

**BIOGRAPHICAL SKETCH**

NAME: Johnson, Todd

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

POSITION TITLE: Professor

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 Date MM/YYYY	FIELD OF STUDY
The Ohio State University, Columbus, OH	BS	07/1984	Computer Science
The Ohio State University, Columbus, OH	MS	07/1986	Computer Science
The Ohio State University, Columbus, OH	PHD	07/1991	Computer Science

**A. Personal Statement**

I have over 20 years of experience in biomedical informatics (BMI) with an emphasis on improving patient safety and the quality of care through human factors engineering and user-centered design of health information technology, including electronic health records, medical devices, and audit and feedback dashboards. My past work includes an AHRQ project to study effects of remote ICU monitoring on clinical workflow, and several funded projects examining interruptions and workflow in the ED. I was a co-investigator of an AHRQ grant to study the effect of real-time interactive visualizations on clinician situation awareness in the ED. From 2008 to 2010 I was Program Director of an AHRQ training program in patient safety and quality. I led the user needs and user interface design team for the NIH-funded BioCADDIE, data discovery index prototype, and co-led (with Drs. Ben Shneiderman and Catherine Plaisant from the University of Maryland) Project 4 (Cognitive Information Design and Visualization: Enhancing Accessibility and Understanding of Patient Data) of the ONC-funded SHARP-C project. For the past 10 years I have devoted at a large percentage of my effort to operational projects with our clinical partners to improve inpatient and outpatient safety and quality under funding from the CMS Delivery System Reform Incentive Pool and the Memorial Hermann Healthcare System. I also continue to seek to improve secondary use of EHR data through research with the Center for Clinical and Translational Science.

- a. **Johnson, TR**, Markowitz, E, Bernstam, EV, Herskovic, JR, and Thimbleby, H. SYFSA: A framework for systematic yet flexible systems analysis. *Journal of Biomedical Informatics* 46 (2013), pp. 665–675
- b. Franklin A, Gantela S, Shifarrow S, **Johnson TR**, Robinson DJ, King BR, Mehta AM, Maddow CL, Hoot NR, Nguyen V, Rubio A, Zhang J, Okafor NG. Dashboard visualizations: Supporting real-time throughput decision-making. *J Biomed Inform.* (2017) Jul; 71:211-221. PubMed PMID: 28579532.
- c. Dixit R, Rogith D, Narayana V, Salimi M, Gururaj A, Ohno-Machado L, Xu H, **Johnson TR**. User needs analysis and usability assessment of DataMed - a biomedical data discovery index. *J Am Med Inform Assoc.* (2018 Mar 1) ;25(3):337-344. doi: 10.1093/jamia/ocx134. PMID: 29202203; PMCID: PMC7378884.
- d. Diaz-Garelli, JF, Bernstam, EV, Lee, M, Hwang, KO, Rahbar, MH, and **Johnson, TR**. DataGauge: A Practical Process for Systematically Designing and Implementing Quality Assessments of Repurposed Clinical Data. *eGEMs7* (2019). PMCID: PMC6659577

**Ongoing Research Support**

UTH/TIPPS Qashqai (Director)

8/31/21- 08/30/2024

CMS

**Title:** Texas Incentives for Physicians and Professional Services (TIPPS)

**Goal:** To implement interventions to improve healthcare quality and reduce costs

**Role:** Co-I

UT System Murphy (PI) 05/12/2016 – 04/11/2023

**Title:** UT System Health Intelligence Platform: Clinical Data Network

**Goal:** To improve quality of care metrics across UT System hospitals

**Role:** Co-I

5 R01 DE024166-07 Walji (PI) 03/01/2015 - 06/30/2026

NIH

**Title:** Implementing Dental Quality Measures in Practice

**Goal:** The primary goal of this project is to develop patient-centered quality metrics for dentistry

**Role:** Co-I

1 U54 TR002804 McPherson (PI) 07/24/2019 - 06/30/2024

NIH/NCATS

**Title:** Center for Clinical and Translational Sciences

**Goal:** The major goals of this project are to transform clinical and translational research at UT-Houston. Dr. Johnson is leading a project to develop interactive visualization tools for accessing and displaying data from the clinical data warehouse.

