

Assessing Radiology Workflow Interruptions with Electronic Communications: A Structural Topic Modeling Analysis

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BACKGROUND:

Interruptions are common in complex work environments, and radiology is particularly susceptible to workflow disruptions¹.

Although electronic communication platforms (ECPs) such as WebEx enable essential communication in contemporary radiology practices, they are a potential source of workflow disruption.

Radiologist and technologist workflow disruptions can negatively impact cognitive processes, increase workload, and lead to error¹⁻², potentially compromising patient safety and the clinical and education missions of an academic radiology practice.

PURPOSE:

To identify the frequency and nature of messages and the contextual factors that lead to communication via an ECP in a multi-subspecialty academic radiology practice using structural topic modeling.

MATERIALS AND METHODS:

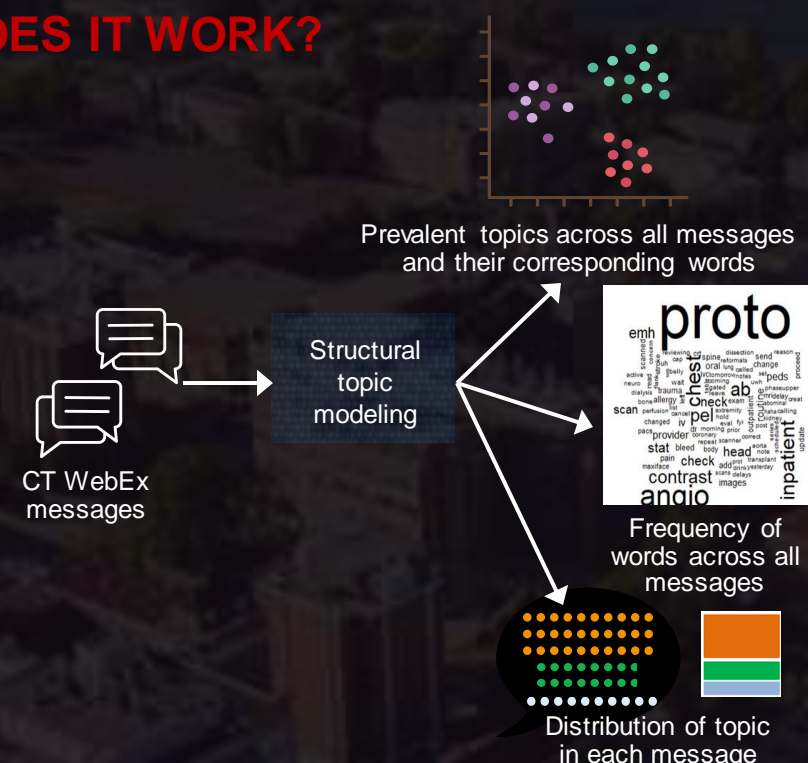
Retrospective, HIPAA-compliant, IRB-exempt quality improvement initiative.

WebEx communication data from CT reading rooms in a multi-subspecialty academic radiology practice at the University of Wisconsin collected from September 2022–September 2023.

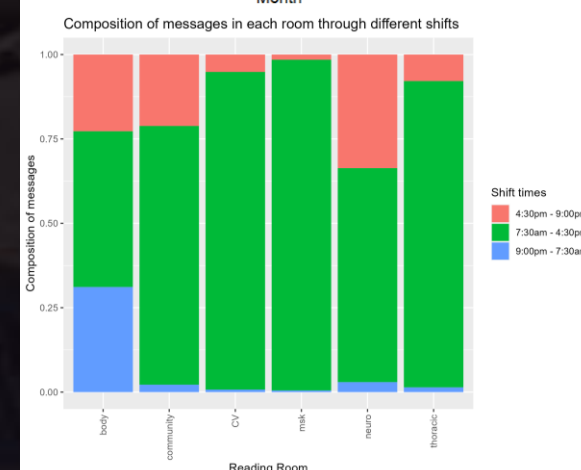
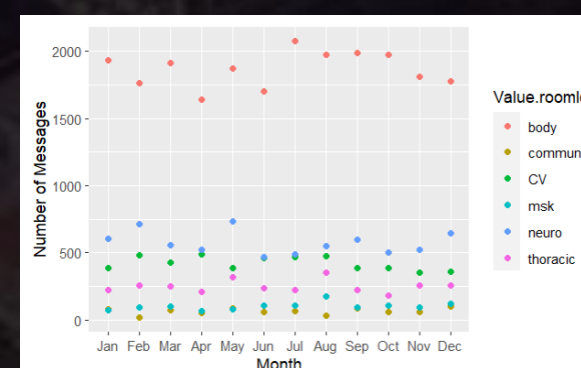
Message frequency was determined across three daily timeframes corresponding to radiology coverage shifts. Subgroup analysis of the ECP space used for after-hours communication (“CT Body” reading room) was also performed.

