BIOGRAPHICAL SKETCH

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NAME: **Empey, Philip Earle**

eRA COMMONS USER NAME (agency login): pempey

POSITION TITLE: Associate Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Rhode Island, Kingston, RI	PharmD	04/1998	Pharmacy
University of Kentucky, Lexington, KY	Resident	06/1999	Pharmacy Practice
University of Kentucky, Lexington, KY	Resident	06/2000	Critical Care Pharmacy Practice
University of Kentucky, Lexington, KY	PhD	12/2007	Clinical Pharmaceutical Sciences
University of Pittsburgh, Pittsburgh, PA	Postdoctoral Fellow	06/2009	Pharmaceutical Sciences

A. PERSONAL STATEMENT

I am a PharmD/PhD (Clinical Pharmaceutical Sciences) with over 15 years of research and training experience in clinical pharmacology. I am also the director of Pharmacogenomics Center of Excellence, Associate Director for Pharmacogenomics for the Institute of Personalized Medicine and lead the Pitt/UPMC Pharmacogenomics implementation initiative (PreCISE-Rx) that is designed to advance precision medicine through clinical care, research, and education. My research program is focused on understanding the mechanisms that drive variations in medication-related patient outcomes in critically-ill populations, specifically drug transporters and pharmacogenomics. I have been PI on a 5-year NIH Career Development Award (KL2 TR000146), foundation grants, and internal projects as well as a Co-I on several NIH-funded collaborative studies involving drug transporters, pharmacokinetics, and critical illness. Specifically, we have active and completed projects involving elucidating the role of drug transporters following traumatic brain injury in close collaboration with clinician-scientists in the Safar Center for Resuscitation Research (see Contributions to Science – Section C). I have received national research and teaching awards including the Young Investigator Award from the Society of Critical Care Medicine for an innovative pharmacokinetic analysis in critically ill children (2013, an honor awarded to one individually annually), the Chancellors Distinguished Teaching Award in 2019, and the Innovations in Education Award from the American Association of Colleges of Pharmacy in 2015. I actively teach and mentor post-graduate, graduate, and professional trainees.

1. Kochanek SJ, Close DA, Wang AX, Shun T, **Empey PE**, Eiseman JL, Johnston PA. Confirmation of Selected Synergistic Cancer Drug Combinations Identified in an HTS Campaign and Exploration of Drug Efflux Transporter Contributions to the Mode of Synergy. SLAS Discov. 2019 Jul;24(6):653-668. PMID: 31039321.
2. Hagos FT, Daood MJ, Ocque AJ, Nolin TD, Bayir H, Poloyac SM, Kochanek PM, Clark RSB, **Empey PE**. Probenecid increases plasma and brain exposure of N-acetylcysteine through a mechanism involving inhibition of OAT1 and OAT3 transporters. Xenobiotica, 2017 Apr;47(4):346-353. PMID: 27278858. PMCID: PMC5572076.
3. Hagos FT, Adams SM, Poloyac SM, Kochanek PM, Horvat CM, Clark RSB, **Empey PE.** Membrane transporters in traumatic brain injury: Pathological, pharmacotherapeutic, and developmental implications. Exp Neurol. 2019 Feb 21. pii: S0014-4886(19)30024-X. PMID: 30797827. PMCID: PMC6544476

B. POSITIONS AND HONORS

Positions and Employment

1998 - 1999	Pharmacy Practice Resident, University of Kentucky Hospital, Lexington, KY
1998 - 2007	Clinical Pharmacist, University of Kentucky Hospital, Lexington, KY
1999 - 2000	Critical Care Resident, University of Kentucky Hospital, Lexington, KY
2000 - 2007	Teaching Assistant/Graduate Student, University of Kentucky, Lexington, KY
2001 - 2003	Clinical Research Associate, Neurosurgery, University of Kentucky Hospital, Lexington, KY
2007 - 2009	Postdoctoral Associate, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2009 -	Assistant Professor, Department of Pharmacy and Therapeutics, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2011 -	Assistant Professor, Clinical and Translational Science (Secondary Appointment), University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2013 –	Scientist, Safar Center for Resuscitation Research (Secondary Appointment), University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2016 -	Associate Director for Pharmacogenomics, Institute for Precision Medicine, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2018 –	Director of the Pharmacogenomics Center of Excellence, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA and Thermo Fisher Scientific, Waltham, MA.
2019 -	Associate Professor University of Pittsburgh, School of Pharmacy, Pittsburgh, PA

