

BIOGRAPHICAL SKETCH

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NAME: Yan Xiao, PhD

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POSITION TITLE: Professor; Human Factors Engineer and Patient Safety Researcher

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)	YEAR(s)	FIELD OF STUDY
Lanzhou Jiaotong University, Lanzhou, China	BS	1982	Mechanical Engineering
Beijing Institute of Technology, Beijing, China	MS	1985	Systems Engineering
University of Toronto, Toronto, Canada	PhD	1994	Human Factors

A. Personal Statement

I am a Human Factors Engineer and Patient Safety Researcher, with a passion to design safer healthcare systems. Currently I am full professor focusing on medication safety improvement through patient engagement and on teaching frontline clinicians human factors. In 2009 I left a tenured full professor position to develop one of the first human factors programs in the nation at large private healthcare systems to incorporate human factors methods and concepts in improving patient safety, such as high performing surgical teams, roadmaps for incorporating human factors in electronic health record deployment and options, infusion medication safety programs, clinical alarms safety, unit-based learning, physician-nurse communication training programs, venous thromboembolism prevention, patient engagement expertise sharing, and patient-centered risk factors for elderly patients who are discharged from hospitals to homes. With education preparation in engineering fields, I have devoted last 25 years improving health care as a continuously federally funded researcher. I am a leading authority nationally on human factors in healthcare with 75+ peer reviewed journal articles in human factors and patient safety. I served as PI for 7 federally sponsored consortium projects. My current projects are supported by Agency for Healthcare Research and Quality and National Science Foundation, including a Learning Lab project on building partnership between patients and their primary care professionals.

My experience in operations improvement and in research provide me with the perspective of developing pragmatic and innovative ways to incorporate human-centered design in complex health care delivery environments. My experience in designing and executing large research projects in health care enables me to work with and lead multi-disciplinary teams across health care and non-health care domains.

B. Positions and Honors**Positions and Employment**

1985-1988	Systems Engineer, North Vehicle Research Institute, Beijing, China
1991-1993	Doctoral Fellow, IBM Canada Centre for Advanced Studies Toronto, Canada
1994-1995	Instructor of Anesthesiology, University of Maryland School of Medicine
1995-2001	Assistant Professor of Anesthesiology, University of Maryland School of Medicine
2001-2009	Associate Professor (with tenure), University of Maryland School of Medicine
2005-2009	Director, Research in Patient Safety, Program in Trauma, University of Maryland
2009-2009	Professor (with tenure), University of Maryland School of Medicine
2009-2017	Director, Human Factors & Patient Safety Science, Baylor Scott & White Health, Dallas, TX
2017-	Professor, School of Nursing and Health Innovation, University of Texas at Arlington

Other Experience and Federal Government Public Advisory Committee Membership (2010-)

2010	Ireland Health Research Board Special external reviewer
2010	Office of National Coordinator for Health Information Technology Review Panel
2010	Ireland Health Research Board Special external reviewer
2005-2011	National Science Foundation CISE Grants Review Panels
2010, 2013	National Institute of Child Health and Human Development Patient Safety Panel
2011-2015	AHRQ Study Section on Healthcare Safety and Quality Research – standing member
2014	National Science Foundation Partnerships for Innovation Grants Review Panel
2014-	Anesthesia Patient Safety Foundation Scientific Evaluation Committee

Editorial Positions

2004-2013	Associate Editor, <i>IEEE Trans Syst, Man, & Cybern, Part A: Human Systems</i>
2007-Present	Editorial Board, <i>Human Factors</i>
2009-Present	Editorial Board, <i>J Cognitive Engineering & Decision Making</i>
2009-Present	<i>F1000 Medicine</i> faculty member

