Affirming Proposed Variable Relationship Patterns in a Conceptual Model by Converting Qualitative Data to Causal Loop Diagrams

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Problem Statement: There is a nascent understanding about the impact Health Information Technology (HIT) has on nursing work. Informatics research often relies on quantitative inquiry under the positivist assumption that this produces significant conclusions. A flaw in this perspective is that it relies on linear relationships to build knowledge about clinical care, a phenomenon that does not operate in straight path algorithms. **Methods:** A Health Information Technology Workaround (HITW) model was compared to causal loop diagrams (CLD) generated from qualitative data in order to integrate feedback loops with the proposed HITW model and to validate hypothesized variable relationships. This study was conducted in collaboration with the American Association of Critical Care Nurses and approved by The University of Texas Health Science Center IRB. Registered nurses (307) responded to a survey consisting of items measuring nursing work, HIT problems, workarounds and open ended questions. The HITW model has three levels: micro represents patient level, mezzo represents the nurse and macro the organization. The dependent variable is the homeostatic variable (H). Causes of disruption are tensions (T) and the variables that try to compensate for disruption and return the system to homeostasis are structure (S). Systems thinking is a formal process combining qualitative and quantitative methods to examine variable relationships. Negative and positive feedback loops are fundamental. Positive feedback or reinforcing loops (R) push change in the same direction while negative feedback or balancing loops (B) push the system back to equilibrium. Qualitative data was coded and transformed into binary matrices to display relationship patterns. A CLD of the multi-level interfaces was then developed from the binary matrix report. **Results:** The CLD's provided evidence that HIT is interacting with variables creating positive and negative feedback loops that also interact with patient safety. Examples of primary relationships in the micro/ mezzo CLD: (↑ equals increase and ↓equals decrease) B1: As turbulence ↑, workarounds ↑ and problems ↓. B2: As safety risks ↑, workarounds ↑; stress and inefficiency ↓; safety risks ↓. B3: When problems ↑, workarounds ↑. Workarounds improve HIT performance; ↓ process steps and ↓ problems. R1: As safety risks ↑ turbulence ↑; ↑ turbulence results in ↑ workload, ↑ safety risks. R2: As problems ↑, turbulence and workload ↑; patient safety risks and problems ↑. Examples of primary relationships in the mezzo/ macro CLD: B1: Protocol adherence ↑, work process mismatches ↑; delays ↑, workarounds ↑, adherence to protocols ↓. B2: As delays↑, inneficiency ↑; workarounds↑, delays ↓. R1: As workarounds ↑, meeting intent of protocol ↑; as protocol compliance ↑ (or appearance of compliance), job security ↑. R2: As workload ↑ , turbulence ↑; ↑ turbulence causes ↑ safety risk, ↑ errors and workload. The CLD's confirmed anticipated HITW model relationships. **Significance:** Qualitative data supported that nurses use HIT to deliver safe patient care. If a barrier is encountered, nurses use whatever mechanism delivers safe care efficiently, and without adding additional workload or turbulence. This paper introduces one approach to analysis of work complexities and provides an additional way to integrate qualitative inquiry in informatics studies.