Other Experience and Professional Memberships

1996 -	Member, American Society of Health-System Pharmacists
1998 -	Member, Society of Critical Care Medicine
1998 -	Member, American College of Clinical Pharmacy
1999 -	Member, Scholarship of Teaching and Learning Program
2002 -	Member, American Associate of Pharmaceutical Scientists
2008 - 2008	Participant, Scientific Management and Leadership Course, University of Pittsburgh
2008 - 2009	Chair, PK/PD/PGx Practice/Research Network, American College of Clinical Pharmacy
2012 - 2014	Member, National Neurotrauma Society
2014 - 2015	Member, Neurocritical Care Society
2016 - present	Member, American Society of Clinical Pharmacology and Therapeutics

Honors

1998	Highest Distinction Honor - PharmD Graduate, University of Rhode Island
1998	Research Program Award, Merck/American Association of Colleges of Pharmacy
1999	Extra Mile Award, University of Kentucky Pharmacy Residency Programs (1999-2000)
2000	K30 Clinical Research and Leadership Development Program, NIH (2000-2006)
2000	Fellow, American Foundation for Pharmaceutical Education (2000-2006)
2000	Fellow, Research Challenge Trust Foundation (2000-2006)
2002	Predoctoral Fellow, Reproductive Sciences Training Grant (2002-2004)
2004	PPDM Graduate Student Travel Award, American Association of Pharmaceutical Scientists
2006	Travel Award, Peter J. Glavinos, PhD, Graduate Student Endowment
2007	Pharmaceutical Sciences Graduate Student Recognition Award, AFPE
2013	Travel Award, Burroughs Wellcome Fund, Translational Science Meeting 2013
2013	Young Investigator Award, Society of Critical Care Medicine
2015	Outstanding Scholarly Contribution Award, Rho Chi Society
2015	Innovations in Teaching Competition Award, American Association of Colleges of Pharmacy
2017	Outstanding Scholarly Contribution Award, Rho Chi Society
2018	Chancellors Distinguished Teachers Award, University of Pittsburgh

C. Contribution to Science

1. Pharmacokinetics during critical illness: There is an unacceptable variability in medication response in critically ill patients that adversely impacts patient outcomes. Complicating the clinical situation is the interaction with concomitant non-drug therapies such as targeted temperature management which is increasing being employed in ICU. My early work was one of the first to demonstrate that hypothermia alters pharmacokinetics; that systemic cooling to 33°C increases drug concentrations and decreases cytochrome p450-mediated metabolism of commonly-administered medications such as fentanyl and midazolam (1a-1b). This work led to a greater appreciation of the need to consider drug therapy modifications in patients receiving targeted temperature management (1b), a highly-cited pharmacometric analysis that quantified the specific impact of hypothermia on phenytoin pharmacokinetics in children receiving this therapy following traumatic brain injury in the multicenter NIH-funded Cool Kids Trial (NIH 1R01-NS052478) (1c), and a greater appreciation of the need to employ pharmacometrics to understand pharmacokinetic variability to achieve precision medicine in critical care. These work was nationally recognized by a research award from the multidisciplinary Society of Critical Care Medicine (described in Section A).

   1a) **Empey PE**, Miller TM, Philbrick AH, Melick J, Kochanek PM, Poloyac SM. Mild hypothermia decreases fentanyl and midazolam steady-state clearance in a rat model of cardiac arrest. Crit Care Med. 2012 April: 40(4): 1221-8. PMID: 22067624. PMCID: PMC3307845.

   1b) Anderson KB, Poloyac SM, Kochanek PM, **Empey PE,** Effect of hypothermia and injury on drug disposition and response. Ther Hypothermia Temp Manag, 2016 Dec;6(4):169-179. PMID: 27622966. PMCID: PMC5144886.

   1c) **Empey PE,** Velez de Mendeizabal N, Bell MJ, Bies R, Kochanek PM, Adelson PD, Poloyac SM. Therapeutic hypothermia decreases phenytoin elimination in children with traumatic brain injury. Crit Care Med. 2013 Oct;41(10):2379-2387. PMID: 23896831. PMCID: PMC3783553.

