Safety in Hospital Medication Administration
Applying STAMP Processes

Elizabeth White Baker, PhD  SDM ’22
Associate Professor, Information Systems
Virginia Commonwealth University (USA)
Evidence:

- The in-hospital losses from incorrect medication administration are $220M-$300M per year from deaths alone, and over $3.5B in serious harm done to patients (valuing 1 life year at $75-100k).
- Studies have reported hospital in-patient medication error rates of 4.8% to 5.3%, with the Institute of Medicine estimating that in-hospital medication errors alone cause 1 of 854 in-patient deaths (Wittich et al., 2014).

Urgency:

- The case of RaDonda Vaught, a nurse convicted of criminally negligent homicide for a medication administration error that resulted in a patient’s death.
- Tragically, this is not an uncommon event in hospitals.

Goal

To reduce hospital medication administration errors (medication adverse events) by developing insights into hazards and losses through a hospital medication administration control structure using STAMP methods.

- Secondary mission: To provide a starting point for hospitals to develop specific interventions (new/revised policies and procedures) to improve medication administration safety.

Focus on **STPA hazard analysis**: construct a systemic view of the interactions among healthcare workers, their patients, the enabling cyber-physical information systems, and the industry operations legally and commercially to elucidate hazards.

**Outcomes:**

- Develop more effective safety interventions
  - The current FMEA and RCA techniques have led healthcare to the situation it is currently in
- Achieve higher patient quality of care metrics
- Repurpose resources from safety legal actions and accident investigations toward better patient outcomes
Hospital Medication Administration High Level Control Structure

Legend
Control
Feedback
Communication

Hospital Regulatory/Compliance Agencies
- Reports
- Audits

Legal-Regulatory Requirements

Medication Administration Requirements

Healthcare Information Technology Vendors (CPOE, EHR/eMAR, Barcode eMAR, ADC)

Software Implementation

Payment

Software Implementation

Health Insurance Companies
- Reimbursements

Pharmaceutical Companies
- Medication Efficacy Reports
- Medication Shipments

Hospital Administration

Personnel Assignments

Observation

Patient Medical Order

Physician
- Medication Order Verification
- Patient Physiological Changes
- Patient Health Outcome

Pharmacist
- Medication Dispensing for Patient
- Medication Dispensation Verification

Nursing Staff
- Medication Administration to Patient
- Medication Order Verification
- Patient Physiological Changes
- Patient Health Outcome

Patient
STPA: Hospital Medication Administration Control Structure for Med Ordering and Transcribing

Key Takeaway: RCA methods did not account for the organizational impacts of management decision making on safety.
**STPA findings:**

- 4 system-level losses, from which three system hazards were identified.
- 43 UCAs that lead to 99 different causal scenarios
- Identified 27 high-level requirements and 16 safety constraints

Control actions from the hospital administration to the medication administration process (providing personnel assignments and approved drug formularies) indicates *there are many ineffective or missing safety management mechanisms to the process.*

**Safety Management System (SMS) analysis also completed**

- In-depth look at control structures within hospital management and hospital safety culture
- Missing safety information systems to make data-driven decisions

*It is easier to reengineer the environment and processes within which medication administration processes happen than to reengineer healthcare personnel.*
Where to next for medication administration safety?

▪ Stop doing what is NOT working when it comes to safety analysis in hospitals

▪ Stop training healthcare quality and safety professionals on safety techniques that do NOT work

▪ Start using CAST for accident analysis to prevent repetitive accident occurrences.

▪ Start introducing safety management systems and effective safety information systems into your facility