New data, new pathways to the patient

Federal Ministry of Health

ccc. Center for Connected Health Care UG

Medizinische Hochschule Brandenburg (MHB)

Ruppiner Kliniken GmbH

K.J.G. Schmailzl 29.03.2017

GESUNDHEITSCAMPUS BRANDENBURG

Neuruppin

Image © 2010 GeoContent

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Digital & analogue companions

for *ageing handicapped chronically ill*

people

(digilog)

TOPIC I
Health care in Brandenburg today and tomorrow

A. Health care in rural regions against the background of demographic and structural changes

B. 'The Sheltered Way' in a model region

TOPIC II
Networked care

C. IT architecture for mHealth

D. Wearables and implants

TOPIC III
Mobile diagnostics

E. Point-of-care as Lab-on-a-chip: patient-side chemistry

F. Point-of-care-ultrasound: patient-side imaging at hot spots of out-patient care

...*what are they for?*

...digital extension of the individual living environment

...what about

Themenfeld I

Gesundheitsversorgung im Land Brandenburg heute und morgen

Teilprojekt A: Gesundheitsversorgung im ländlichen Raum vor dem Hintergrund des demografischen und Strukturwandels

Teilprojekt B: "Der geschützte Lebensweg "in einer Modellregion

Milestones:
- Calculating demographic changes and the development of existing structures of healthcare w/o inter the 10 yrs to come
- Gathering perceived deficits and wishes, with a view to widespread diseases, from all players involve
- Predicting future needs of out-patient, preventive and rehabilitative medicine and care,

various scenarios will be worked up, and their respective advantages, disadvantages, chances and r named

the role of   *the health architect*

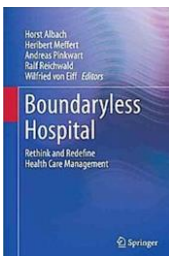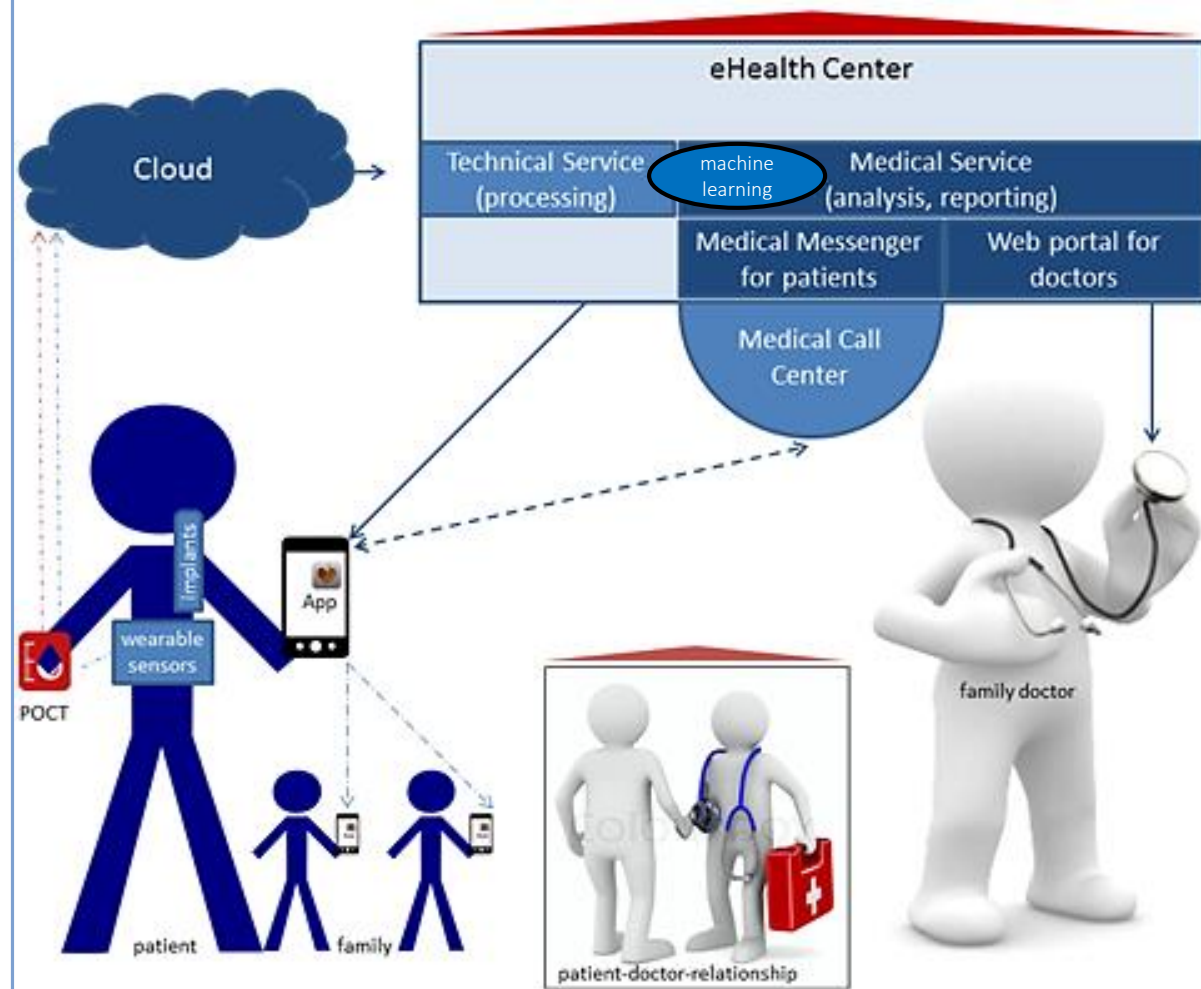Health Architect;