**Role:** Co-I

MD Anderson Cancer Center, Johnson and Le (Co-PIs) 03/01/2022 – 02/31/2024

**Title:** Enhancing health informatics infrastructure to increase HPV vaccination uptake across UT Physicians.

**Goal:** To reengineer clinical workflow and health IT to improve HPV vaccination update

**Role:** Co-PI

## **B. Positions, Scientific Appointments, and Honors**

### **Positions and Scientific Appointments**

2013 -	Professor, The University of Texas School of Biomedical Informatics at Houston, Houston, TX
2010 - 2013	Professor and Director, Division of Biomedical Informatics, The University of Kentucky, Lexington, KY
1998 - 2010	Associate to Professor, The University of Texas School of Biomedical Informatics, Houston, TX
1991 - 1998	Assistant and Associate Professor, The Ohio State University, Columbus, OH

### **Honors**

2017	John P. McGovern Outstanding Teacher Award, UTHealth School of Biomedical Informatics
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## **C. Contributions to Science**

### **1. Patient Safety and Quality**

Much of my informatics career has been devoted to improving patient safety and quality through the application of cognitive engineering, human factors engineering, and information visualization. In addition to the projects mentioned above, I have extensive experience studying safety-related user interface design issues for smart infusion pumps. As part of the ONC-funded SHARPC subproject, Cognitive Information Design and Visualization, I lead several teams to develop guidelines for improving the safety and usability of EHRs. In earlier work I participated in the development of a medical error ontology, and on health information technology to assist clinicians with antibody identification and biopsy interpretation.

- a. **Johnson, TR**, Zhang, J, Patel, VL, Keselman, A, Tang, X, Brixey, JJ, Paige, D, and Turley, JP. "The role of patient safety in the device purchasing process." In: *Advances in Patient Safety: From Research to Implementation*. Ed. by Henriksen, K and Battles, JB. Vol. 1. Agency for Healthcare Research and Quality, (2005), pp. 341–352.
- b. Johnson, C. **Johnson, TR**, Zhang, A user-centered framework for redesigning health care interfaces. *Journal of biomedical informatics*. (2005); 38(1):75–87. PMID: 15694887
- c. **Johnson, TR**, Tang, X, Graham, M, Brixey, J, Turley, J, Zhang, J, Keselman, A, and Patel, V. Attitudes toward medical device use errors and the prevention of adverse events. *Joint Commission Journal on Quality and Patient Safety* 33 (2007), pp. 689–694. PMID: 18074717
- d. Joffe, E, Turley, JP, Hwang, KO, **Johnson, TR**, Johnson, CW, and Bernstam, EV. Evaluation of a problem-specific SBAR tool to improve after-hours nurse-physician phone communication: a randomized trial. *Joint Commission Journal on Quality and Patient Safety* 39 (2013), pp. 495–501. PMID: 24294677

## 2. Information Visualization

I have over 20 years of experience in information visualization, beginning with early work on diagrammatic reasoning and how visual representations affect cognition and problem solving. I co-led (with Drs. Ben Shneiderman and Catherine Plaisant from the University of Maryland) the ONC-funded SHARPC subproject: Cognitive Information Design and Visualization. I also currently spend 70% of my time designing information visualizations for population health and clinical quality improvement under funding from the CMS Delivery System Reform Incentive Pool (DSRIP).

- a. Plaisant, C, Chao, T, Wu, J, Hettinger, AZ, Herskovic, JR, **Johnson, TR**, Bernstam, EV, Markowitz, E, Powsner, S, and Shneiderman, B. Twinlist: novel user interface designs for medication reconciliation. *AMIA Annual Symposium Proceedings 2013* (2013). (Winner of one of five distinguished paper awards given at AMIA 2013. Selected from 103 full research papers.), p. 1150. PMID: PMC3900136
- b. Patil, S, Patel, B, Kaushal, S, Ayad, M, Gopal, K, and **Johnson, T**. Implementation Of Data Visualization Dashboard Can Improve The Venous Thromboembolism (VTE) Prophylaxis Compliance And Reduce The VTE Incidence In Hospitalized Patients'. *American Thoracic Society 2017 International Conference. American Thoracic Society, 2017, A2325*
- c. Franklin, A, Gantela, S, Shifarrar, S, **Johnson, TR**, Robinson, DJ, King, BR, Mehta, AM, Maddow, CL, Hoot, NR, Nguyen, V, Rubio, A, Zhang, J, and Okafor, NG. Dashboard visualizations: supporting real-time throughput decision-making. *Journal of Biomedical Informatics* 71 (2017), pp. 211–221. PMID: 28579532

## 3. Foundational Issues in Biomedical Informatics

I have made several contributions to foundational issues in biomedical informatics, including work proposing a scientific foundation for the field that contributed to two AMIA Board white papers on competencies for graduate programs. I have also contributed to analyzing and why healthcare information technology has not resulted in similar gains in efficiency and quality seen in non-healthcare fields.

