OMB No. 0925-0001/0002 (Rev. 08/12 Approved Through 8/31/2015)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Boyce, Richard D.

eRA COMMONS USER NAME (credential, e.g., agency login): boycerd

POSITION TITLE: Associate Professor (with tenure) of Biomedical Informatics and Clinical and Translational Science in the Clinical and Translational Science Institute, University of Pittsburgh

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

| INSTITUTION AND LOCATION | DEGREE(if applicable) | Completion DateMM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| Central Washington University, Ellensburg WA | B.S. | 2000 - 2003  | Computer Science |
| University of Washington, Seattle WA | M.S. | 2003 - 2005 | Biomedical and Health Informatics |
| University of Washington, Seattle WA | PhD | 2005 - 2008 | Biomedical and Health Informatics |
| University of Pittsburgh, Pittsburgh PA |  | 2008 – 2010  | Postdoctoral fellowship in Biomedical Informatics |
| University of Pittsburgh, Pittsburgh PA |  | 2010 - 2013 | K12 Scholar, University of Pittsburgh Comparative Effectiveness Research Program |

# A. Personal Statement

I have more than 12 years of prior work in informatics, comparative effectiveness research, and pharmacoepidemiology. My publication record includes more than 30 peer reviewed journal articles and 10 peer reviewed conference papers at the intersection of medication safety, knowledge representation, and decision support. Since 2014, I have been the Principal Investigator (PI) a National Library of Medicine R01 project that is studying a novel approach to addressing gaps in drug-drug interaction evidence. So far, I have led this grant’s research team to publish 18 peer-reviewed papers (see Progress Report Publication List). I also direct the Informatics Core for the Center of Excellence for Natural Product Drug Interaction Research funded by the National Center Complementary and Integrative Health, and have a longstanding research program focused on the design of medication decision support for nursing home patients. My long-term goal is to see patient’s benefit from highly effective clinical decision support that helps to manage difficult clinical scenarios such as drug-drug interactions.

1. Romagnoli, KM., Nelson, SD., Hines, L., Empey, P., **Boyce, RD.**, Hochheiser, H. Information needs for making clinical recommendations about potential drug-drug interactions: a synthesis of literature review and interviews. BMC Medical Informatics and Decision Making. February 2017. Available at: http://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-017-0419-3. DOI:10.1186/s12911-017-0419-3 . PMCID: PMC5322613.
2. Samwald M, Xu H, Blagec K, Empey PE, Malone DC, Ahmed SM, Ryan P, Hofer S, **Boyce RD.** Incidence of Exposure of Patients in the United States to Multiple Drugs for Which Pharmacogenomic Guidelines Are Available. PLoS One. 2016 Oct 20;11(10):e0164972. doi: 10.1371/journal.pone.0164972. PubMed PMID: 27764192. PMCID: PMC5072717.
3. **Boyce RD**, Handler SM, Karp JF, Perera S, Reynolds CF 3rd. Preparing Nursing. Home Data from Multiple Sites for Clinical Research - A Case Study Using Observational Health Data Sciences and Informatics. eGEMS (Generating Evidence & Methods to improve patient outcomes). 2016 Oct 26;4(1):1252. PubMed PMID: 27891528. PMCID: PMC5108634.
4. Ayvaz S, Horn J, Hassanzadeh O, Zhu Q, Stan J, Tatonetti NP, Vilar S, Brochhausen M, Samwald M, Rastegar-Mojarad M, Dumontier M, **Boyce RD**, Toward a complete dataset of drug-drug interaction information from publicly available sources, Journal of Biomedical Informatics. 55 (2015), 206-217. DOI:10.1016/j.jbi.2015.04.006. http://www.sciencedirect.com/science/article/pii/S1532046415000738# PMCID: PMC4464899.

