, Omaha, NE
March 2011	The effects of preoperative angiotensin-converting enzyme inhibitors on patient outcomes ACPE accredited lecture The Nebraska Medical Center, Omaha, NE
January 2011	Optimization of diuretic therapy in acute heart failure: continuous infusion versus intermittent dosing ACPE accredited lecture The Nebraska Medical Center, Omaha, NE
October 2010	P2Y12 antagonists in ACS and variable response to clopidogrel ACPE accredited lecture The Nebraska Medical Center, Omaha NE

Professional Membership and Service

2021-present	Experiential Education Committee
2020-present	Peer Reviewer for Journal of Heart and Lung Transplant
2017-present	American College of Cardiology
2015-present	Venous Thromboembolism Clinical Guideline Committee Michigan Medicine, Ann Arbor, MI
2014-present	Peer Reviewer for Pharmacotherapy
2013-present	Atrial Fibrillation Clinical Guideline Committee Michigan Medicine, Ann Arbor, MI
2012-present	Heart Transplant Quality Committee Michigan Medicine, Ann Arbor, MI
2012-present	Anticoagulation Subcommittee, Pharmacy and Therapeutics Committee Secretary (2016-present) Michigan Medicine, Ann Arbor, MI
2012-2018	CICU Quality Committee Michigan Medicine, Ann Arbor, MI
2011-present	American College of Clinical Pharmacy (ACCP)
2017-2018	International Society for Heart and Lung Transplantation (ISHLT)
2015-2018	Clinical Pharmacy Workflow Committee Michigan Medicine, Ann Arbor, MI

2010-2011	UHC Research and Education Committee
2010-2012	American Society of Health Systems Pharmacy
2008-2010	Rho Chi, Alpha Sigma Chapter of the Academic Honor Society in Pharmacy
2007-2008	Mortar Board
2004-2010	Phi Delta Chi, Professional Pharmacy Fraternity, Psi Chapter Service, Rush/Alumni and Professional Committees, 2004-2009 Worthy Master-At-Arms, 2007-2008

Community Involvement

September 2013-2019	Volunteer pharmacist for Hope Clinic, Bi-weekly to monthly, Ypsilanti, MI
January 2007-May 2008	Weekly tutoring of 4 th graders at Monroe Elementary, Des Moines, IA
September 2004-May 2009	RVM dances, breakfast club, relay for life, kids fest, playroom at Blank Children's Hospital, Special Olympics, pharmacy health fair, letter writing for St. Jude's Hospital, Des Moines, IA

Honors

May 2010	Merck Scholastic Achievement in Pharmacy Studies
May 2009	Plough Pharmacy Scholarship
August 2004-May 2009	Drake University Presidential Scholarship
December 2008	Walgreen's R. Arnold Scholarship
2005-2009	President's List
Fall 2004 & Fall 2008	Dean's List

References

Available upon request