Imagine 2029: Our data, our health, our care – 20th anniversary of EHTEL

EHTEL 2019 Symposium

13:00 – 14:30 [s3] Artificial Intelligence in Use – AI Literacy for All

Mapping the field. Insights and use case highlighting what AI means today and will mean in the future for the practice of healthcare as well as the (self-)management of health and wellness.

Session Chair: Siri Bjørvig, Norwegian Centre for E-Health Research, Tromsø

Machine Learning, Health Analytics and AI in Healthcare: Lessons from Norway
Alexandra Makhlysheva, Maryam Tayefi, Norwegian Centre for E-Health Research, Tromsø

Scaling up AI in Health Systems
Francisco Lupiañez-Villanueva, Open Evidence, Barcelona, Spain

Artificial Intelligence in Use - Operating Rooms
Rachelle Kaye, Assuta Medical Centres and Michael Attias, Razor Labs, Israel

AI Friendly Data Management in Clinical Research: Using TrialComplete in Cardiology
Johannes Stemmer, T-Systems Iberia, Barcelona / Telekom Healthcare Solutions, Germany

Q&A and Conclusions by the Session Chair

#EHTEL_Symposium #EHTEL_BCN @ehtel_eHealth
Machine Learning, Health Analytics and AI in Healthcare: Lessons from Norway

Alexandra Makhlysheva, senior advisor
Maryam Tayefi, researcher

EHTEL Symposium. December 3-4, 2019. Barcelona
What is health analytics?

• Process of deriving insights from health data to make informed healthcare decisions
Big pressure on healthcare

• Changes in demographics and disease picture:
  • Greater proportion of older people
  • Chronic diseases
  • Patients with multimorbidity
  • Increased need for long-term treatment and follow-up

• Lack of specialists
Big pressure on healthcare

- Have to reduce costs without reducing treatment quality and patients’ security
- Preserve patients’ privacy and confidentiality
Characteristics of health data

- In multiple places and different formats
- Can be structured or unstructured
- Developing continuously
- Complex
- Strict regulatory requirements for data reuse

**Structured data**
- Laboratory data
- Diagnoses
- Medication lists

**Unstructured data**
- Free text
- Images
- Video
- Genomics data
Technologies for health analytics

• Machine learning
• Natural language processing
• Deep learning

Artificial intelligence

Machine learning

Deep learning

NLP

Algorithms which can interpret, transform and generate human language

Programs with the ability to learn and reason like humans

Programs with the ability to learn without being explicitly programmed

Subset of ML in which multilayered neural networks learn from vast amounts of data
Artificial intelligence

- capability of a machine to imitate intelligent human behavior
- **General AI**: systems that can think, learn, reason and communicate on the same level as humans
- **Narrow AI**: solves very specific problems which require a certain level of “intelligence”. Applied in healthcare
Machine learning

• sub-area of AI
• collection of mathematical and computer science techniques for knowledge extraction from large data sets, and the use of these techniques for classification, prediction and estimation problems
Benefits of machine learning in healthcare

- Reduction of administrative costs
- Clinical decision support
- Cutting down on fraud and abuse
- Better care coordination
- Improved patient wellbeing/health
Challenges for machine learning in healthcare

• Data governance
• Algorithm interpretability
• Breaking down data silos and encouraging a data-centric view
• Standardizing/ streamlining electronic health records
• Overdiagnosis
Examples of machine learning in healthcare

- Diagnosis in medical imaging
- Treatment queries and suggestions
- Drug discovery/drug development
- Improved care for patients with multiple diagnoses
- Development of clinical pathways
Examples of machine learning in healthcare

- Population risk management
- Robotic surgery
- Personalized medicine/ precision medicine
- Automatic treatment/recommendation
- Performance improvement
Disruptive areas in healthcare

• Interpretation of medical images
  • Most developed, rapidly developing

• Prognostics
  • Not that mature

• Diagnostics
  • Complex area, needs time to be ready for use in practice
Lessons from Norway
Norwegian Health and Care Services

Nationally

- Ministry of Health and Care Services
- The Parliament
  - Ministry of Local Government and Modernization

Regionally/locally

- Regional health authorities
- 1,800 Contracted Specialists and institutions
  - Hospitals and Specialist health care
- 428 municipalities
  - 4,200 General Practitioners
  - Primary health care
Norwegian e-health