# B. Positions and Honors

**Positions and Employment**

|  |  |
| --- | --- |
| 2003 – 2006 | National Library of Medicine Pre-Doctoral Fellow, Division of Biomedical and Health Informatics, University of Washington, Seattle, WA |
| 2006 – 2008 | Research Associate, Department of Global Health, University of Washington, Seattle WA |
| 2008 – 2010 | Postdoctoral Associate, Department of Biomedical Informatics, University of Pittsburgh, Pittsburgh, PA |
| 2010 – Present | Assistant Professor, Department of Biomedical Informatics, University of Pittsburgh, Pittsburgh, PA |
| 2010 – Present | Faculty, Geriatric Pharmaceutical Outcomes and Gero-Informatics Research and Training Program, University of Pittsburgh, Pittsburgh, PA |
| 2013 – Present | Faculty, Center for Pharmaceutical Policy and Prescribing, University of Pittsburgh, Pittsburgh, PA |
| 2016 – Present | Associate Professor of Biomedical Informatics and Clinical and Translational Science in the Clinical and Translational Science Institute (Tenured) |

Other Experience and Professional Memberships

|  |  |
| --- | --- |
| 2016 - | Member, International Society for Pharmacoepidemiology |

**Honors**

|  |  |
| --- | --- |
| 2001 - 2003 | Scholarship - National Science Foundation Computer Science  |
| 2002 – 2003 | Scholarship - Rural American Foundation |
| 2003 | Outstanding Oral Presentation - Source 2003, Central Washington University |
| 2010 – 2013 | Agency for Healthcare Research and Quality Comparative Effectiveness Research Scholar |
| 2013 | Merit Reviewer for the Patient-Centered Outcomes Research Institute (Cycle 3, Health Systems) |
| 2013 | Invited member of the Evidence Appraisal Working Group for the 2013 AHRQ Drug-Drug Interaction Clinical Decision Support Conference Series  |
| 2013 | Distinguished Paper Award – AMIA Summit on Translational Bioinformatics, San Francisco, USA |
| 2013 | Distinguished Paper Award – The 14th World Congress on Medical and Health Informatics (MEDINFO 2013), Copenhagen, Denmark. |

# C. Contribution to Science

1. Early in my research career I worked closely with pharmacy, pharmaceutics, and informatics experts to develop a new method for predicting pharmacokinetic drug-drug interactions (DDIs) that addresses the uncertain and dynamic nature of drug knowledge. The design and validation of this method became the focus of my PhD dissertation and subsequent publications.

1. **Boyce R**, Collins C, Horn J., Kalet I., "Modeling Drug Mechanism Knowledge Using Evidence and Truth Maintenance," IEEE Transactions on Information Technology in Biomedicine, Volume 11(4) 2007, Page(s):386 - 397. PMID: 17674621.
2. **Boyce R**, Collins C, Horn J, Kalet I, Computing with evidence part I: A drug-mechanism evidence taxonomy oriented toward confidence assignment, Journal of Biomedical Informatics, 2009, 2009 Dec;42(6):979-89, PMCID: PMC2783801.
3. **Boyce R**, Collins C, Horn J, Kalet I. Computing with evidence part II: an evidential approach to predicting metabolic drug-drug interactions, Journal of Biomedical Informatics, 2009 Dec;42(6):990-1003. PMCID: PMC2783683
4. Schneider, J., Brochhausen, M., Rosko, S., Ciccarese, S., Hogan, WR., Malone, D., Ning, Y., Clark, T., **Boyce, RD.** Formalizing knowledge and evidence about potential drug-drug interactions. The International Workshop on Biomedical Data Mining, Modeling, and Semantic Integration: A Promising Approach to Solving Unmet Medical Needs (BDM2I 2015) at the 14th International Semantic Web Conference (ISWC). October 11th 2015. Bethlehem, PA. http://ceur-ws.org/Vol-1428/BDM2I\_2015\_paper\_10.pdf.

2. Early on in my postdoctoral training I began working with Drs. Joseph Hanlon and Steven Handler; clinician scientists whose work focuses on improving medication safety for older adults. I learned that elderly individuals were at a particularly high risk for harm due to unsafe medication therapy due, in part, to multiple co-morbidities, reduced metabolic function, and increased frailty. This led to my interest in exploring methods for identifying and potentially reducing adverse drug events associated with drug interactions among older adults.

