# An effective Clinical Decision Support System

### Diagnostics Problems in Hospitals

Diagnostic error rate of hospitals



Misdiagnoses involve cognitive errors by physicians



Physicians showing at least one symptom of burnout

### Clinical Decision Support System (CDSS)

#### Definition:

CDSS links patient observations with health knowledge to assist Patient clinicians in making informed health choices for better care.

CDSS empowers physicians to spend more time on finding the right diagnosis.



## 20% of current CDSSs influence clinical outcome

### Problems of current CDSS

### Incomplete Patient Data



Physician does not have access to patient's medical information from other physicians. Unstructured data from text sources cannot be processed.

## Solutions of an effective CDSS

### Mobile Patient Data Integration



CDSS has complete access to patient data repository, e.g. Apple Health. Unstructured data can be analyzed with information extraction techniques using medical ontologies, e.g. SNOMED CT.

Inference

Engine

Medical

Knowledge

Base

Physician

assistance

### Clinical and Scientific Data Silos



Physician does not have access to recent medical scientific publications. Researchers do not have access to clinical data.

#### Outdated medical knowledge

### Clinical and Scientific Data Exchange



CDSS integrates existing scientific databases, literature and clinical trials to update knowledge base.

CDSS channels anonymized clinical data to research. Data exchange happens via web-hooks and streaming APIs.

Workflow Interruptions

### Seamless Workflow Integration



Physician switches to CDSS, types in patient information, selects analysis and executes query.

Additional time overhead



CDSS and physician interact with each other over audio and voice control. CDSS has access to data via Health Level 7 (HL7) and FHIR data exchange protocols. Diagnostic results are automatically added to patient's EHR.

#### **Complex Tools**



HP

Physician needs to learn CDDS's complex queries and visualizations.

Additional complexity



CDSS recommends and assists in diagnostic process and visualization by using medical guidelines, physician CDSS interaction and patient data. CDDS focuses on pre-attentive visual attributes visualization.

Data Engineering in der Praxis - Ringvorlesung WS 17/18 Janos Brauer - <u>janos.brauer@student.hpi.de</u> Master Medical misdiagnosis can be attributed by 79% to cognitive errors of physicians. Premature closing of a diagnostic case, complexity of diseases and missing patient information constitute main sources of errors. Tools, such as a Clinical Decision Support System (CDSS) have been developed to combine patient information with medical rules, guidelines and models from the CDSSs knowledge base. It infers diagnostic actions and assists a physician in the diagnosis process to reduce misdiagnosis.

Studies suggest that current CDSS are ineffective, as only 20% of them have influenced clinical outcome. This poster looks at the main insufficiencies of current CDSS and proposes solutions for an effective CDSS. Inspirations were given by the talks of Dr. Weidlich, Mr. Heuckendorf and Dr. Albrecht.