   1d) **Empey PE**. Precision medicine in critical care requires an understanding of pharmacokinetic variability. Pediatr Crit Care Med. 2017 Jul;18(7):728-729. PMID: 28691967.

2. Pharmacokinetic approaches to develop novel treatments for traumatic brain injury: My work in pharmacokinetics has also provided solution to a well-known problem in drug development for traumatic brain injury (TBI). There are no FDA-approved treatments for TBI and it is widely-acknowledged that a lack of understanding of drug disposition and specifically, brain penetration of potential therapies is one of the causes of high profile clinical trial failures. My laboratory takes the novel approach of integrating pharmacokinetic assessments throughout the entire drug development process. I modeled cyclosporine disposition following human traumatic brain injury (TBI) in a Phase I trial to guide final dose selection moving into Phase II trials (2a). We collaborate with Operation Brain Trauma Therapy consortium (PI=Kochanek PM) to test novel TBI therapies in multi-center preclinical trials and are actively testing a combination therapy that creatively uses a drug transporter pharmacokinetic interaction to increase delivery of an antioxidant therapy to the injured brain. This combination therapy (probenecid/n-acetylcysteine) is currently being evaluated as a potential treatment for pediatric TBI (NIH R01 NS069247) through pharmacokinetics-focused investigations (2c-2d).

   2a. **Empey PE**, McNamara PJ, Young B, Rosbolt MB, Hatton J. Cyclosporin A disposition following acute traumatic brain injury. J Neurotrauma. 2006 Jan;23(1):109-16. PubMed PMID: 16430377.

   2b. Kochanek PM, Jackson TC, Ferguson NM, Carlson SW, Simon DW, Brockman EC, Ji J, Bayır H, Poloyac SM, Wagner AK, Kline AE, **Empey PE**, Clark RS, Jackson EK, Dixon CE. Emerging therapies in traumatic brain injury. Semin Neurol. 2015 Feb;35(1):83-100. PubMed PMID: 25714870; PubMed Central PMCID: PMC4356170.

   2c. Hagos FT, **Empey PE,** Wang P, Ma X, Poloyac SM, Bayır H, Kochanek PM, Bell MJ, Clark RSB. Exploratory Application of Neuropharmacometabolomics in Severe Childhood Traumatic Brain Injury. Crit Care Med. 2018 May 7. PMID: 29742587

3. Precision Medicine and Pharmacogenomics Implementation: Recognizing that some clinical variability in drug response (efficacy or adverse drug events) could be explained by genetics, I have focused my research in pharmacogenomics. I am PI on the highly translational PreCISE-Rx research study that is engaging and recruiting a large number of patient across the health system to improve their care through pharmacogenomics. Contributions to science from this work include describing the opportunities for pharmacogenomics in the intensive care unit (3a), a implementation strategies (3b), pragmatic clinical trials (3c), and proposed approaches to value modeling (3d). I also lead the team who created the nationally-awarded Test2Learn™ program which teaches pharmacogenomics concepts through an innovative participatory model involving learner engagement through personal genomic testing. The ethical framework we created is a path forward for bridging knowledge gaps that currently hinder the broad dissemination of precision medicine programs.

   3a) **Empey PE.** Genetic predisposition to adverse drug reactions in the intensive care unit. Crit Care Med. 2010 Jun;38(6 Suppl):S106-16. PubMed PMID: 20502164.

   3b) **Empey PE**, Stevenson JM, Tuteja S, Weitzel KW, et al. for the NHGRI Implementing GeNomics In PracTicE (IGNITE) Network. Multi-site investigation of strategies for the implementation of CYP2C19 genotype-guided antiplatelet therapy. Clin Pharmacol Ther. 2017 Dec 26. PMID: 29280137.

   3c) Cavallari LH, Beitelshees AL, Blake KV, Dressler LG, Duarte JD, Elsey A, Eichmeyer JN, **Empey PE**, at al. The IGNITE Pharmacogenetics Working Group: An Opportunity for Building Evidence with Pharmacogenetic Implementation in a Real-World Setting. Clin Trans Sci 2017. PMID: 28294551. PMCID: PMC5421730.