- Billions are invested in information- and communication technologies within health nationally
- Knowledge will ensure that money is wisely and effectively spent, benefitting societal needs
- Directorate of e-health was established on January 1st, 2016
- An instrument to realize political aims
One citizen – one health/medical record

<table>
<thead>
<tr>
<th>Health personnel must have simple and secure access to patient and user information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizens must have access to simple and secure digital services.</td>
</tr>
<tr>
<td>Data must be accessible for quality improvement, health surveillance, governance and research.</td>
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</tbody>
</table>
Challenges in secondary use of health data in Norway

- Data is distributed across institutions and sharing is difficult
- Lack of laws and infrastructure
Background for health analytics in Norway

- Health registries with high-quality population-wide data
- Early digitization of healthcare
- A uniform, single-payer healthcare system
- Personal ID numbers identifying citizens on all levels of care
National health registries

- Registries with high-quality population-wide data
- Personally identifiable information that is not based on consent

<table>
<thead>
<tr>
<th>Register</th>
<th>Source: <a href="https://www.fhi.no/en/more/access-to-data/about-the-national-health-registries2/">https://www.fhi.no/en/more/access-to-data/about-the-national-health-registries2/</a></th>
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<tbody>
<tr>
<td>1. Medical Birth Registry of Norway</td>
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<td>2. Registry of Pregnancy Termination</td>
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<td>3. Norwegian Cardiovascular Disease Registry</td>
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<td>4. Cause of Death Registry</td>
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<td>5. Norwegian Prescription Database (NorPD)</td>
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<td>6. Norwegian Immunisation Registry</td>
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<td>7. Norwegian Surveillance System for Communicable Diseases</td>
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<td>8. The Norwegian Surveillance System for Antibiotic Use and Healthcare-Associated Infections</td>
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<td>10. Norwegian Surveillance System for Virus Resistance</td>
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<tr>
<td>11. Norwegian Patient Register (NPR)</td>
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<tr>
<td>12. Norwegian Information System for the Nursing and Care Sector</td>
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<tr>
<td>13. Municipal Patient and User Registry*</td>
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<tr>
<td>14. Cancer Registry of Norway</td>
<td></td>
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<tr>
<td>15. Genetic screening of newborns**</td>
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<tr>
<td>16. ePrescription database* *</td>
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<tr>
<td>17. Registry of the Norwegian Armed Forces Medical Services</td>
<td></td>
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<tr>
<td>18. Medical Archives Registry</td>
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</tbody>
</table>

- Cancer Registry of Norway
- Genetic screening of newborns**
- ePrescription database* *
- Registry of the Norwegian Armed Forces Medical Services
Privacy and security concerns and AI: GDPR

• Principle of legality, fairness and transparency
• Purpose limitation principle
• Principle of data minimization
Norwegian machine learning research groups in healthcare
• Norwegian University of Science and Technology (NTNU)
• University of Agder
• University of Oslo
• University of Tromsø
• Oslo University Hospital
• Simula Research laboratory and Simula Met
• BigMed
• BigInsight
• SINTEF
• Norwegian Centre for E-health Research
Norwegian University of Science and Technology (NTNU)

• Automatic real-time 3D segmentation of all heart chambers
• Automatic detection of blood vessels in real-time from ultrasound images
• Improving self-management of non-specific low back pain
• Clinical decision support
University of Agder, Centre for Artificial Intelligence Research (CAIR)

- Detecting allergy through EHR notes
- Breast cancer
- Human-interpretable rules for high-accuracy text categorization with medical applications
UiT – The Arctic University of Norway

• Predicting and preventing postoperative complications for better quality of care by leveraging data from EHR
• Early detection of anastomosis leakage before the actual complication occurs
University of Oslo

• AI-aided diagnostics of colorectal polyps during colonoscopy
• Part of the BIGMED project at Oslo University Hospital for integrating patient health record information with genomics data
Simula Research Laboratory and SimulaMet

- Personalized cancer screening, with a particular focus on cervical cancer, by utilizing existing registries and health data intelligently
BigMed

- Metastatic colorectal cancer
- Sudden cardiac death
- Rare diseases
Oslo University Hospital

• Diagnosis and prognostication to improve treatment of cancer: lung, colorectal and prostate cancer
• Clinical decision support
BigInsight

