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Appendix: Summary of Best Papers Selected for the 2020 Edition of the IMIA Yearbook, Section Human Factors and Organizational Issues

Wang J, Liang H, Kang H, Gong Y

Understanding health information technology induced medication safety events by two conceptual frameworks

Appl Clin Inform 2019;10:158–67

This paper reveals a new perspective to Health Information Technology (HIT) induced medication errors through the application of two conceptual frameworks: the information value chain (Coiera, 2016) used in conjunction with the sociotechnical model for HIT-related errors (Sittig & Singh, 2010) can enhance measurement and facilitate identification of the most significant risks to patient safety.

Relying on the two conceptual frameworks and the National Coordinating Council for Medication Errors Reporting and Prevention (NCC MERP) taxonomy, a retrospective analysis of 9-year safety reports from the US FDA (Food and Drug Administration) MAUDE (Manufacturer and User Facility Device Experience) database (45,624 MAUDE reports were extracted; 3,521 reports were identified as HIT-related reports) was conducted. A hundred and fifty-two unique reports met the inclusion criteria.

Results show a variety of contributing factors to risks which are mostly associated with clinical content followed by human–computer interface, and people. While Organizational and system-related contributing factors are critical underlying factors, they were not directly highlighted. Results also provide an overview of how likely certain effect may be brought on one step and how it affects the other adjacent steps (*e.g.*, receiving wrong information causes making a wrong decision with a probability of 0.62, and the wrong information may lead to a wrong (probability: 0.38) or delayed (probability: 0.56) care process, with a high chance of resulting in patient harm (probability: 0.94)).

The application of the two conceptual frameworks to the MAUDE database may be a general approach to analyze any event reports in the context of HIT. It may enhance the understanding of HIT-induced problems, along with their causes and the identification of the most significant risks to patient safety. This may have implication on (i) how to formalize risk-related reporting template for HIT, and (ii) the development of a knowledge base supported by case-based reasoning.

Lee JY, van Karnebeek CDM, Wasserman WW

Development and user evaluation of a rare disease gene prioritization workflow based on cognitive ergonomics

J Am Med Inform Assoc 2019;26(2):124–33

This paper is interested in understanding human cognitive capabilities and applying this understanding to support human cognition via the design and evaluation of a human–system interaction for optimized performance in gene prioritization activities. The authors designed a novel workflow in which clinicians recalled known genetic diseases with similarity to patient phenotypes to inform data interpretation. This prototype-based workflow was evaluated against the common computational approach based on physician-specified sets of individual patient phenotypes. An evaluation was conducted as a web-based user study, in which 18 clinicians analyzed two simulated patient scenarios using a randomly assigned workflow. Data analysis compared the two workflows with respect to accuracy and efficiency in diagnostic interpretation, efficacy in collecting detailed phenotypic information, and user satisfaction.

Results demonstrated that gene interpretation could be accelerated using the prototype-based workflow by facilitating prototypical thinking. It was likely that participants employed some level of prototypical thinking in both workflows, while the reasoning process was more efficiently facilitated by the prototype-based workflow.

Patterson ES, Su G, Sarkar U

Reducing delays to diagnosis in ambulatory care settings: A macrocognition perspective

Appl Ergon 2020 Jan;82:102965

In this paper, the authors want to characterize contributors to diagnostic delays by physicians that can be mitigated by work system redesign. To do so, they overlay concepts from the theoretical framework of macrocognition upon a foundation of human factors concepts, including a perspective on how to advance patient safety known as Safety-II. In the outpatient care setting, complex tasks, conducted by a primary care provider, are provided for five macrocognition functions: sensemaking, re-planning, detecting problems, deciding, and coordinating. Relying on an interdisciplinary team, the authors held a series of meetings to redesign systems in order to reduce delays to diagnosis by helping users to avoid missed symptoms, forgotten follow-up activities, and delayed actions.

For each critical task, relying on the five macrocognition functions, the authors identified vulnerabilities in care provision in the outpatient setting that can contribute to diagnostic delays. Resilience strategies were proposed that can mitigate these vulnerabilities with work system redesign. The primary contribution of this paper is a set of resilience strategies that could be supported by innovations in health information technology (HIT) in future research.

Results augment an existing theoretical framework providing examples of how HIT could be redesigned to make complex tasks easier. This effort represents a preliminary step in a line of potentially useful research for reducing patient harm by providing ideas for interventions that go beyond training or education. The paper is a nice contribution of constructing a bridge between how human factors engineers conceptualize cognitive work in a way that can suggest innovative design solutions.