C. Contribution to Science

1. Patient safety and human factors. High quality, safe healthcare delivery relies on understanding of the interactions between humans and complex systems, a field called human factors. My research in this area has been supported by Agency for Healthcare Research and Quality, National Patient Safety Foundation, and National Science Foundation. Based on observations at homes and hospitals on medication safety during transition of care, we developed a framework for engineering support systems for patients and family members to be active participants in improving safety [a]. Using ethnographic observations in operating rooms, I developed a model [b] that explains the expertise in creating safety as knowledge and skills in anticipating and preventing potential harmful situations. This model suggests educational strategies to focus beyond the often recognized area of responding and recovering from harmful situations. Collaborating with post-doctoral fellows, I directed several studies on compliance, alarms, and multi-disciplinary rounding. We developed the concept that compliance is the “property of a system”, not as outcomes of individual decisions [c], an insight for developing robust systems approaches to improve compliance, to define systems ambiguity as “uncertainty or vagueness that may prevent a work system from achieving its purpose.” Using time-motion methodologies, we illustrated the importance of strategic time management in achieving high performance of the “rounding team” [d].

- a) **Xiao, Y.**, Abebe, E, & Gurses, A.P. Engineering a Foundation for Partnership to Improve Medication Safety during Care Transitions. *J Patient Saf Risk Manag* (In print). First Published January 11, 2019. [DOI: doi.org/10.1177/2516043518821497].
- b) **Xiao, Y.**, Milgram, P., & Doyle, D.J. Planning behavior and its functional roles in the interaction with complex systems. *IEEE Trans Syst Man Cybern, Pt A: Syst Hum*, 27(3):313-324. 1997
- c) Gurses AP, Seidl K, Vaidya V, Bochicchio GV, Harris A, Hebden J, **Xiao Y.** Ambiguity and guideline compliance: A qualitative study of how intensive care units follow guidelines. *Qual Saf Health Care* 17:351-359. 2008 [PMID 18842974] (Editor’s choice)
- d) Sen A, **Xiao Y**, Lee S, Hu P, Dutton RP, Haan J, O’Connor J, Pollak AP, Scalea T. Daily Multi-Disciplinary Discharge Rounds in a Trauma Center: A Little Time, Well Spent. *J Trauma*. 66(3):880-7, 2009 [PMID 19276768]

2. Team performance and team leadership. Healthcare is a “team sport”, yet much is required to understand the nature of teamwork in a variety of healthcare settings. With co-authors I reviewed key shortcomings in current research on team work [a], particularly organizational support for team performance beyond individual teamwork skills. This review was in part based on over 15 years of my own research on teams in healthcare, including a descriptive model of team leadership in trauma teams [b] and the concept of “dynamic delegation” [c], published in and awarded scholarly contribution 5 years after publication by a premier journal (*Administrative Science Quarterly*). To translate some of the insights gained in research to team performance improvement, I led a group to develop an operationally defined metric “team consistency” to monitor organizational support of teamwork, based on an analysis that linked team compositions to patient outcomes [d].

- a) **Xiao Y**, Parker SH, Manser T. Teamwork and Collaboration. *Rev Hum Fact Ergon* 8(1):55-102, 2013. [DOI: 10.1177/1557234X1349518]
- b) **Xiao, Y.**, Seagull, F.J., Mackenzie, C.F., Klein, J. Adaptive leadership in trauma resuscitation teams: a grounded theory approach to video analysis. *Cogn, Techn Work*, 6(3): 158-164. 2004.
- c) Klein K, Ziegert J, Knight A, **Xiao Y**. Dynamic Delegation: Shared, Hierarchical, Deindividualized Leadership in Extreme Action Teams. *Admin Sci Quart.* 51(4):590-621. 2006
- d) **Xiao Y**, Jones A, Belinda Zhang, Bennett M, Mears SC, Mabrey J, Kennerly DA. Team consistency and occurrences of prolonged operative time, prolonged hospital stay, and hospital readmission: a retrospective analysis. *World J Surg.* 2015 Apr;39(4):890-6 [PMID 25472890]

