AI in healthcare in the information driven era

- translating data into value

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Region Halland

Region Halland – Southern Sweden

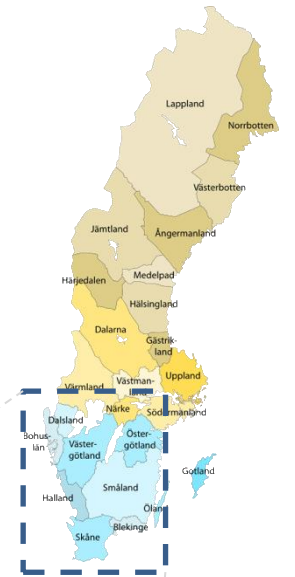330,000 population, 6 municipalities

Infrastructure: 3 acute care hospitals, 40 inpatient wards, 2 emergency departments, 30 outpatient specialty clinics, 50 primary care clinics, prehospital ambulance system

Clinical activity: Inpatient admissions (46,000), Emergency department visits (88,000), Outpatient specialty clinic visits (600,000), Primary care contacts (1,700,000), EMS runs (40,000)
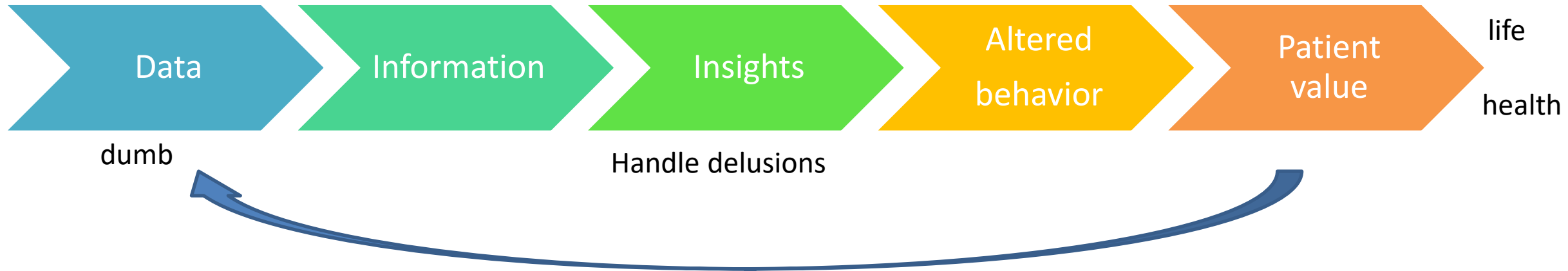
Annual budget: approx. 8 bn SEK

Healthcare System Challenges:

- Increasing demand for acute unscheduled care

- Silo structure driving costs, holding back quality improvement

- Sub-optimized workflow within and between hospitals

- Limited capacity for system level data analysis

Informationsdriven Care

Work along the value chain of knowledge

Data → Information → Insights → Altered behavior → Patient value → life / health
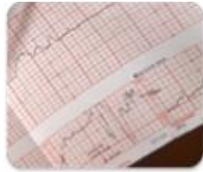
dumb

Handle delusions

Imprecision medicine --> precision medicine

Imprecision --> precision healthcare

SHAARP/PEC Enables Patient Focused, Data Driven Care

Production   Clinical   Patients   Providers   Capacity   Cost

SHAARP / PEC

Information driven care

Data Driven Management for Healthcare Systems

Opportunity Identification
- Variability analysis, Benchmarking
- Systematic vs. issue based

Prioritize Initiatives
- ROI Analysis
- Value Matrices

Personalized Precision Medicine for Patients

Evidence Based Guidelines
- Monitor implementation at the whole population level
- Optimize patient level compliance

