

Clinical Text Mining Group



Health Care Analytics and Modeling

NLP tools in healthcare

Detecting Hospital acquired infections

**Automatic translation of
radiology reports into general Swedish**

NLP tools in healthcare

Detecting Hospital acquired infections

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Automatic translation of radiology reports into general Swedish

Mia, Martin, Sumithra

Hospital acquired infections

In Europe:

cirka 3 milj identified cases
50 000 deaths per year

5 -10 % of all inpatients

30% avoidable?

Detect - HAI



Sequence of events

**Start event
leading up to
an infection**

**in a temporal
cause-effect
relationship.**

Detect - HAI



Sequence of events

**Start event ?
leading up to
an infection**

**in a temporal
cause-effect
relationship.**

Detect – HAI

Hospital acquired infections



Postop infections

Katheter induced infections

Urinary tract infections

Pneumonia

Detect – HAI

Hospital acquired infections



Postop infections

Katheter induced infections

Urinary tract infections

Pneumonia

Immunosuppressed patients

Detect – HAI

Hospital acquired infections



Moving between specialized clinics.

Outpatient care at hospitals

Patients living at home with multiple caretakers,
General practitioner and
Specialized hospital care

Detect - HAI

**Health records
from patients with and without HAI.**

Stockholm EPR Corpus

(2009-2010)

and

Karolinska PPM

Mostly free text

Structured fields



Detect - HAI



Rulebased

Machine learning

Detect - HAI



Rulebased

- **Structured fields**
- **Free text**

Machine learning

Detect – HAI

Structured part of record

Antibiotics

Microbiology reports

Fever

ICD-10 Infections

Events/Katheter



TEMPORALITY

Urinary Tract Infection

Crude sorting, structured fields

ICD-10
for UT-Infection

Antibiotics
for UT-infection:
started or changed
> 2 d after admitted to
hospital

Positive Culture
from urine or blood
(bacteria from UT).
Sample taken
> 2 d after admitted
to hospital

If a record has 1 – 2 – 3 of the above, it is interesting.
Numbers?

We extract for readthrough and use for annotation

Urinary Tract Infection

Crude sorting, structured fields

ICD-10
for UT-Infection

Antibiotics
for UT-infection:
started or changed
> 2 d after admitted to
hospital

Positive Culture
from urine or blood
(bacteria from UT).
Sample taken
> 2 d after admitted
to hospital

Urinary catheter

Antibiotics
for UT-infection:
started or changed
> 2 d after catheter

Positive Culture
from urine or blood
(bacteria from UT).
Sample taken
> 2 d after catheter

Detect – HAI

Free text



**8 classes
&
Negation
Speculation
Temporality
Other person**

8 classes

Annotation

Lists (ICD-10, ATC, Op-codes, SNOMED CT etc)

Event

Device (IN/OUT)

VRI-Symptom

Action

Antimicrobial Treatment

Microbiological agent

 bakteria

 virus

 fungi

VRI-Diagnosis (infection)

Risk



Detect - HAI



Rulebased
Process text

Part of speech tag (Granska)

Malt parser

Match to words (8 classes)

Temporality tag

Remove negated instances

Detect - HAI



Rulebased

Apply heuristic rules

Identify events
with causality,
temporal pattern

Textmining



Automatic processes at
DSV, Stockholms universitet

Detect - HAI



Rulebased

Negation
Speculation
Temporality

Detect - HAI



Rulebased

Find infection

Determine if
hospital aquired



Automatic translation of radiology results into general Swedish -part of the democratization of health care

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Changes in health care

**Patient access to medical records
via Internet by e-identification.
2015?**

**Encourage patients to be active in health
process. Life-style disorders**

Ethical issues

Reading medical records

Patients have problems with

- abbreviations/acronyms
- medical terminology

Translate/Simplify

Start –

- **lexical exchange of words**
- **Fixed phrases**
- **uncertainty markers**

Relations by SNOMED

**Break up long sentences and
compound words**

Translate/Simplify

- **Basic characterization radiology texts**
- **Measure readability and understanding**
- **Lexical resources**
- **SCAN –
Swedish Clinical Abbreviation Normalizer**

QUESTIONS?



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