1. **Boyce RD**, Handler SM, Karp JF, Hanlon JT. Age-related changes in antidepressant pharmacokinetics and potential drug-drug interactions: a comparison of evidence-based literature and package insert information. Am J Geriatr Pharmacother. 2012 Apr;10(2):139-50. Epub 2012 Jan 27. PMID 22285509. PMCID: PMC3384538
2. **Boyce RD**, Hanlon JT, Karp JF, Kloke J, Saleh A, Handler SM. A review of the effectiveness of antidepressant medications for depressed nursing home residents. J Am Med Dir Assoc. 2012 May;13(4):326-31. Epub 2011 Oct 21. PMID: 22019084. PMCID: PMC3340502.
3. **Boyce RD**, Perera S, Nace DA, Culley CM, Handler SM. A survey of nursing home physicians to determine laboratory monitoring adverse drug event alert preferences. Appl Clin Inf 2014; 5: 895-906. DOI: 10.4338/ACI-2014-06-RA-0053. PMID: 25589905. PMCID: PMC4287669.
4. **Boyce RD**, Handler SM, Karp JF, Perera S, Reynolds CF 3rd. Preparing Nursing. Home Data from Multiple Sites for Clinical Research - A Case Study Using Observational Health Data Sciences and Informatics. eGEMS (Generating Evidence & Methods to improve patient outcomes). 2016 Oct 26;4(1):1252. PubMed PMID: 27891528. PMCID: PMC5108634. DOI: http://dx.doi.org/10.13063/2327-9214.1252 Available at: http://repository.edm-forum.org/egems/vol4/iss1/21.

3. As my career has advanced, I have developed a program of research on informatics interventions that improve medication safety for nursing home residents. The main theme of this research is developing new informatics interventions that can help clinicians effectively manage safety issues related to pharmacogenomics and drug-drug interactions.

1. Handler SM, **Boyce RD**, Ligons FM, Perera S, Nace DA, Hochheiser H. Use and Perceived Benefits of Mobile Devices by Physicians in Preventing Adverse Drug Events in the Nursing Home. J Am Med Dir Assoc. 2013 Oct 2. doi:pii: S1525-8610(13)00472-6. 10.1016/j.jamda.2013.08.014. Epub 2013 Oct 2. PubMed PMID: 24094901. PMCID: PMC4351260
2. Giménez, JAM., Blagec, K., **Boyce, RD.**, Adlassnig, KP., Samwald, M.. An Ontology-Based, Mobile-Optimized System for Pharmacogenomic Decision Support at the Point-of-Care. PLOS ONE. 2014 May. 9(5). DOI: 10.1371/journal.pone.0093769. PubMed PMID: PMID: 24787444. PMCID: PMC4008421
3. **Boyce RD**, Perera S, Nace DA, Culley CM, Handler SM. A survey of nursing home physicians to determine laboratory monitoring adverse drug event alert preferences. Appl Clin Inf 2014; 5: 895-906. DOI: 10.4338/ACI-2014-06-RA-0053. PMID: 25589905. PMCID: PMC4287669.
4. Samwald, M., Giménez, J., **Boyce, RD.**, Freimuth, R.R., Adlassnig, K., and Dumontier, M. Pharmacogenomic knowledge representation, reasoning and genome-based clinical decision support based on OWL 2 DL ontologies. BMC Medical Informatics and Decision Making. 2015, 15:12 PubMed PMID: 25880555. PMCID: PMC4340468

4. Another program of research that I have developed is creating and validating new methods for representing potential drug-drug interaction knowledge and evidence. The goal of this research is to help drug safety researchers more rapidly identify and address important knowledge gaps.