• Improving treatment predictions for patients with cancers
• Prediction of synergy between drugs and effect of the drug combination with data from cancer cell lines
• Prediction of cancer drugs sensitivity with large-scale in vitro drug screening
SINTEF

- Research and development in ultrasound and image processing for cancer, cardiovascular disease, and muscle/skeletal disorders (together with NTNU and St Olav’s Hospital)
Norwegian Centre for E-health Research

- Exploring electronic phenotyping for clinical practice in Norway: gaining knowledge on EHR phenotyping and identifying its clinical relevance in Norwegian settings
- NorKlinText: gaining knowledge on NLP for EHR data
- PCRN infrastructure: extracting patient health data from EHR for quality-assured clinical studies in Norwegian general practice
Norwegian Centre for E-health Research

- Health analytics report has been read by Norwegian health authorities and is considered in National health and hospital plan 2020-2023
National health and hospital plan 2020-2023

- Government wants to:
  - use artificial intelligence in healthcare and increase health data sharing to improve healthcare
  - facilitate personalized medicine

Source: https://www.regjeringen.no/no/dokumenter/nasjonal-helse-og-sykehusplan-2020-2023/id2679013/sec1#id0007
Thank you for attention!

Questions?
Artificial Intelligence in Use – AI Literacy for All

- statistics
- Artificial intelligence
- Machine Learning
Evolving landscape of AI
How AI innovation can transform health systems and policy-making

Innovation Width (continuum)

1 domain only

several domains

Cross-domains

Innovation Depth (continuum)

Disruptive Reframing

Incremental reframing

No reframing

EXPANSION
(i.e. data analytics for decision making)

CONTEXTUALISATION
(i.e. smart and context aware bundle of policies/services)

ENABLEMENT
(i.e. AI robots replacing employees in routine procedures)

TRANSFORMATION
(i.e. including the creation of new structures such as platform for data sharing and collaboration)

ADDITION
(i.e. new elements to internal working without changing practices and structures)

COPYCAT MIRRORING
(i.e. all of health system digitization without innovations)

Open Evidence, 2019
Solving real problems with Real World Data

Source Layer | Storage Layer | Data Layer | Cognitive Layer
---|---|---|---
Primary care | Structured Data | Central Data Repository | Artificial Intelligence
Secondary care | ETL | Document-oriented storage | Business Intelligence
Social care | Unstructured Data | Text-oriented storage |
Pharmacy | Anonymizer module | Distributed storage |
Medical laboratories | Lookup table | engine |

Unstructured Data | ETL | Distributed Processing |
It is not just about AI

Combining a systemic intervention based on advanced data analytics and new scripts and techniques for front-end professionals based on behavioural principles and institutional settings.

System (Data analytics)
- Profiling
- Prediction
- Matching
- Other...

Big data plus behavioural

Scripts
- Excellence
- Situations
- Value
- Other...

Knowledge codification

Organisation (Behavioural approach)

Algorithms

Data Analytics
- Predictive algorithms
- Decision trees
- Improved data infrastructure

Machine Learning
Natural Language Process

Professionals

New scripts for front end professionals
- Decision-making
- Transformation

Open Evidence, 2019
### Organisational and institutional settings matter

#### Environmental level
- Environmental pressure
- Participation in network
- Regulatory aspects
- Compatible agencies adopting the same innovation
- Competition with other organisations

#### Organisational level
- Slack resources
- Leadership style
- Degree of risk aversion/room for learning
- Incentives/rewards
- Organisational structures

#### Innovation level
- Ease in use of innovation
- Relative advantage
- Compatibility
- Trialability

#### Individual level
- Employee autonomy
- Knowledge, skills and creativity
- Demographic aspects
- Commitment and satisfaction with jobs
- Shared perspective and norms
- Innovation acceptance

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**Institutional settings**

- **Digital health innovation type** (combination of antecedents & technology)
- **Intervening factors** (jobs and skill measures, privacy & security, ethical Frames)
- **Effects** (Sought impacts, side effects, negative effects)

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**Governance mechanisms**
Predicting hospital outpatient attendance