...consultant

...coordinator

...supervisor

...anchorman...

...of an healthcare project

ccc trains regional players in the planning, design, controlling and reconstruction of *healthcare*.

eHealth Center

Technical Service (processing) — machine learning — Medical Service (analysis, reporting)

Medical Messenger for patients | Web portal for doctors

Medical Call Center

Cloud

implants
wearable sensors
App
POCT

patient | family

patient-doctor-relationship

family doctor

Schmailzl KJG, Sendler HTH. Networked Care: IT-assisted tools (wearable sensors) for patients at risk.
In: Boundaryless Hospital - Rethink and Redefine Health Care Management. Springer-Verlag Berlin Heidelberg 2016: 111.

Themenfeld II

Vernetzte Versorgung

Teilprojekt C: IT-Architektur für *mHealth*
Teilprojekt D: *Wearables* und Implantate

Integration von Daten aus Medizinprodukten und Consumer Health-Produkten auf der IoT-Plattform.
In: Caumanns J, Rode O, Düchting B, Zielke B, Keck A, Wolff J, Schmailzl KJG, Wöllenstein M, Werner L: Plug&Play-Integration und Analyse von Lifestyle- und Medizin-Daten über eine IoT-Plattform.
Erfahrungen mit der Umsetzung eines Demonstrators zur Überwachung von Herzpatienten an den Ruppiner Kliniken. conhIT 2016.

In-Ear PPG

for a cuff-less continous blood pressure measurement
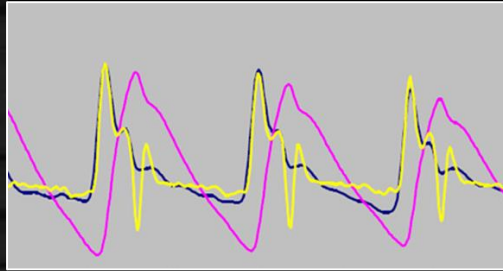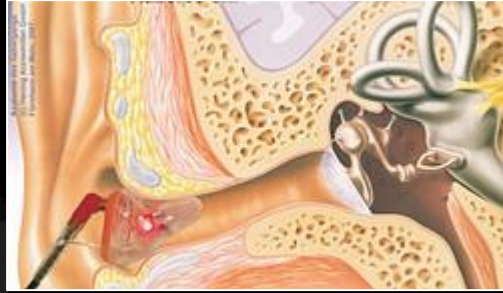
digital companions...

