The Open European Nephrology Science Center as Open Science Center - a platform for scientific data and image management

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Outline

1 Background

2 Material & Methods

3 Results

4 Discussion
Background

Secondary use of clinical data

Figure: Many resources - one interface
Data repositories in Medicine

- Tumor Registers - automatic messages from hospitals and medical centers to a tumor register
- Epidemiological Register - data collection as cross sectional analysis or cohort study (e.g. Study of Health in Pomerania - SHIP, National Cohort)
- Competence Center - disease related register for medical studies
- Tissue banks - collection of tissue and related patient data
- Research Data Repositories - clinical data for various use cases

Requirements

**Flexibility**  Add new resources with different data structures and data types

**Transparency**  Management of users as well as resources and data

**Data privacy**  Usage of anonymized data

**Data quality**  Review, score and management of data quality
Problem area

- Heterogeneity of data
  - Reports
  - Diagnosis
  - Laboratory data
  - Images
- Quite different opinions about data- and image quality
- Different use cases and variable user requirements
**System Architecture**

**Figure:** Service Oriented Architecture

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**System components**

- Database Engine: PostgreSQL
- Application server: Apache Geronimo
- Portal (Web-GUI): Liferay
- Webservices: Java
- Business process modeling: Signavio
Material & Methods

Open European Nephrology Science Center

Figure: System Architecture

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Processes in OpEN.SC

Data
- Data Input
- Data Retrieval
- Data Analysis
- Data Access
- Data Presentation

Images
- Image Input (scanning, linking)
- Image Retrieval
- Image Analysis
- Image Presentation

Integration of new partner

Figure: Contract based integration process
Daten Input

Figure: Prozessschritte beim Daten Input

Webservice with
- **local** Property File as part of the contract
- **active** Transfer of data from resources to repository

Flexibility: Data structure transformation

<table>
<thead>
<tr>
<th>Key: PatientID</th>
<th>Examination</th>
<th>Date</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Y426’</td>
<td>‘Blood Pressure’</td>
<td></td>
<td>‘140/95 mmHg’</td>
</tr>
<tr>
<td>‘Z537’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure: ER-Model ➾ Triple-Struktur
Results

Data domain model of OpEN.SC

Figure: Domains in OpEN.SC

Import of Data

Figure: System structure for data import
### Status domain: Nephrology

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>CVK</td>
<td>5.581</td>
<td>288.961</td>
<td>1.351.691</td>
<td>41.500.563</td>
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<tr>
<td>CCM</td>
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<td>232.566</td>
<td>1.277.379</td>
<td>34.286.984</td>
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<tr>
<td>CBF</td>
<td>1.118</td>
<td>27.647</td>
<td>38.369</td>
<td>4.352.947</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td><strong>549.174</strong></td>
<td><strong>2.667.439</strong></td>
<td><strong>80.140.494</strong></td>
</tr>
</tbody>
</table>

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### Data Creativity Tools

**Objective**  
Improve secondary use of clinical data by providing tools for creativity and support of association and pattern recognition

**Contribution**  
data platform
**DCT Overview**

![Diagram](image)

**Figure:** Data as starting point of Creativity

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**Berlin-Brandenburg Kidney Register**

**Objective**

Management of cases with renal diseases in region Berlin-Brandenburg

**Contribution**

- Platform for data management
  - New workflow of Data-Input
  - Specialised workflow for case management - problem of assignment of anonymised cases in database to real patients
  - Integration of barcode-reader

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Extension of data model

Figure: Interface for manual data input

Image processes

Figure: Virtual Microscopy
Integrated viewer

**Figure:** Presentation of a case

**Figure:** Detail

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Image analysis

**Figure:** Bildanalyseprozess
Results

Image analysis example

Figure: Measurement of tubuli lumina

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Principles of OpEN.SC

- **Openness**
  - New partner
  - New projects

- **Transparency**
  - Open documents about project and system for OpEN.SC members
  - Medical Advisory Board

- **Data security and data privacy protection**
  - Anonymizing clinical data
  - Dedicated user and resources management

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**Take home message**

- OpEN.SC is a repository for anonymised, research relevant clinical data.
- It based on SOA and processes controls all aspects of scientific data management
- By processes OpEN.SC fullfills the requirements of flexiblity, creativity, transparency and data privacy protection.
Thank you very much for your attention

Any questions?

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