**Modelling**

- Metric to optimize: Sensitivity (% of correctly identified absent patients from the total of absences)
- Chosen model: Decision Trees
- ML problem to solve: Unbalanced classification
- Stratification strategy: 75% train / 25% test
- Parameter optimization: 5-fold cross validation (complexity factor and max depth of the tree)
- Predictor variables:
  - Socio-demographic (5): Age, sex, nation, …
  - Medical appointment (8): Date, time, doctor, treatment, type, …
  - Historical (4): Number of past appointments, % of absence, …

**Dermatology**

- Accuracy: 73.49%
- Sensitivity: 79.90%
- Prospective validation: 123/157 absences correctly predicted (78.34%)

**Pneumology**

- Accuracy: 64.61%
- Sensitivity: 71.38%
- Prospective validation: 81/116 absences correctly predicted (69.83%)
Piloting hospital outpatient attendance

Set up:

• Time interval: 8 weeks
• Population: 2537 medical appointments (1702 DER, 835 PNE)
• Type of pilot study: Intervention VS Control

<table>
<thead>
<tr>
<th>Metric</th>
<th>Dermatology</th>
<th>Pneumology</th>
<th>Total</th>
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<tbody>
<tr>
<td>Located patients (intervention)</td>
<td>69%</td>
<td>68%</td>
<td>69%</td>
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<tr>
<td>Absence intervention</td>
<td>13.42%</td>
<td>16.49%</td>
<td>14.38%</td>
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<tr>
<td>Absence intervention (located)</td>
<td>6.69%</td>
<td>11.90%</td>
<td>8.29%</td>
</tr>
<tr>
<td>Absence intervention (not located)</td>
<td>27.82%</td>
<td>25.81%</td>
<td>27.18%</td>
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<tr>
<td>Absence control</td>
<td>26.38%</td>
<td>23.41%</td>
<td>25.43%</td>
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<tr>
<td>Absence</td>
<td>17.27%</td>
<td>15.89%</td>
<td>16.75%</td>
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<tr>
<td>Absence (Historical)</td>
<td>20.81%</td>
<td>18.12%</td>
<td>19.87%</td>
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From reports to actionable knowledge

Manual review of Anatomical Pathology (AP) reports and recording of the findings.

- TNM
- FIGO
- GLEASON
- ESTROGEN
- PROGESTERON
- HER – protooncogén
- CK19
- ECADHERINA
- FENLUM
- NOTTINGHAN
- KI67
- P53

Dataset with 14,188 manually annotated reports.

75% of the samples are used to adjust the models and the extraction rules.

25% of the samples are stored in a drawer.

The parameters and rules of the extraction model are adjusted with the training samples.

The trained model and the results of the training set are obtained.

The model is applied on the test set to obtain the final extraction metrics.
Próstata, RTU: - Adenocarcinoma acinar prostático incidental, con grado de Gleason: 7, patron combinado: 3+4, que afecta 5% de la muestra. (pT1a) - Hiperplasia nodular muscular y glandular benigna (33,4 g).


A) MUESTRA NO REMITIDA.B) "VEJIGA" (BMN): FRAGMENTOS DE PARED VESICAL EN LOS LÍMITES DE LA NORMALIDAD. AUSENCIA DE MALIGNIDAD EN LOS CORTES EXAMINADOS.C) "FRAGMENTOS DE RESECCIÓN TRANSURETRAL DE TUMOR VESICAL" INMUNOHISTOCQUIMICA PARA PSA Y NEGATIVIDAD PARA GATA-3 Y UROPLAKINA, GLEASON 9 (4+5).

A/ Próstata, lób dret, biòpsies per punció:- ADENOCARCINOMA PROSTÀTIC ACINAR, GRUP DE GRAU 1/5 (ISUP 2014, OMS 2016) (GLEASON 3+3), AFECTANT MENYS DE 5% DEL TEIXIT (EN DOS DE SIS CILINDRES, SENSE INVASIÓ PERINEURAL).B/ Próstata, lòbul esquerre, biòpsies per punció:- ADENOCARCINOMA PROSTÀTIC ACINAR, GRUP DE GRAU 1/5 (ISUP 2014, OMS 2016) (GLEASON 3+3), AFECTANT MENYS DE 5% DEL TEIXIT (EN DOS DE SIS CILINDRES, SENSE INVASIÓ PERINEURAL).
Using interoperability and standards

1) Training
   - Exploration of the training reports and model fitting

2) Information Extraction
   - Recognition Patterns
   - Extraction Templates
   - Disambiguation Rules
   - Test Reports
   - Extraction Module
   - Extracted Texts

