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Automatic Analysis of Critical Incident Reports: Requirements and Use Cases

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Critical incident

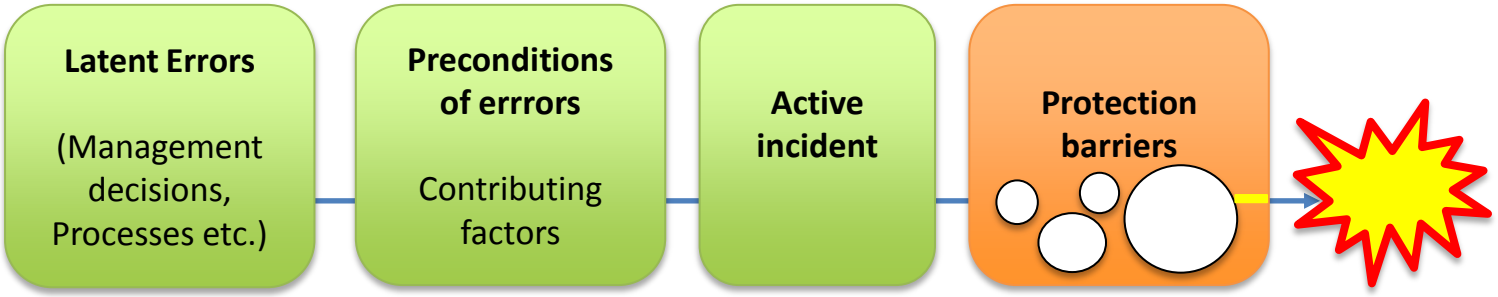
Agenda

- Incident reporting
- Material: Incident reports
- Corpus analysis
- Results
  - Linguistic and semantic characteristics
  - Use cases
- Conclusions

Critical incident reporting system (CIRS)

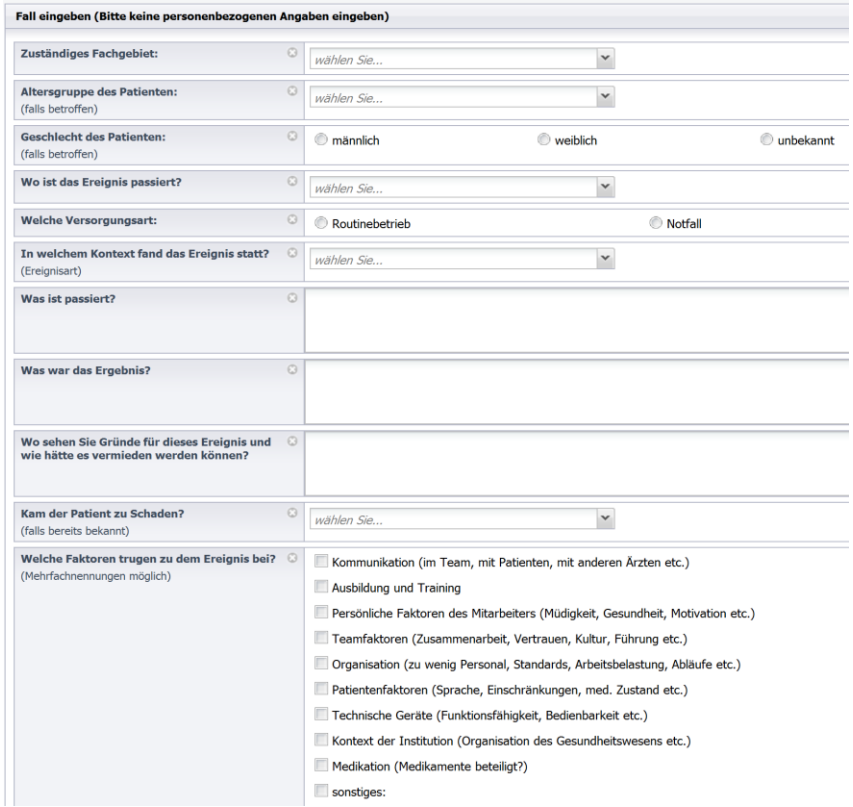
Basic idea:
Employees report errors or critical incidents

