

# Analysis of Nested Interruptions in Intensive Care

Farzan Sasangohar<sup>1,2</sup>, Jaquelyn Monis Rodriguez<sup>1</sup>, Birsen Donmez<sup>1</sup>, Patricia Trbovich<sup>2,3</sup>, Anthony Easty<sup>2,3</sup>



<sup>1</sup> Human Factors and Applied Statistics Lab, Mechanical and Industrial Engineering, University of Toronto

<sup>2</sup> HumanEra, Center for Global eHealth Innovation, University Health Network

<sup>3</sup> Institute of Biomaterials and Biomedical Engineering, University of Toronto



## 1. Background

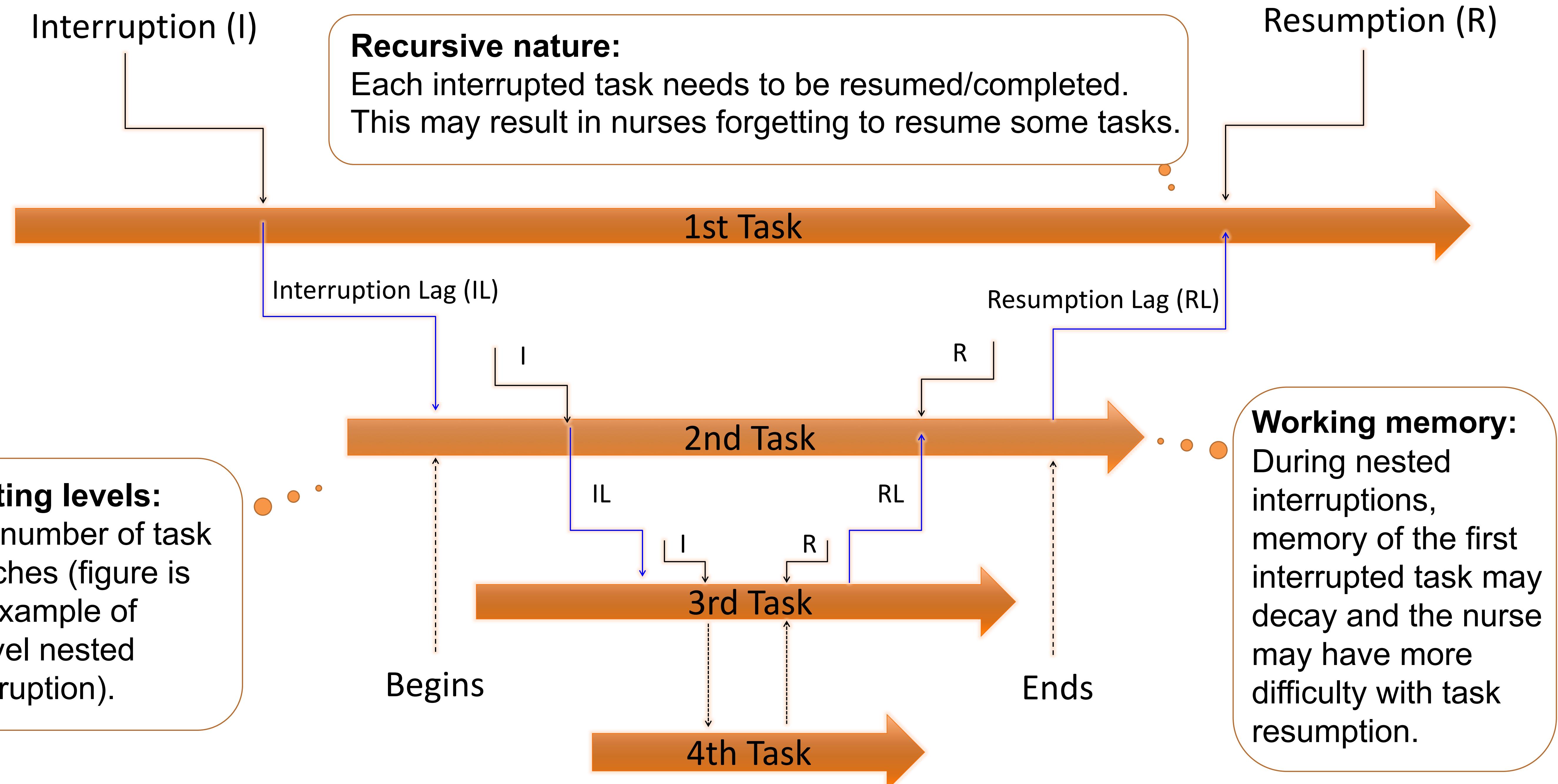
**Interruptions are a contributing factor to medical errors (Institute of Medicine, 2000).**

Given the limitations of human working memory and attentional resources (Just and Carpenter, 1992), it is likely that multiple interruptions resulting in multiple task switches facilitate errors (Coiera et al., 2002).

**Hypothesis:** Nurses may experience several nested interruptions (defined in section 2) which may affect their workload and performance.