1. **Boyce RD**, Horn JR, Hassanzadeh O, de Waard A, Schneider J, Luciano JS, Rastegar-Mojarad M, Liakata M. Dynamic enhancement of drug product labels to support drug safety, efficacy, and effectiveness. J Biomed Semantics. 2013 Jan 26;4(1):5. DOI 10.1186/2041-1480-4-5 PMID: 23351881. PMCID – PMC3698101.
2. Scheife RT, Hines LE, **Boyce RD**, Chung SP, Momper JD, Sommer CD, Abernethy DR, Horn JR, Sklar SJ, Wong SK, Jones G, Brown ML, Grizzle AJ, Comes S, Wilkins TL, Borst C, Wittie MA, Malone DC. Consensus Recommendations for Systematic Evaluation of Drug-Drug Interaction Evidence for Clinical Decision Support. Drug Saf. 2015 Feb. 38(2):197-206. PubMed PMID: 25556085. PMCID: PMC4624322.
3. Brochhausen, M., Schneider, J., Malone, D., Empey, PE., Hogan WR., and **Boyce, RD.** Towards a foundational representation of potential drug-drug interaction knowledge. The 1st International Drug-Drug Interaction Knowledge Representation Workshop (DIKR 2014). Collocated with the 2014 International Conference on Biomedical Ontology (ICBO 2014). October 6th, Houston, Texas. United States. http://ceur-ws.org/Vol-1309/paper2.pdf.
4. Schneider, J., Brochhausen, M., Rosko, S., Ciccarese, P., Hogan, WR., Malone, D., Ning, Y., Clark, T., and **Boyce, RD.** Formalizing knowledge and evidence about potential drug-drug interactions. The International Workshop on Biomedical Data Mining, Modeling, and Semantic Integration: A Promising Approach to Solving Unmet Medical Needs (BDM2I 2015) at the 14th International Semantic Web Conference (ISWC). October 11th 2015. Bethlehem, PA. http://ceur-ws.org/Vol-1428/BDM2I\_2015\_paper\_10.pdf.

# Complete List of Published Work in MyBibliography: <http://www.ncbi.nlm.nih.gov/sites/myncbi/richard.boyce.1/bibliography/46576449/public/?sort=date&direction=descending>

# D. Research Support

**On-going**

|  |
| --- |
|  U54 AT008909-02 McCune (PI) |
|  Title: Natural Product-drug Interaction Research: The Roadmap to Best Practices |
|  Description: The goal of this proposed Center of Excellence is to provide leadership on how best to study  potential adverse interactions between natural products and conventional medications. The uniquely  experienced and multidisciplinary team of investigators will work with NCCAM officials to identify a priority list  of natural products that could alter dru disposition and, in turn, significantly alter the efficacy and safety of  conventional medications; challenges inherent to studying these interactions will be addressed using a  combination of novel and established approaches. Upon assessment of the selected natural products and  potential drug interactions through the Interaction Projects, a repository and web-based public portal will be  developed that allows other researchers to access the generated data for further analysis and communicate  the health implications of the results to health care practitioners and the public. |
|  Role: Co-investigator (Director of the Informatics Core) |
|  |
|  R01 LM011838-01 Boyce (PI) |
| Title: Addressing gaps in clinically useful evidence on drug-drug interactions |
| Description: This project's goal is to build an exemplar framework that implements core components of the new knowledge representation paradigm for potential drug-drug interactions that I hypothesize will yield more clinically relevant evidence than is currently possible. My role is Principal Investigator on this multi-site project. I manage four working groups focusing on different aspects of the project which include 1) deriving a new potential drug-drug interaction (PDDI) meta-data standard that can meet the information needs of pharmacist working in different care settings, 2) applying a novel evidence synthesis process to enhance product label PDDI information, and 3) testing innovative methods for PDDI information retrieval.  |
| Role: Principal Investigator |
|  |
| R21 HS023826 Malone (PI) |
| Title: Individualized Drug Interaction Alerts |
| Description: The development of a DDI-specific knowledge database combined with clinically validated algorithms will increase the specificity of warnings concerning dangerous drug combinations. These developments have the strong potential to drastically reduce the occurrence of irrelevant alerts while simultaneously improving patient safety. |
| Role: Co-Investigator  |
|  |
| R18 HS024208 Kane-Gill (PI) |
| Title: Transforming the medication regimen review process of high-risk drugs using a patient-centered telemedicine-based approach to prevent adverse drug events in the nursing home |
| Description: In response to PA-14-002, we are proposing to conduct a cluster-RCT for a period of a year, to determine the impact of patient-centered telemedicine-based high-risk medication regimen reviews on adverse drug event reduction in four nursing homes. The National Action Plan for Adverse Drug Event Prevention identified, the nearly 16,000 NHs, as a clinical setting where adverse drug event prevention strategies are lacking for high- risk drug classes including anticoagulants, antidiabetic agents, and opioids. This study will correct a faulty retrospective 30-day medication regimen review process and provide a model for more frequent medication regimen reviews when residents are prescribed a high-risk drug during their stay to prevent ADE occurrence with the innovative use of patient-centered telemedicine technology. |
| Role: Co-Investigator |