Machine Learning-based AI Predictive Modeling
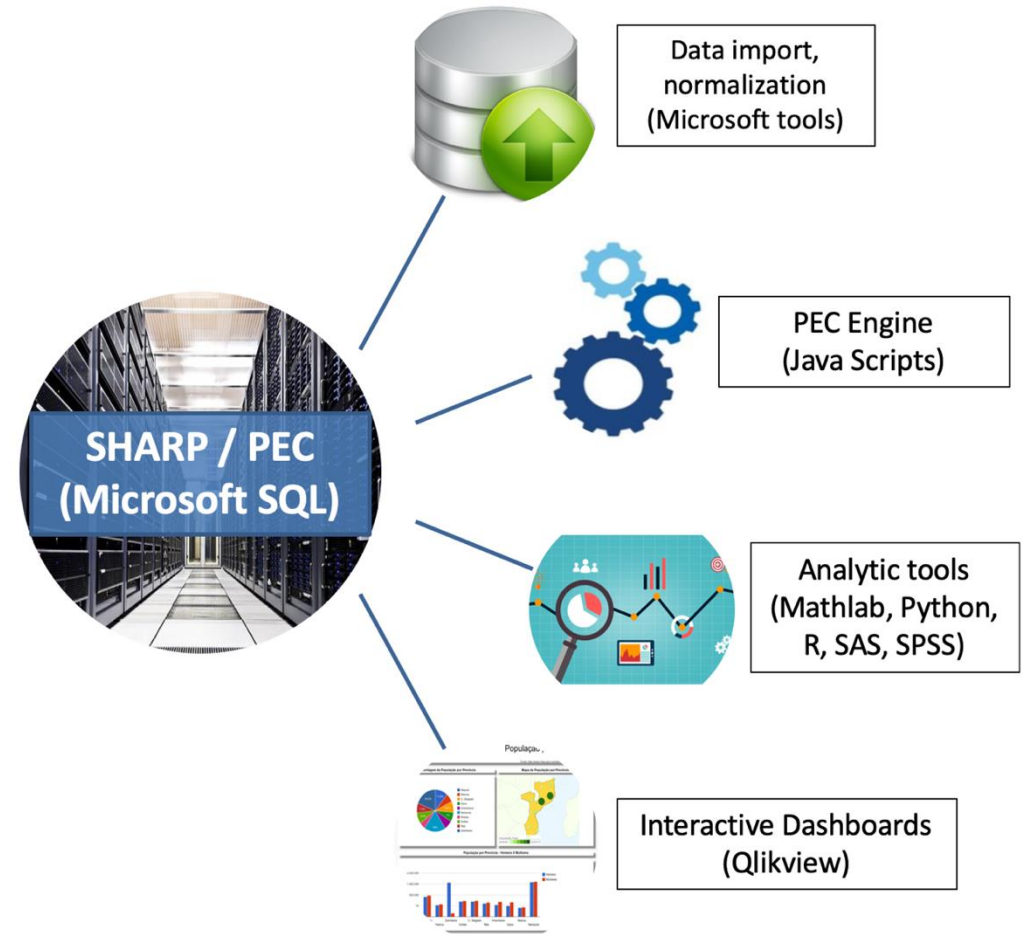- Predict healthcare events of interest
- Prevention, care optimization

PARTNERS HEALTHCARE

BRIGHAM HEALTH
BWH BRIGHAM AND WOMEN'S HOSPITAL

HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

EMI EMERGENCY MEDICINE INTERNATIONAL

Region Halland

Need to link clinical, resource and cost data across the entire healthcare system