**Study Aim:** To investigate the occurrence of nested interruptions in the cardiovascular ICU of a Canadian teaching hospital

## 3. Anatomy of Nested Interruptions



## 2. Definitions

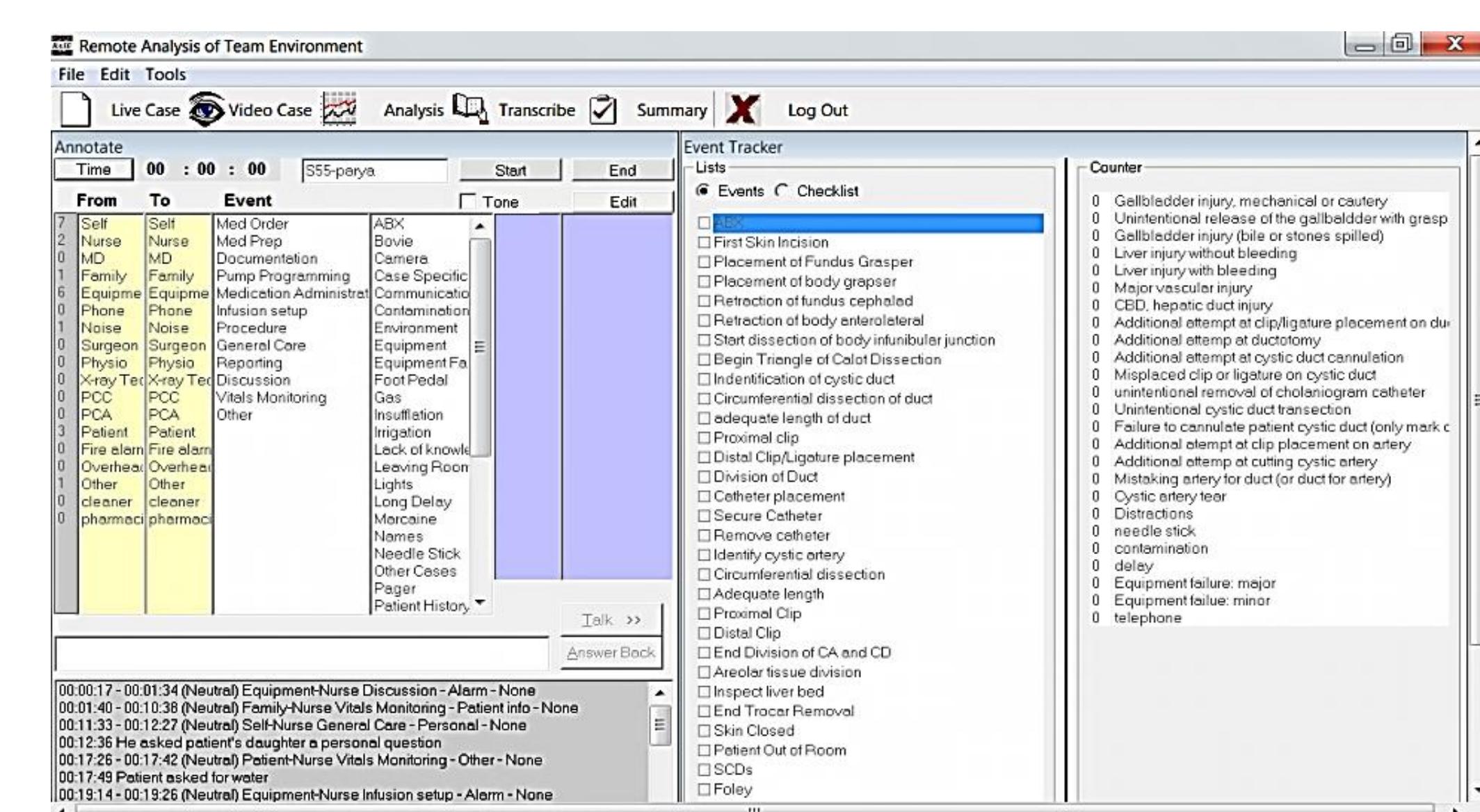
**Interruption:** An external intrusion of a secondary task, which leads to a discontinuity in primary task

**Nested Interruptions:** Interruptions that happen when the nurse is performing activities related to the interruption task. For example, nurse may get interrupted by an MD during medication preparation (1st task) who asks her to order a medication (2nd task), and while performing the medication ordering, the nurse gets interrupted by a pump alarm (3rd task).

## 4. Data Collection Method

### Observation of Nurses in the ICU

- Toronto General Hospital CVICU
- 56 observations of approximately 1 hour in length
- Observations conducted between 8 AM and 6 PM



### Data Acquisition

- Quantitative: Interruptions occurrence and length using Remote Analysis of Team Environment (RATE) software on tablet PCs
- Qualitative: scenario description direct observation and short interviews with nurses during the observations

## 5. Results

- 107 instances of two-level (92 instances), three-level (13 instances), and four-level (2 instances) nested interruptions (10.65% of observed interruptions)
- Personnel (e.g., nurses, MDs) were responsible for 44.44% of all nested interruptions.
- 50% of nested interruptions happened during high-severity tasks (e.g., pump programming, medication administration, etc.) and 40.85% occurred during medium-severity tasks (e.g., documentation, discussion).
- The content of overlapping interruptions were mostly work-related (30.86%) and patient-related (30.86%), but 13.58% had personal content.

## 6. Conclusion & Future Work

**Nested interruptions are common in the ICU settings.** Research is warranted to investigate the effects of nested interruptions on nursing performance.

**Hypothesis:** Nested interruptions 1) increase the resumption lag, 2) negatively impact the working memory of the primary task

**In progress:** A controlled experiment to investigate the effects of nested interruptions on task-resumption, and performance