**Completed**

|  |  |
| --- | --- |
| *K01 AG044433-01 Boyce (PI)* | 12/01/2013-11/30/2016  |
| Title: Improving medication safety for nursing home residents prescribed psychotropic drugs |
| Description: This project's goal is to develop an effective informatics intervention that prevents harm to nursing home residents from drug-drug interactions while avoiding known issues with drug-drug interaction alerting such as alert fatigue. To accomplish this goal, I am conducting a mixed methods study with the specific aims of 1) validating an novel automated falls prognostic model for nursing home patients exposed to psychotropic potential drug-drug interactions, and 2) identifying modifiable potential barriers to the use of active PDDI monitoring in the NH and designing a pilot intervention that addresses them |
| Role: Principal Investigator |
| *Pittsburgh Health Data Alliance Initiative (PHDA) Center for Commercial Applications of Healthcare Data* | 11/01/2015 – 9/30/2016 |
|  Title: Fall Sentinel Description: Fall Sentinel’s Phase I PHDA/CCA Early Research Grant accelerated the development of a  functioning medication-related fall risk monitoring system so that it could be piloted at five skilled nursing  facilities (SNFs). The primary purpose of this study was to translate our prior research on medication-related  fall prediction into a beta version monitoring system. We accomplished that goal and collected both qualitative  and quantitative data on potential issues that need to be addressed before a prospective system can be  deployed as a working clinical intervention. Role: Principal Investigator |
| *R01-HS018721 Handler (PI)* | 5/01/10-4/30/14 |
| Title: Enhancing the Detection and Management of Adverse Drug Events in the Nursing Home |
| Description: The specific aims of this proposed project are to determine if nursing home (NH) patients managed by physicians who receive active medication monitoring alerts have more adverse drug effects (ADE) detected, have a faster ADE management response time, and can result in more cost-savings from a societal perspective compared to usual care. The study includes a cluster randomized controlled trial among eighty-six NH physicians working in one of four NHs in Southwestern Pennsylvania. My role on the project is to assist with the design and implementation of the active medication monitoring intervention. Over the four years that I have participated on the project I have contributed algorithms and software for the computation component of the intervention, developed a process for reducing the work of consultant pharmacists within the intervention, and co-authored multiple manuscripts related to the project. |
| Role: Co-investigator |
| *K12 HS019461-01 Kapoor (PI)* |  | 07/01/10 – 06/30/13 |
| Title: The University of Pittsburgh’s Comparative Effectiveness Research Scholars Program |
| Description: This intramurally awarded K grant provided me with salary support during my transition to becoming an independently-funded, translational scientist. It supported tuition for training in comparative effectiveness research and pharmacoepidemiology. As part of this grant, I developed my research program in informatics to improve medication safety. Projects I completed during the award include a systematic review of the effectiveness of antidepressants for nursing home residents, a review of pharmacokinetic drug interactions affecting antidepressants, a study concordance between various sources of psychotropic drug-drug interaction information, and a pilot study of an innovation to enhance the safety, efficacy, and effectiveness in information in drug product labeling. During the last five months of my funding, I am completing a study of the prevalence of exposure to antidepressant drug-drug interactions in the United States nursing home population and designing a pilot active monitoring system for nursing home residents exposed to drug-drug interactions. |

 Role: Scholar