ZOE CO

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EDUCATION

University of Michigan Medical School   08/2023 – PRESENT
Ann Arbor, MI
Ph.D.: Health Infrastructures and Learning Systems (HILS)
Cumulative GPA: 4.0
Advisors: Gretchen A. Piatt, PhD, MPH & Rachel Richesson, PhD, MPH, MS, FACMI

University of Pittsburgh   04/2017
Pittsburgh, PA
B.S.: Biological Sciences
Certificate: Conceptual Foundations of Medicine

RESEARCH EXPERIENCE

University of Michigan   03/2024 – PRESENT
College of Pharmacy
Role: Graduate Student Research Assistant
PI: Corey Lester, PharmD, PhD, MS
Study Description: Assessment and pilot of an *artificial intelligence (AI)* tool that provides decision support to aid pharmacists in the medication verification process. During the study sessions, pharmacists performing the medication verification task in *Labvanced*, which is a software used to track the eye movements of participants as they complete the task.

- Screened 91 potential study participants for the pilots through telephone calls.
- Oversaw 46 study sessions with each study participant to ensure any technical difficulties are resolved.
- Extract and analyze data using R from *Labvanced* in preparation for manuscripts.

University of Utah   01/2024 – PRESENT
Department of Internal Medicine, Division of Epidemiology
Role: Health IT Patient Safety Consultant
PI: David C. Classen, MD, MSc

- Develop strategies for management and maintenance the clinical content for the Leapfrog Group's inpatient Computerized Physician Order Entry (CPOE) Evaluation Tool in collaboration with research

pharmacists and clinical content experts. The CPOE Evaluation Tool assesses hospital's ability to detect and prevent serious medication errors.

- Lead the piloting of 4 new testing modules for the CPOE Evaluation Tool with 5 academic medical centers across the country.

  - Lead the integration and implementation of the new testing modules into the pre-existing software platform.
  - Led qualitative interview sessions with 2 representatives from each of the academic medical centers to solicit feedback on the 4 testing modules.
  - Develop and refine the testing modules based on feedback from pilot sites.

- Provide strategic direction and feedback about the clinical content and testing methodology for CPOE Evaluation Tool based off analyses about hospital performance in the tool.

- Presented 2 research posters disseminating the results from the 2022 CPOE Evaluation Tool.

  - Performed statistical analyses for both posters, including calculating descriptive statistics, t-tests, one-way ANOVA to compare performance across hospital demographics.
  - Created multiple linear regression models to analyze potential relationships between performance and select hospital characteristics and reported the odds ratios and 95% confidence intervals.

Brigham and Women's Hospital   **10/2021 – 08/2023**
Department of General Internal Medicine
Role: Research Project Coordinator
PI: David W. Bates, MD, MSc

- Developed and implemented 4 new testing modules for the Leapfrog Group's *Computerized Physician Order Entry (CPOE)* Evaluation Tool targeting different capabilities of clinical decision support, targeting usability, deep vein thrombosis prevention, clinical overuse based on the Choosing Wisely® recommendations, and medication reconciliation.
- Led, developed, and piloted a new version of the CPOE Evaluation Tool targeted at ambulatory medication clinical decision support, which was piloted with 10 outpatient clinics across the country.
- Analyzed and disseminated results from the CPOE Evaluation Tool for conference presentations and peer reviewed publications. This includes 7

conference presentations, 2 co-authored and 3 first-authored peer reviewed publications related to the CPOE Evaluation Tool.

- o For co-authored publications, cleaned and analyzed data from the tool using Microsoft Access and SAS for longitudinal and cross-sectional analyses of the results from the CPOE Evaluation Tool.
- o For first-author publications, drafted the manuscript, responded to reviewers' comments and performed the data analyses.