3) Use of SNOMED-CT dictionaries
   - Codification Module
   - SNOMED-CT PDO* Dictionaries

* PDO: Plan Director de Oncología (Director of Oncology Plan)
## Tested and transparent results

\[
\text{Precision} = \frac{tp}{tp + fp} \\
\text{Recall} = \frac{tp}{tp + fn} \\
F_1 = \frac{2}{\frac{1}{\text{recall}} + \frac{1}{\text{precision}}} = 2 \cdot \frac{\text{precision} \cdot \text{recall}}{\text{precision} + \text{recall}}.
\]

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Dataset</th>
<th>No. of Reports</th>
<th>No. of Abbreviations</th>
<th>Recall</th>
<th>Precision</th>
<th>F1-Score</th>
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<tr>
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<td>Train</td>
<td>10.647</td>
<td>4.948</td>
<td>95.29</td>
<td>99.01</td>
<td>97.10</td>
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<tr>
<td>TNM</td>
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<td>Test</td>
<td>3.550</td>
<td>52</td>
<td>94.34</td>
<td>98.04</td>
<td>96.15</td>
</tr>
</tbody>
</table>
From AI and RWD to Value based care

New information extraction templates (Biomarkers, genomic indicators, molecular concentrations, etc.) and data linkage
It is not just about AI

Combining a systemic intervention based on advanced data analytics and new scripts and techniques for front-end professionals based on behavioural principles and institutional settings.

System (Data analytics)
- Profiling
- Prediction
- Matching
- Other...

Algorithms

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Scripts
- Excellence
- Situations
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Knowledge codification

Organisation (Behavioural approach)

Data Analytics
- Predictive algorithms
- Decision trees
- Improved data infrastructure

Behavioural
- New scripts for front end professionals
- Decision-making
- Transformation
Thank you!

Francisco Lupiáñez-Villanueva - flupianez@open-evidence.com - @flupianez

Open Evidence
Universitat Oberta de Catalunya
Assuta Medical Centers

Raising Health Standard
General Background

• The State of Israel has developed one of the world’s leading healthcare systems, delivering cutting-edge medical care to its citizens

• Assuta network is Israel’s largest and leading chain of private hospitals and medical centers owned by Maccabi Healthcare Services Israel’s 2nd largest H.M.O.

Working in Assuta:

• Around 4,000 Employees

• **Around 2,000 Specialist Doctors**
Operating Theater - Types of Surgeries

**Major procedures**
Cardio-Thoracic (incl. TAVI); Neurosurgery / Spine; Robotic Surgery; Complex Abdominal Surgery; Bariatric Surgery; Joint Replacement; Urology, Gynecology; Head & Neck surgeries - new approach...

**Medium procedures**
Mastectomies; Laparoscopies; Arthroscopies; Plastic surgery, E.N.T; Ophthalmology...

**Minor procedures**
Biopsies; Hernia; Excisions...
Leading in Information Technologies

A comprehensive and integrative approach

**EMR** - Electronic Medical Record
**LIS** - Laboratory Information System
**RIS** - Radiology Information System & PACS
**ERP** - Administrative missions
**CRM** - Customer Relationship Management
Assuta’s flagship hospital in Tel Aviv

a standard of medical excellence
Assuta Tel Aviv Hospital Operating Theatres and Intensive Care Unit

• More than 42,000 surgical procedures annually
• 19 operating rooms, 230 hospital beds for surgical care
• 14 ICU beds in a large spacious unit, with physical separation between them
• Isolation rooms inside the unit
• Advanced monitoring system
The challenge — Optimizing the work flow in the Operating theatre complex

- Scheduling — uneven utilization
- From the doctor to hospital staff to the schedule — human error
- Every hour that an operating room stands idle
  - Financial loss
  - Unnecessary queues
  - Wasted time for patients and families
  - Wasted time for surgeons and OR staff
The Solution - AI to the Rescue

Razor-Labs provides AI products and innovation to solve complex business and operational challenges.

Razor Labs is a trusted partner of organizations in their journey to the future by helping them maximizing ROI from AI.

