

NSF FW-HTF-P #: 2026518

Mapping the Human-Technology Frontier to Improve Trauma Care: A Transdisciplinary Approach to Identify Opportunities, Challenges, and Risks

Graduate Students: Tobias Lodemann (Industrial and Systems Engineering [ISE]), Shannon Hickey (ISE).

PI: E. Akçali (ISE). Co-PIs: Benjamin Lok (Computer and Information Sciences Engineering), Charles Peek (Sociology), Shabboo Valipoor (Interior Design), Jade Williams (Communication Studies).

Senior Personnel: Rosemarie Fernandez (Emergency Medicine [EM]), Mary Patterson (EM).

Presenter: Elif Akçali, University of Florida, akcali@ise.ufl.edu

Goal:

- Trauma resuscitations are performed by interdisciplinary teams of individuals with diverse, specialized, interdependent, complementary skills in a highly dynamic and stochastic work environment.
- Diagnostic errors and delays in treatment are the most common errors reported in trauma resuscitations.
- Substantial number of emergency medicine nurses and physicians report symptoms of burnout.
- The goal is to *support patient safety* and *prevent burnout syndrome* in trauma care via clinically informed, human-centrally designed, and carefully engineered pervasively intelligent technological interventions (PITIs) to (i) support decision-making *during* and (ii) facilitate effective team training *for* diagnostic and treatment processes in trauma resuscitations.

Objective:

- O.1. Develop a holistic conceptual framework for, and a theoretical understanding of, *diagnostic and treatment care planning* (DTCP) to facilitate modeling and analysis of trauma resuscitations.
- O.2. Develop a comprehensive approach for *challenges, opportunities, and risks assessment* (CORA) to evaluate and justify PITIs for trauma resuscitations.

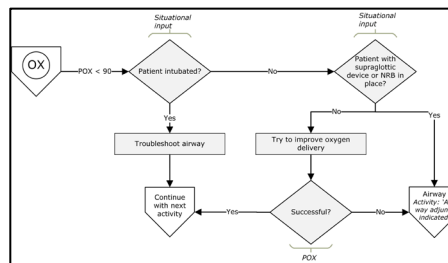
Approach:

- Understand and develop the team-based workflow associated with trauma resuscitations
- Identify opportunities, challenges, and risks associated with the use of PITIs to support trauma resuscitations.

Work to date:

O.1. Diagnostic and treatment care planning

- Developed a detailed process flow for primary survey ABCDE (Airway, Breathing, Circulation, Disability, Exposure) of trauma resuscitations focusing on blunt trauma
- Verified against a video library of trauma resuscitations¹



O.2. Challenges, opportunities and risks assessment

- Studied assessment of attitudes toward the use PITIs in other fields in medicine, e.g., radiology
- Three facets²
 - Attitude assessment along cognitive, affective, and behavioral dimensions
 - Individual, organizational, and societal perspectives
 - Assessment of challenges, opportunities and risks associated with change

Dimensions of attitude	Perspectives	Dimensions of assessment
Affective (e.g., excitement, fear)	Individual (e.g., physician, nurse, technician)	Challenges (e.g., training, upskilling)
Cognitive (e.g., prediction, expectation)	Organizational (e.g., infrastructure, ED)	Opportunities (e.g., safety, non-routine events)
Behavioral (e.g., training, research involvement)	Societal (e.g., professional group, society)	Risks (e.g., burnout, bias, privacy)

Next steps:

- Interview research design
- In-depth one-on-one interviews with physicians, nurses and technicians on trauma teams at UF Health Shands in Gainesville, FL and Jacksonville, FL
- Interview data analysis to identify opportunities, challenges, and risks for the use of PITIs in trauma resuscitation to support patient safety and prevent burnout syndrome considering scope of work and perspectives of workers

Trauma resuscitation work	Perspectives	Dimensions of assessment
Diagnosis and treatment planning	Physician	Perceived challenges
Teamwork facilitation	Nurse	Perceived opportunities
Team development and training	Technician	Perceived risks

Publications:

- Lodemann T, Akçali E, Fernandez R (2022) Process modeling of ABCDE primary survey in trauma resuscitations: A crucial first step for agent-based simulation modeling of complex team-based clinical processes. *Simulation in Healthcare*. 2022 Jan 12. doi: 10.1097/SIH.0000000000000622.
- Lodemann T, Hickey S, Akçali E, Fernandez R, Lok B, Patterson M, Peek C, Valipoor S, Williams J (2022) A Critical analysis of surveys assessing attitudes among physicians, residents and medical students towards the use of artificial intelligence in diagnostic radiology, *working paper*.