   3d) Kogan JN, **Empey PE**, Kanter J, Keyser DJ, Shrank WH. Delivering on the Value Proposition of Precision Medicine: The View From Healthcare Payers. Am J Manag Care. 2018 Apr;24(4):177-179. PMID: 29668207.

Complete List of Published Work in MyBibliography:

http://www.ncbi.nlm.nih.gov/sites/myncbi/philipe..empey.1/bibliography/10196145/public/?sort=date&direction=descending

D. RESEARCH SUPPORT

Ongoing Research Support

1OT2OD026554-01s1 (Reis, Marroquin, Visweswaran) 02/08/18 - 01/31/23
NIH/Office of the Director
All of Us Pennsylvania
All of Us PA will engage the more than 4 million patients receiving care from the University of Pittsburgh Medical Center (UPMC), the largest non-profit integrated health delivery system in the US, and leverage several large-scale participant recruitment and informatics initiatives at the University of Pittsburgh (Pitt) to fully enroll at least 111,002 participants in the *All of Us* Research Program.
Role: Co-Investigator

5UL1TR001857-03 (Reis) 07/12/16 - 05/31/21
NIH/NCATS
University of Pittsburgh Clinical and Translational Science Institute
We will focus our infrastructure, comprehensive research training programs, best practices, and innovative approaches to support translational science and scientists and to advance each of the 5 national CTSA program goals: 1) workforce development for all translational scientists and research professionals; 2) advancing translation through collaboration, engagement, and team science; 3) integration of research across the lifespan, complex populations, and the translational spectrum; 4) creating new research methods and streamlining research processes with an emphasis on multi-center clinical trials; and 5) infusing informatics throughout the entire research life cycle. Our achievements to date, exceptional institutional support, and committed and enthusiastic team will ensure that our impact is significant locally and nationally.
Role: Co-Investigator

1R01HL129722 (Kim) 07/01/16 - 06/30/21
National Institutes of Health
Randomized Clinical Trial of Sodium Nitrate for Out-of-Hospital Cardiac Arrest
This is a randomized placebo controlled trial of nitrite therapy administered during CPR after out of hospital cardiac arrest (OHCA). In the first phase we will establish the dose required to achieve a 10 uM plasma level and in the second phase 1000 OHCA patients will be randomized 1:1 to this dose of nitrite vs vehicle control.
Role: Co-Investigator

(Empey) 03/01/16 - 02/28/21
National Association of Chain Drug Stores
Test2Learn: Community Pharmacists Pharmacogenetics Education Certificate Program
The purpose of this project is to develop pharmacogenetics to an on-line and in-person continuing education program to be delivered through web-based and online platforms.

(Empey) 01/01/19 - 12/31/19
Lowenstein Foundation
Application of Machine Learning to Medication Outcome Prediction
This project will apply machine learning to guide the implementation of pharmacogenomics by the development of methods to predict prescribing of medications with PGx prescribing guidance.

(Empey) 05/01/19 - 04/30/22
Mellon Foundation
Accelerating Whole Genome Sequencing Adoption Through Innovative Education
This project will integrate whole genome sequencing data into the Test2learn genomics education platform to advance its application by frontline providers.

Selected Completed Research Support

2013039201 (Lee) 02/01/15 - 06/30/18
McCune Foundation
Development of Pharmacogenomics
This project builds necessary infrastructure to support pharmacogenomics clinical and research programs within the Institute of Personalized Medicine.

KL2-TR000146 Empey (PI) 7/1/10-6/30/15
NIH
Implications of hypothermia on drug transport
The central hypothesis of this project is that is that mild therapeutic hypothermia will produce time- and pathway-dependent alterations in drug transport.
Role: PI

5UL1 TR0000005-09 Reis (PI) 7/1/14-6/30/15
NIH/NCATS University of Pittsburgh
Clinical and Translational Science Institute (Center for Accelerated Innovations)
MEDivate: achieving great medication outcomes together
This pilot project is creating a simple-to-use platform that empowers patients through engaging educational videos, personalized coaching, and the sharing of accurate medication information. The technology provides intelligent medication management to solve expensive medication adherence and transition of care problems.
Role: CPI