3. Team coordination. Theories of how team members work together or coordinate can guide optimal design of workflows and health information technology. I led a number of ethnographic studies of coordination practices in trauma teams and in operating room management. We developed the concepts of “bandwidth” and “resolution” of highly tailored workplaces in supporting team coordination [a]. We drew practical implications for status board design for emergency medicine in general [b], which was selected as editor’s choice). We designed a hybrid whiteboard to enhance the “cognitive properties” of a manual whiteboard [c] to improve team coordination. I was the PI for a National Science Foundation project that supported field studies to capture coordination practices such as flexible teaming to counter extreme demands of expertise and resources at times in settings such as busy trauma centers. We developed the concept of dialogic coordination [d]: interactive processes among care providers of different disciplines in time-critical responses to novel events and to ensure error-free operation

- a) **Xiao, Y.** Artifacts and Collaborative Work in Healthcare: methodological, theoretical, and technological implications of the tangible. *Journal of Biomedical Informatics*, 38(1):26-33. 2005 [PMID 15694883]
- b) **Xiao Y**, Schenkel S, Faraj S, Mackenzie CF, Moss JA. What whiteboards in a trauma center operating suite can teach us about emergency department communication. *Ann Emerg Med.* 50(4):387-395, 2007 (Editor’s choice) [PMID: 17498845]
- c) **Xiao Y**, Dexter F, Hu FP, Dutton R. Usage of Distributed Displays of Operating Room Video when Real-Time Occupancy Status was Available. *Anesth Analg* 106(2):554-560. 2008. (F1000 Medicine Referred).[PMID 18227316]
- d) Faraj S., **Xiao Y**. Coordination In Fast-Response Organizations. *Manag Sci.* 52(8):1155-69. 2006

4. Video methodologies to improve patient safety. Video data is intuitively attractive as a potentially powerful tool for improving quality. I contributed to the pioneer work to overcome technological, methodological, ethical, and logistical difficulties with the use of video. I led a project to use human factors principles to analyze risks of preventable blood stream infections in central venous catheterization. The project used video analysis to examine sterile techniques during line placement, and subsequently developed an innovative video-based training course to avoid common mistakes. A randomized trial demonstrated a 6-fold increase in sterile practices after taking the course [a]. We also found that mentors to be poor role models in complying to sterile practices, even though they were technically excellent [b]. A detailed analysis of failed attempts at line placements identified 6 types of errors [c]. We conducted an ergonomic analysis of emergency chest tube insertions in trauma patients, which revealed risks to the patient and operator by poor instrument-tray positioning and or awkward instrument content [d].

- a) **Xiao Y**, Seagull FJ, Bochicchio GV, Guzzo JL, Dutton RP, Sisley A, Joshi M, Standiford HC, Hebden JN, Mackenzie CF, Scalea TM. Video-Based Training Increases Sterile-Technique Compliance During Central Venous Catheter Insertion. *Crit Care Med.* 35(5):1302-1306. 2007 [PMID 17414726]
- b) Guzzo, JL, Seagull FJ, Bochicchio GV, Sisely A, Mackenzie CF, Dutton R, Scalea T, & **Xiao Y**. Multiple Operators During Central Line Placement in the Trauma Resuscitation Unit: Videotape Review of Maximum Barrier Precautions. *Surg Infect.* 7(1):15-20. 2006 [PMID 16509781]
- c) Kilbourne MJ, Bochicchio GV, Lumpkins KM, Scalea T, **Xiao Y**. Avoiding Common Technical Errors in Subclavian Central Venous Catheter Placement. *J Am Coll Surg.* 208(1):104-109, 2009 [PMID 19228511]
- d) Seagull FJ, Mackenzie CF, **Xiao Y**, Bochicchio GV. Video-based Ergonomic Analysis to Evaluate Thoracostomy Tube Placement Techniques. *J Trauma.* 60(1):227-232. 2006 [PMID 16456461]

5. Information technology and patient safety. Increasingly health information technology (HIT) plays a critical role in patient safety, as highlighted in recent reports. With a post-doctoral fellow we developed a framework based on human factors principles to support team communication processes during rounds [a]. The framework contributed ideas on how HIT may be used to support team communication. I contributed to the theoretical consideration of HIT design on how to integrate HIT in clinical workflow [b], and on the importance of understanding how users themselves created tools to support cognitive work [c]. More recently, I led a team to develop a survey tool to help organization to improve the safety of HIT [d].