Data warehouse**
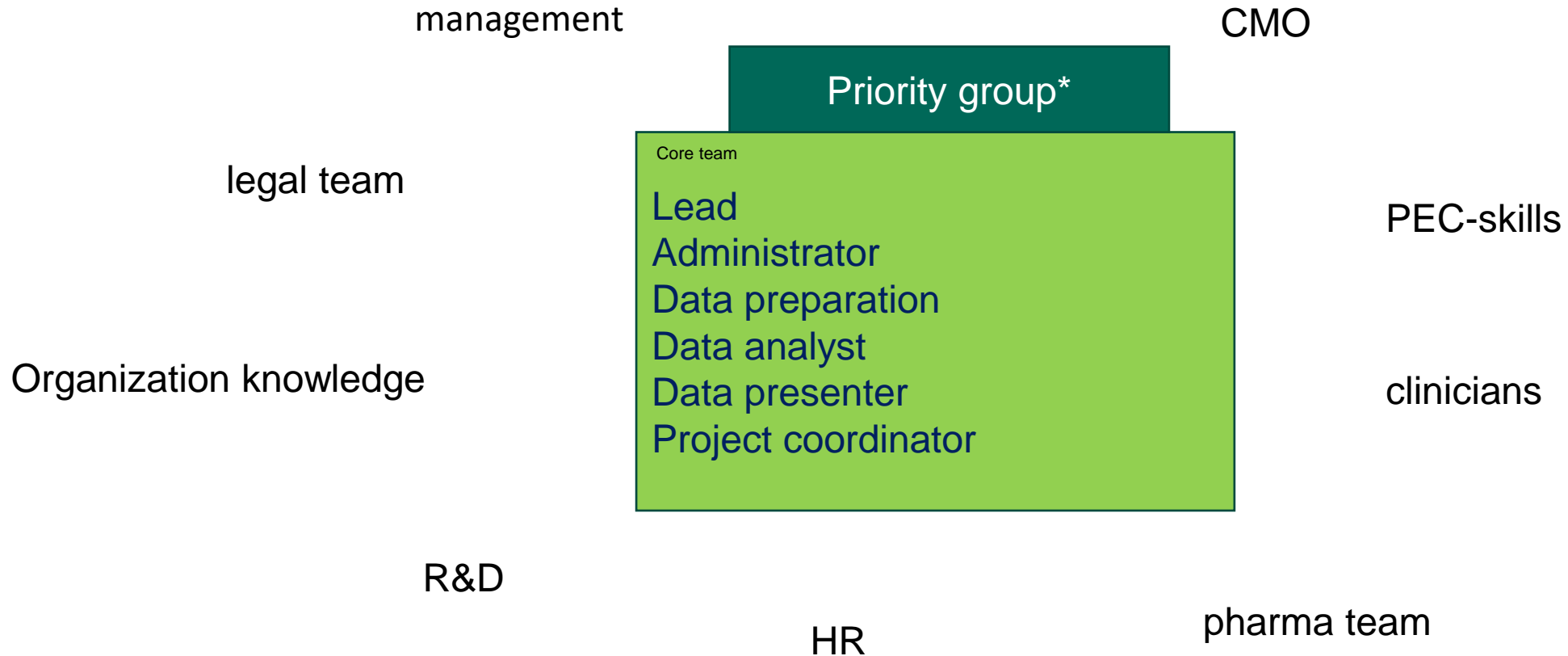
- Entire care chain

- Enable academic research

- Understand actual costs (not budget, prices, average costs…) through Patient Encounter Costing***

- Prepare for PROM/PREM

**Int J Epidemiol
*** Schluzmann J et al. Multiple journals

Data import, normalization (Microsoft tools)

PEC Engine (Java Scripts)

SHARP / PEC (Microsoft SQL)

Analytic tools (Mathlab, Python, R, SAS, SPSS)

Interactive Dashboards (Qlikview)

Centre for Information driven Care

management   CMO

Priority group*

legal team   PEC-skills

Core team

Lead
Administrator
Data preparation
Data analyst
Data presenter
Project coordinator

Organization knowledge   clinicians

R&D

HR   pharma team

Healthcare director, team lead, other key position

Training machine learning models to predict 30-day mortality in patients discharged from the emergency department: a retrospective, population-based registry study

Mathias Carl Blom,[1] Awais Ashfaq,[2,3] Anita Sant'Anna,[2] Philip D Anderson,[4,5] Markus Lingman[3,6]

Pitfalls of medication adherence approximation through EHR and pharmacy records: Definitions, data and computation

Alexander Galozy [a] ✉ ⊕, Slawomir Nowaczyk [a], Anita Sant'Anna [a], Mattias Ohlsson [b], Markus Lingman [c,d]

Receiving care according to national failure guidelines is associated with l total costs: an observational study in Halland, Sweden

Zayed M. Yasin ⊕ [1]*, Philip D. Anderson[2], Markus Lingman[3], Jap Awais Ashfaq ⊕ [3,4], Jonathan E. Slutzman[5], and Björn Agvall[3]

1Department of Emergency Medicine, Medtigo Medical Group, North Adams, MA, USA; [2]Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA; [3]Halland Regional Hospital, Region Halland, Halmstad, Sweden; [4]Center for Applied Intelligent Systems Research, Halmstad University, Halmstad, Sweden; and [5]Department of Emergency Medicine, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

Readmission prediction using deep learning on electronic health records

Awais Ashfaq[a,b,*], Anita Sant'Anna[a], Markus Lingman[b,c], Sławomir Nowaczyk[a]

[a] Center for Applied Intelligent Systems Research, Halmstad University, Sweden
[b] Halland Hospital, Region Halland, Sweden
[c] Institute of Medicine, Dept. of Molecular and Clinical Medicine/Cardiology, Sahlgrenska Academy, University of Gothenburg, Sweden

Currently in focus

- **Privacy preserving techniques**
  - Federeated learing/edge learning
  - Differntial privacy

- **Explainable AI**

- **The Route to application**

- **Multiomics**

- **Health economics (Patient Encounter Costing)**

- **New regulatory frameworks (EU AI law, MDR)**
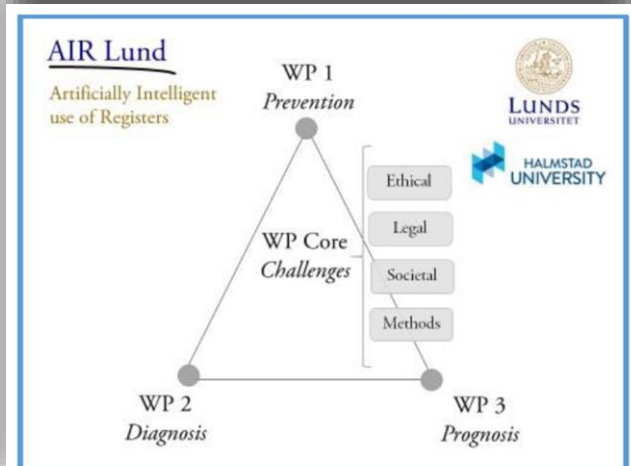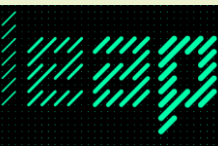
Collaboration is key!!!

Precision medicine **as part of**

Predictive precision healthcare

in the Informationdriven era

"lower NNT…higher PTP…"

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English - Leap for Life