Brigham and Women's Hospital   **10/2017 – 02/2021**
Department of General Internal Medicine
Role: Research Assistant (RA) I & II
PI: David W. Bates, MD, MSc

- Managed and maintained the clinical content for the Leapfrog Group's inpatient CPOE Evaluation Tool, which is used by over 2000 hospitals annually to assess the ability of their *electronic health record (EHR)* systems to detect and prevent medication-related errors.
- Contributed to 6 other projects related to patient safety and clinical informatics. Three notable projects include:
  - o (1) studying the impact of a problem oriented EHR for clinical data retrieval using a randomized block allocation design
    - ▪ Recruited 17 physicians for the study and oversaw the study sessions where clinicians were provided with clinical scenarios and asked to retrieve clinical data such as laboratory values from the EHR.
    - ▪ Assisted in drafting the results section of the manuscript for the Brigham and Women's study site.
  - o (2) scoping review focused on the use of artificial intelligence decision support tools to detect adverse drug events
    - ▪ Screened over 2000 articles for relevance based on title and abstract.
    - ▪ Screened over 126 articles for relevance based on a full-text review.
    - ▪ Assisted in the drafting of the methods section of the manuscript.
  - o (3) derivation of a clinical risk score to predict hypoxia, ICU admission, and death among COVID patients.
    - ▪ Extracted structured patient data from the electronic health record system.

- Cleaned and analyzed the patient data for variables of interest including diagnoses, recent vital signs, and respiratory rate.
- Promoted from RA I to RA II on 02/2019.

PROFESSIONAL EXPERIENCE	

University of Michigan Medical School
08/2024 - PRESENT
Department of Learning Health Sciences
Role: Graduate Student Staff Assistant
- Assist 2 faculty instructors in the 1st- and 2nd -year professional development seminars with determining topics, and identifying and scheduling guest speakers.
- Assist department administration with recruitment efforts for the PhD and master's programs, including virtual informational sessions, prospective student campus visits, and maintaining communication with prospective students.
- Co-facilitate summer project meetings with 1st-year PhD students (6 students) - answer questions and provide project guidance.

AWARDS & RECOGNITIONS

University of Michigan – Rackham Graduate School
- Rackham Conference Travel Grant - $900   **11/2024**
  - Poster presentation at AMIA 2024 Annual Symposium; November 2024; San Francisco, CA.
- Rackham Conference Travel Grant - $900   **03/2024**
  - Poster presentation at Academy Health - Annual Research Meeting 2024; June 2024; Baltimore, MD.

University of Michigan Medical School – Department of Learning Health Sciences
- Health Infrastructure and Learning Systems (HILS)   **11/2024**
  Travel Grant - $500
  - Poster presentation at AMIA 2024 Annual Symposium; November 2024; San Francisco, CA.
- Health Infrastructure and Learning Systems (HILS)   **05/2024**
  Travel Grant - $900
  - Poster presentation at Academy Health - Annual Research Meeting 2024; June 2024; Baltimore, MD.

Journal of the American Medical Informatics Association (JAMIA)
- Featured journal article in Volume 27, Issue 8, August 2020 for *"The tradeoffs between safety and alert fatigue: Data from a national evaluation of hospital medication-related clinical decision support"*

Brigham and Women's Hospital   **05/2019**
- *Honorable Mention* for Research at the Division of General Internal Medicine's Research Day, nominated by David W. Bates, MD, MSc

Mass General Brigham   **11/2018**
- *Partners In Excellence* Award for Research on "Building Safer Electronic Health Records"

GUEST LECTURE

"An Overview of Clinical Decision Support Systems & Infrastructural Components". University of Michigan Medical School. Learning Health Sciences 650 Seminar (8 doctoral students). November 2024.

PROFESSIONAL MEMBERSHIPS

Academy Health   **03/2023 – PRESENT**
American Medical Informatics Association   **08/2018 – PRESENT**

PEER REVIEW EXPERIENCE

Student Editorial Board Member   **01/2025 – PRESENT**
Journal of the American Medical Informatics Association (JAMIA)
- Collaborate with associate editors on reviewing at least 6 manuscripts per year for publication in *JAMIA*.
- Assess manuscripts for journal fit, likeliness to advance the field of informatics, and rigor of the methodology.
- Manage and moderate the monthly *JAMIA* Journal Club.

Reviewer   **07/2024**
Applied Clinical Informatics
- Invited by associate editor Gregory L. Alexander.

Reviewer   **05/2024**
Clinical Pharmacology & Therapeutics
- Invited by associate editor Richard B. Kim.