- a) Gurses AP, Xiao Y. A systematic review of the literature on multidisciplinary rounds to design information technology. *Journal of American Medical Informatics Association*. 13(3):267-276. 2006 [PMID 16501176]
- b) Xiao, Y. Artifacts and Collaborative Work in Healthcare: methodological, theoretical, and technological implications of the tangible. *J Biomed Inform*, 38(1):26-33. 2005 [PMID 15694883]
- c) Gurses AP, Xiao Y, Hu, P, User-designed information tools to support communication and care coordination in a trauma hospital. *Journal of Biomedical Informatics*. 42(4):667 – 77 2009 [PMID 19298868]
- d) Xiao Y, Montgomery D, Philpot LM, Barnes SA, Compton J, Kennerly D. Development of a Tool to Measure User Experience Following Electronic Health Record Implementation, *J Nurs Adam* 2014 Jul-Aug;44(7/8):423-8 [PMID25072233]

My publications listed on pubmed can be found on:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/yan.xiao.1/bibliography/43568772/public/?sort=date&direction=descending>

D. Research Support

Ongoing Research Support

AHRQ R18HS027277 (Xiao) 9/30/2019-9/29/2023

PROMIS Learning Lab: Partnership in Resilience for Medication Safety

Goal: to create a learning laboratory for patient safety in primary care, which designs and tests innovative and practical solutions based on systems engineering methods and concepts to improve medication safety in ambulatory and community settings.

Role: PI

AHRQ R01 HS24436 (Xiao/Gurses) 09/30/2015-09/29/2018

Patient-Centric Risk Model for Medication Safety during Care Transitions

Goal: to develop a patient-centric risk model of medication errors in ambulatory care.

Role: PI 9/2015-5/2017; Co-I from 6/2017

National Science Foundation 1838621 (Xiao) 9/1/2018-8/30/2022

Novel Computational Methods for Continuous Objective Multimodal Pain Assessment Sensing System (COMPASS)

Role: PI (multi-PI collaborative project)

AHRQ R18 HS027268 (Walji) 9/1/2019-8/31/2023

Open Wide Learning Lab (OWLL): Improving Patient Safety in Dentistry

Goal: To systematically identify threats to dental patient safety and iteratively test improvement strategies to prevent them.

NSF 1937143 (Li) 9/1/2019-5/31/2020

RAISE: C-Accel Pilot - Track A1: Credible Open Knowledge Network

Role: Senior Personnel (6.25%)

Goal: To develop new capability and resources for enabling a credible open knowledge network that can help ensure the quality of knowledge rich applications and aid in debunking misinformation.

The University of Texas System Board of Regents
The STARs (Science and Technology Acquisition and Retention) Program
Role: PI (startup infrastructure fund)

11/1/2017-10/31/2020

Completed Research Support (within last 5 years)

AHRQ (PI: Butler) 09/01/2012-08/31/2016
Understanding Clinical Information Needs and Health Care Decision Making Processes in the Context of Health Information Technology
Goal: To apply workflow modeling language to understand how clinical care is done currently, and how it could be improved by building measurably better workflows into health information systems.
Role: Co-Investigator

AHRQ R18 HS204161 (Mancini) 04/01/2011-3/31/2015
Improving Physician and Nurse Communication with Serious Gaming
This project is develop a serious game for physicians and nurses to appreciate the impact of ineffective interpersonal, inter-professional communication while experimenting with and learning more effective communication skills through practice and feedback.
Role: Site PI