2016 | Year Founded | 70+ | Employees | 55+ | Projects Completed

2016
70+
55+
The Problem

over 150 surgeries/day

10 days simultaneous scheduling

Restrictions & Limitations

Constant changes
The Solution - AI to the Rescue
The Solution

- Online Data
- Offline Data
- Policy
- View
- Engine
- Reports
The Solution

- Input data
  - Parser
  - Data Pre-processing

- Data analysis
  - Statistics Module
  - Task Optimizer Module
  - Constraints Module

- Outputs
  - Schedule Data Module
  - Management Dashboard Data Module
  - Recommendations Data Module
The Solution - Data

- 10 years of historical data from legacy system
  - Surgeries
  - Patients
  - Doctors
  - Pricing
  - Resources
  - Planned vs. actual

- List of restrictions and constraints
  - Equipment
  - Procedures
  - Doctors
  - Staff skills
  - Rooms
The Vision - Fully Automated AI Optimization
THANK YOU
IMAGING IN CLINICAL TRIALS

at Deutsches Zentrum für Herz-Kreislaufforschung e.V.

Barcelona, November 2019
WHO IS DZHK

Deutsches Zentrum für Herz-Kreislauf-Forschung eV

✓ Established in 2012 by German Federal Ministry of Education and Research
✓ Governmentally funded Organization, 40 m€ per Year
✓ 32 Members, mostly German University Hospitals, among these (Charité, Heidelberg, LMU Munich, UKE Hamburg)
✓ Fosters cooperation in basic and clinical research
✓ Translation cardiovascular research into better patient care
✓ Currently 16 Investigator Initiated Clinical Trials (IICT)
✓ Over 100 Study Sites involved
TYPICAL WORKFLOW: SEPARATE DOCUMENT HANDLING

- Recruitment, Informed Consent
- Enrollment in CDMS
- Fill eCRF
- Monitor
- Export Data

local Clinic-PACS

central Study-PACS

pseudonymize

search

enter results
OBJECTIVES FOR IMPLEMENTATION OF BDMS („BILDDATENMANAGEMENT“ - IMAGE PROCESSING CDMS)

- Integration of documents into managed process of data provision for re-use
- Integration without media disruption
- Appropriate role/rights concept
- Fully synchronized integration into DZHK ecosystem
- Documented/reproduceable document handling workflow
- High level of Data Privacy, according to TMF e.V. Data Privacy Concept
  ✓ Integrated concept for consent management according to GDPR
  ✓ Pseudonymization – separated from clinical data
  ✓ Individual pseudonyms per system
  ✓ Appropriate procedures for subject withdrawal
  ✓ Integrated data sharing re-pseudonymization procedures
DZHK WORKFLOW: INTEGRATED DOCUMENT HANDLING

Volunteers Management

CDMS
- Enrollment in CDMS
- Fill eCRF
- Monitor

BDMS
- Enrollment in BDMS
- Fill eCRF
- Monitor

Export Data

Sync

Trustee

Search

local Clinic-PACS

Volunteers Management

add Volunteer

Integrated PACS

Transfer Point

Enrollment in BDMS

Fill eCRF

Monitor

Enrollment in CDMS

Fill eCRF

Monitor

Export Data

HEALTHCARE SOLUTIONS
IMPRESSION OF ESTABLISHED SYSTEM
IMPLEMENTATION OF INTEGRATED DOCUMENT HANDLING: LESSONS LEARNED

• Performance: Data Privacy cost Time
  ✓ Periodic Background Synchronization
  ✓ Precautionary token generation

• Synchronization: Standardization helps
  ✓ Synch with non-imaging CDMS based on CDISC ODM
  ✓ Still, SOP’s needed to adjust divergent operative principles

• Automatization, responsibility, sequencing of procedures:
  ✓ Subject Merge and Withdrawal driven by Trustee: sequenced procedures, such as block Interfaces, assign ToDo’s, coordinate Responses
  ✓ Export Data driven by Transfer Point: sequenced procedures, such as re-use request, identification of appropriate data, coordinated release decision
NEXT STEPS: IMAGE PROCESSING WITH AI

- Enrollment in CDMS
- Fill eCRF
- Monitor

- Enrollment in BDMS
- Fill eCRF
- Monitor

- Volunteers Management

- Export Data

- Image Processing

- Trustee search

- local Clinic-PACS

- Integrated PACS

- Transfer Point

add Volunteer

HEALTHCARE SOLUTIONS
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