PEER REVIEWED JOURNAL ARTICLES

1. **Co Z**, Strasberg HR, Hanway BR, Sittig DF, Classen DC. "Comparing the effectiveness of a medication knowledge base product as designed with real world hospital implementations using the Leapfrog Group's Computerized Physician Order Entry (CPOE/EHR) Evaluation Tool". 2025. (***Under Review***)

2. **Co Z**, Bates DW, Cole JM, Ratwani R, Classen DC. "Special Issue on CDS Failures: Development and Pilot of an Electronic Tool for Assessing Human Factors Principles in Ambulatory Medication Clinical Decision Support". 2025. (***Under Review***)

3. Lester C, Rowell B, Zheng Y, **Co Z**, Marshall V, Kim JY, Chen Q, Kontar R, Yang XJ. "Effect of uncertainty-aware artificial intelligence models on human reaction time and decision-making: A randomized controlled trial." ***JMIR Preprints***. 30/07/2024:64902. DOI: 10.2196/preprints.64902. URL: https://preprints.jmir.org/preprint/64902

4. Wasserman RL, Seger DL, Amato MG, **Co Z**, Mugal A, Rui A, Garabedian PM, Marceau M, Syrowatka A, Volk LA, Bates DW. "Straight to the point: evaluation of a Point of Care Information (POCI) resource in answering disease-related questions". *J Med Libr Assoc*. 2024;112(1):13-21. doi:10.5195/JMLA.2024.1770

5. **Co Z,** Classen DC, Cole JM, Seger DL, Madsen R, Davis T, McGaffifan P, Bates DW. "How Safe are Outpatient Electronic Health Records? An Evaluation of Medication-Related Decision Support using the Ambulatory Electronic Health Record Evaluation Tool". *Appl Clin Inform.* 2023;14(5):981-991. doi:10.1055/s-0043-1777107

6. Nuckols TK, Berdahl CT, Henreid A, Schnipper JL, Rauf A, Ko E, Nguyen A, **Co Z**, Fanikos J, Kim JH, Leang D, Matta L, Mulligan K, Ray A, Shane R, Wassef K, Pevnick JM, and the PHARM-DC Group. "Comprehensive Pharmacist-led Transitions-of-care Medication Management around Hospital Discharge Adds Modest Cost Relative to Usual Care: Time-and-Motion Cost Analysis". *Inquiry*. 2023;60:469580231218625. doi:10.1177/00469580231218625

7. **Co Z**, Classen DC. "Pilot Results from the Ambulatory Electronic Health Record (EHR) Evaluation Tool: Lessons Learned". *J Clin Res Med. 2023;* 6(3): 1–2. DOI: 10.31038/JCRM.2023633

8. Syrowatka A, Song W, Amato MG, Foer D, Edrees H, **Co Z**, Kuznetsova M, Dulgarian S, Seger DL, Simona A, Bain PA, Purcell Jackson G, Rhee K, Bates DW. "Key use cases for artificial intelligence to reduce the frequency of adverse drug events: a scoping review". *Lancet Digit Health*. 2022;4(2):e137-e148. doi:10.1016/S2589-7500(21)00229-6

9. **Co Z**, Holmgren AJ, Classen DC, Newmark LP, Seger DL, Cole JM, Pon B, Zimmer KP, Bates DW. "The Development and Piloting of the Ambulatory Electronic Health Record Evaluation Tool: Lessons Learned". *Appl Clin Inform*. 2021;12(1):153-163. doi:10.1055/s-0041-1722917

10. Semanik MG, Kleinschmidt PC, Wright A, Willett DL, Dean SM, Saleh SN, **Co Z**, Sampene E, Buchanan JR. "Impact of a problem-oriented view on clinical data retrieval". **J Am Med Inform Assoc**, 2021;, ocaa332, https://doi.org/10.1093/jamia/ocaa332

11. Levine DM, Lipsitz SR, **Co Z.** Song W, Dykes PC, Samal L. "Derivation of a Clinical Risk Score to Predict 14-Day Occurrence of Hypoxia, ICU Admission,

and Death Among Patients with Coronavirus Disease 2019". *J GEN INTERN MED* (2020). https://doi.org/10.1007/s11606-020-06353-5