Structural topic modeling (STM)³, a machine learning technique, was employed to identify themes within the communication data and determine how these themes vary based on shift timings.

STRUCTURAL TOPIC MODELING: HOW DOES IT WORK?



RESULTS: MESSAGE FREQUENCY



39,448 messages over the one-year study period.

Most messages were in the “CT Body Reading Room” 22,446 messages.

Message frequency per hour across shifts:

7:30 am – 4:30 pm:

4.2 mgs/hr (SD 3.4)

4:30 pm – 9:00 pm:

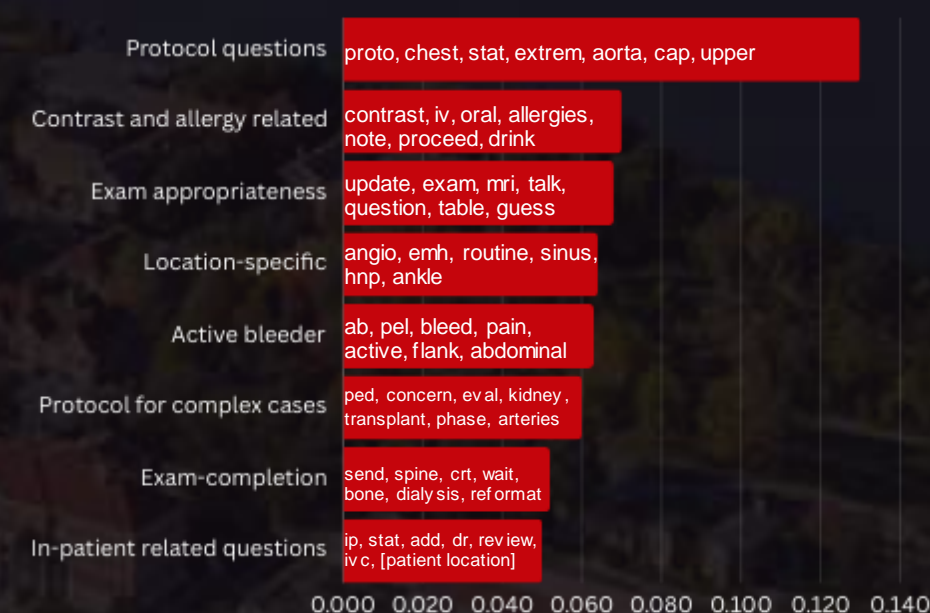
4.2 mgs/hr (SD 3.5)

9:00 pm – 7:30 am:

3.1 mgs/hr (SD 2.9)

RESULTS: WEBEX TOPICS

Prevalence of 8 most prevalent topics in WebEx messages



RESULTS: CT BODY TOPICS AND PREVALENCE BY TIME

Analysis of the “CT Body” reading room:

Communication Issues: Unclear orders from requesting physicians, primarily during peak hours (7:30am-9:00pm).

Protocol Clarifications: Varied based on patient acuity and most frequent during off-peak hours (4:30pm-7:30am).

Contrast-Related Questions: Focused on allergies and complex cases, throughout the day (7:30am-9:00pm).

Protocol-Related Questions (Complex Cases): Occurred primarily during business hours (7:30am-4:30pm).

Exam Completion Requests: Concentrated during evening and overnight hours (4:30pm-7:30am).

CONCLUSION:

Electronic communication platforms are a common mode of communication in contemporary academic radiology practice and a frequent source of workflow disruption, which varies across subspecialties and times of day.

Using an STM approach, we identified exam protocolling, contrast and allergy, exam appropriateness, and exam and patient complexity to be among the most common CT-modality-specific topics in our ECP communications.

Organizational communication protocols based on time of day and message type could reduce workflow disruption for radiologists and technologists. Optimizing ECP communication protocols by time of day and message type could also improve workflow efficiency, ultimately enhancing patient safety and productivity.

Structural topic modeling can be used to identify contextual factors in communication and highlight potential sources of non-value-added disruption that impact workflow efficiency and potentially compromise patient safety.

Future implementation of targeted interventions using these data is warranted.

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