Improvements



Reporting form

Context →
Event →
Result →
Reasons →



http://cirsmedical.de/

Objective

- Incident reports bear relavant knowledge
- How to learn from it? How to analyse the textual information?
  - ➔ Identifying use cases for natural language processing
  - ➔ Study linguistic and semantic characteristics of these reports in comparison to clinical documents

Material and methods

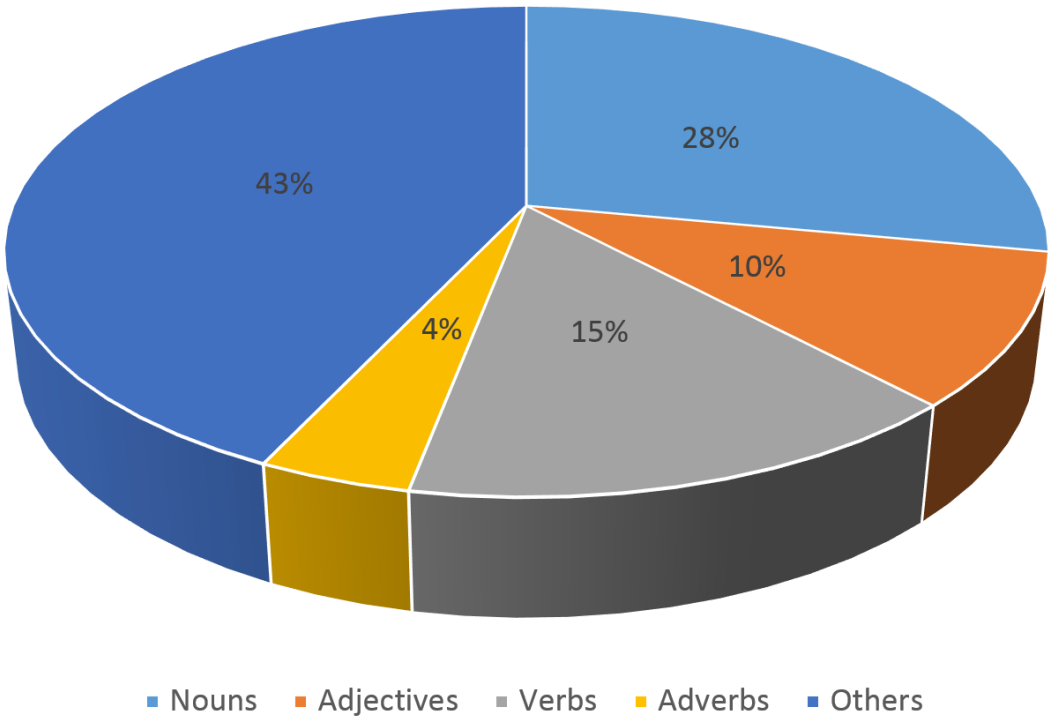
Material

- 581 randomly selected reports from Inselspital Bern
- 100 randomly selected reports from cirsmedical.de

Methods

- Manual data assessment with guiding questions (linguistic, semantic)
- Linguistic analysis with openNLP (parts of speech)
- Interview with quality manager and physician

Part of speeches



Linguistic characteristics

Category	Example
Sentence structure	Sentences or incomplete phrases / keywords
Word usage	*Personal pronouns (process descriptions), verbs, product names (drugs), names of technical devices, software, specific locations (Aufwachraum, OP), adjectives for characterizing the situation* Compound words, number expressions
Spelling	Misspellings; abbreviations, acronyms
Language	Host language and medical terms,

Semantic characteristics

- Rarely: diagnoses
- Clinical interventions
  - (e.g. *Intubationsnarkose (intubation anesthesia), nachbeatmet (ventilated), Ambulanz-OP (ambulant surgery)*
- Pharmaceutical agents
  - *Heparin*
- Involved persons
  - *Doctor, MPA, nurse*
- Technical or non-technical material including software systems
- Facts versus experiences