12. **Co Z**, Holmgren AJ, Classen DC, Newmark L, Seger DL, Danforth M, Bates DW. "The tradeoffs between safety and alert fatigue: Data from a national evaluation of hospital medication-related clinical decision support". **J Am Med Inform Assoc**. 2020 Aug 1;27(8):1252-1258. doi: 10.1093/jamia/ocaa098. PMID: 32620948

13. Levine DM, **Co Z**, Newmark LP, Groisser AR, Holmgren AJ, Haas JS, Bates DW. "Design and testing of a mobile health application rating tool". *NPJ Digit Med*. 2020 May 21;3:74. doi: 10.1038/s41746-020-0268-9. PMID: 32509971; PMCID: PMC7242452

14. Classen DC, Holmgren AJ, **Co Z**, Newmark LP, Seger D, Danforth M, Bates DW. "National Trends in the Safety Performance of Electronic Health Record Systems From 2009 to 2018". *JAMA Netw Open*. 2020 May 1;3(5):e205547. doi: 10.1001/jamanetworkopen.2020.5547. PMID: 32469412; PMCID: PMC7260621

15. Holmgren AJ, **Co Z**, Newmark L, Danforth M, Classen D, Bates DW. "Assessing the safety of electronic health records: a national longitudinal study of medication-related decision support". *BMJ Qual Saf*. 2020 Jan;29(1):52-59. doi: 10.1136/bmjqs-2019-009609. Epub 2019 Jul 18. PMID: 31320497

CONFERENCE PRESENTATIONS

1. **Co Z**, Classen DC, Danforth M, Bates DW. "Hospital Performance on Advanced Clinical Decision Support Areas in the Leapfrog Group's 2022 CPOE Evaluation Tool". Presented at: **AMIA 2024 Annual Symposium**; November 2024; San Francisco, CA. Poster.

2. **Co Z**, Classen DC, Cole JM, Bates DW. "Characteristics of High-Performance Hospital in the Leapfrog Group's 2022 CPOE Evaluation Tool". Presented at: **Academy Health - Annual Research Meeting 2024**; June 2024; Baltimore, MD. Poster.

3. **Co Z**, Newmark LP, Classen DC, Cole JM, Bates DW. "Development and Piloting of a Human Factors Survey Based on I-MeDeSA through the Ambulatory EHR Evaluation Tool". Presented at: **AMIA 2022 Annual Symposium**; November 2022; Washington, D.C. Oral Presentation.

4. **Co Z**, Newmark LP, Classen DC, Seger DL, Danforth M, Bates DW. "Healthcare System Performance on Unsafe Medication Orders in the 2019 CPOE Evaluation Tool". Presented at: **AMIA 2021 Annual Symposium**; November 2021; San Diego, CA. Poster.

5. **Co Z**, Classen DC, Pon B, Zimmer K, Seger DS, Cole JM, Bates DW. "Pilot Results from the Ambulatory Flight Simulator Tool: Lessons Learned". Presented at: **AMIA 2020 Virtual Annual Symposium**; November 2020. Poster.

6. **Co Z**, Holmgren AJ, Newmark L, Seger D, Classen DC, Danforth M, Bates DW. "Hospital Performance on Unsafe Medication Orders in the 2017-2018 CPOE Evaluation Tool". Presented at: **AMIA 2019 Annual Symposium**; November 2019; Washington D.C. Poster.

7. Holmgren AJ, **Co Z**, Newmark L, Danforth M, Classen D, Bates D. "Building Safer EHRs: Hospital Medication Order Safety Performance". Presented at: **AMIA 2019 Annual Symposium**; November 2019; Washington D.C. Oral Presentation.

8. **Co Z**, Holmgren AJ, Newmark L, Seger D, Classen DC, Danforth M, Bates DW. "Variable Performance in the Computerized Physician Order Entry (CPOE) Tool: Areas for Improvement". Presented at: **The 7th International Jerusalem Conference on Health Policy**; September 2019; Jerusalem, Israel. Oral Presentation.

9. **Co Z**, Seger D, Newmark L, Classen DC, Danforth M, De Silva L, Bates DW. "Results from the 2017 CPOE Evaluation Tool: Areas for Improvement". Presented at: **AMIA 2018 Annual Symposium**; November 2018; San Francisco, CA. Poster.