- a. Bernstam, EV, Smith, JW, **Johnson, TR**. What is biomedical informatics?. *Journal of biomedical informatics*. 2010; 43(1):104-110. PMID: PMC2814957
- b. Kulikowski, CA, Shortliffe, EH, Currie, LM, Elkin, PL, Hunter, LE, **Johnson, TR**, Kalet, IJ, Lenert, LA, Musen, MA, Ozbolt, JG, Smith, JW, Tarczy-Hornoch, PZ, and Williamson, JJ. AMIA Board white paper: Definition of biomedical informatics and specification of core competencies for graduate education in the discipline. *Journal of the American Medical Informatics Association* 19 (2012), pp. 931–938 PMID: PMC3534470
- c. Valenta, AL, Berner, ES, Boren, SA, Deckard, GJ, Eldredge, C, Fridsma, DB, Gadd, C, Gong, Y, **Johnson, T**, Jones, J, Manos, EL, Phillips, KT, Roderer, NK, Rosendale, D, Turner, AM, Tusch, G, Williamson, JJ, and Johnson, SB. AMIA Board White Paper: AMIA 2017 Core Competencies for

Applied Health Informatics Education at the Master's Degree Level. *Journal of the American Medical Informatics Association* (2018). PMID: PMC7647152

- d. Johnson TR, Bernstam EV. Why is biomedical informatics hard? A fundamental framework. *J Biomed Inform.* 2023 Apr;140:104327. doi: 10.1016/j.jbi.2023.104327. Epub 2023 Mar 8. PMID: 36893995.

#### 4. Data Quality

I have over 8 years of experience assessing and developing methods to improve data quality for clinical research. This includes studying factors that affect the quality of data from medical records, and the benefits and challenges of standardized terminologies. This work provides guidance on the kinds of processes that can ensure higher quality data. In addition, helped to develop a framework (called DataGauge) for assessing data quality relative to a specific purpose.

- a. Saitwal H, Qing D, Jones S, Bernstam EV, Chute CG, **Johnson TR**. Cross-terminology mapping challenges: a demonstration using medication terminological systems. *J Biomed Inform.* 2012 Aug;45(4):613-25. PMID: PMC4398308
- b. Zozus MN, Pieper C, Johnson CM, **Johnson TR**, Franklin A, Smith J, Zhang J. Factors Affecting Accuracy of Data Abstracted from Medical Records. *PLoS One.* 2015;10(10):e0138649. PubMed PubMed Central PMID: PMC4615628.
- c. Diaz-Garelli, JF, Bernstam, EV, Lee, M, Hwang, KO, Rahbar, MH, and **Johnson, TR**. DataGauge: A Practical Process for Systematically Designing and Implementing Quality Assessments of Repurposed Clinical Data. *eGEMs7* (2019). PMID: PMC6659577

#### 5. Standardized Terminological Systems

I have both used and contributed to the development of standardized terminologies and ontologies, as well as novel methods for improving and augmenting ontologies using machine learning. This includes early work on a cognitive taxonomy of medical errors. A 2012 paper reported on the many issues around mapping across multiple medication terminological systems. More recently I have been applying machine learning methods to help automate semantic tagging, and to augment existing ontologies.

- a. Zhang, J, Patel, VL, **Johnson, TR**, and Shortliffe, EH. A cognitive taxonomy of medical errors. *J Biomed Inform* 37 (2004), pp. 193–204.
- b. Saitwal H, Qing D, Jones S, Bernstam EV, Chute CG, **Johnson TR**. Cross-terminology mapping challenges: a demonstration using medication terminological systems. *J Biomed Inform.* 2012 Aug;45(4):613-25. PMID: PMC4398308.
- c. Yu Z, Bernstam E, Cohen T, Wallace BC, **Johnson TR**. Improving the utility of MeSH® terms using the TopicalMeSH representation. *J Biomed Inform.* 2016 Jun;61:77-86. PMID: PMC4893983.
- d. Yu, Z, Wallace, BC, **Johnson, T**, and Cohen, T. Retrofitting Concept Vector Representations of Medical Concepts to Improve Estimates of Semantic Similarity and Relatedness. *Studies in Health Technology and Informatics* 245 (2017), pp. 657–661. PMID: PMC6464117

Complete List of Published Work in MyBibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/todd.johnson.2/bibliography/public/>