Semantic characteristics: Event categories

Category	Example
Technical events or events related to equipment	Oxygenator is burning
Administrative events	mistaken identity, ambiguous abbreviation as diagnosis, language barrier, mixing of laboratory probes
Hygiene-related events	Report on a case of Methicillin-resistant Staphylococcus aureus (MRSA) / hospital infection
Workflow-related events	application of wrong drug or dosis, allergy information was not transmitted to all involved persons
Events related to transport and positioning of patient	Patient is falling from operating table

Scenario: Search and retrieval of critical incident reports

- Standard search interface, semantics
- Faceted search

Event category

Hygiene event (1)

Technical event (1)

Administrative event (9)

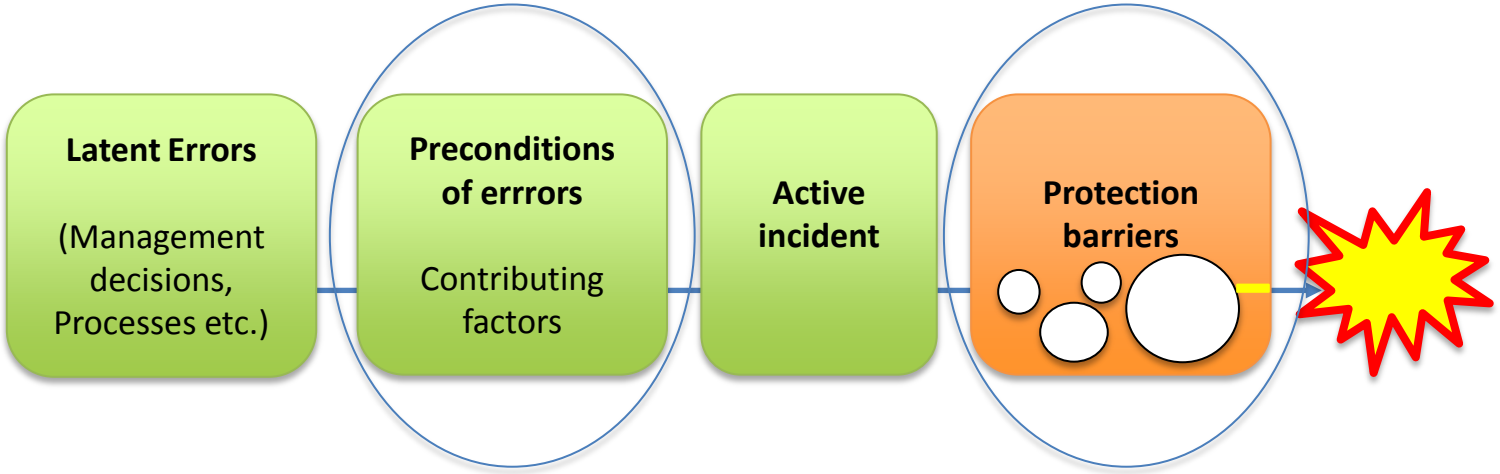
Workflow event

Event location

Zwei Studenten ziehen den apikalen Thoraxdrain. Sie informieren mich, dass sie bei Pat. den Drain herausgezogen haben, und dass ich den zweiten Drain nun verbinden könne. Ich komme ins Zimmer, Pat. liegt unter der Decke, der Verband ist offen, keine Longuette.

Scenario: Incident analytics

- Cause –effect relations
  - What led to an incident?
  - What helped in preventing serious problems?



Conclusions

- Support in retrieval and analysis is desired
- Linguistic and semantics differ from clinical documents
- Need for methods for
  - identifying persons and locations,
  - separating factual from experiential or hypothetical information,
  - categorizing incident reports semantically and of events according to severity,
  - detecting events and their relations,
  - analysing time and number expressions.

Herzlichen Dank für Ihre Aufmerksamkeit

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