of a 'Sheltered Way'

for the elderly
for the handicapped
for the chronically ill

Plug & Play Integration and Analysis of Fitness and Medical Data using IoT Platform

Learnings from the Implementation of an IoT Demonstrator for Predictive Monitoring of Heart Patients at Ruppiner Kliniken

IT Solutions for Health Care
Integrating Lifestyle Gadgets with Medical Diagnosis

Plug & Play Integration and Analysis of Fitness and Medical Data using IoT Platform

Learnings from the implementation of an IOT Demonstrator for predictive Monitoring of Heart Patients at Ruppiner Kliniken

IT solutions in Health Care sector have typically been following the paradigm, that doctors own the monopoly on data. As a result it has become a mandatory requirement for IT to broker patient data as needed between doctors and medical institutions. The paradigm

- is blocking the development of profitable business models as a basis for sustainable profileration of new IT solutions, where cost and benefits for data exchange typically sits with different owners,

- is not mirroring the current situation of growing usage of implants and wearables recording Lifestyle and Medical Data, resulting in an influx of data produced and stored outside the realm of medical practioners,

- is ignoring the fact that vendors for medical and clinical systems are building proprietary platforms for storing and analyzing patient data,

- is underestimating the fact that patients have the ultimate authority over their data, and that patients are claiming their rights to use this data for personal fitness and for medical treatment.

We are Living in an Increasingly Complex and Fragmented Data World ...

where doctors, patients and medical device suppliers are holding only parts of the recorded patient data. This trend has brought about a paradigm change from a single data monopolist to distributed autonomous data owners, each with different interests on data usage and data processing. A similar IT paradigm change is needed to support data consolidation and analysis. New concepts such as Internet of Things (IoT), Fog Computing and Edge Clouds, are tailored to meet these requirements in the Health Care sector and well suited to deliver the required component interoperability as well as a viable business model.

An interdisciplinary team was established in March 2016 to validate this hypothesis. Team members include Fraunhofer FOKUS, SYTE, Microsoft Deutschland, AthenaDiaX and Boston Scientific, with clinical sponsorship from Ruppiner Kliniken. An Proof-of-Concept for Predictive Monitoring of Heart Patients was implemented, with the objective of deriving benefits and cost of an IOT based medical solution.

Collaboration Partners:

RUPPINER KLINIKEN · Fraunhofer FOKUS · syte Strategy institute for eHealth · Microsoft · AthenaDiaX · Boston Scientific Advancing science for life · SD&C Solutions Development Consulting · ixto

Dr. Jörg Caumanns, Olaf Rode (Fraunhofer FOKUS), Bernhard Düchting, Bettina Zielke (Microsoft Deutschland), Dr. Andreas Keck, Justus Wolff (SYTE Institute), Prof. Dr. Dr. Kurt J. G. Schmailzl (Ruppiner Kliniken), Matthias Wöllenstein (AthenaDiaX), Lutz Werner (Boston Scientific), Martin Brinkmann, Alexander Köller (SD&C), Emil Wiens (ixto)
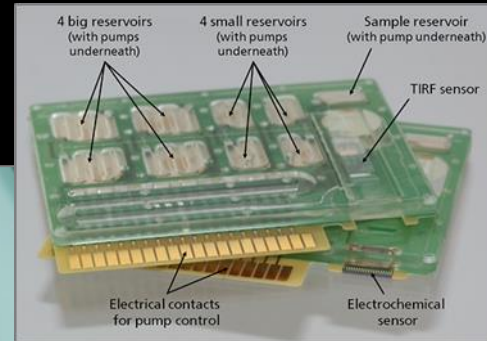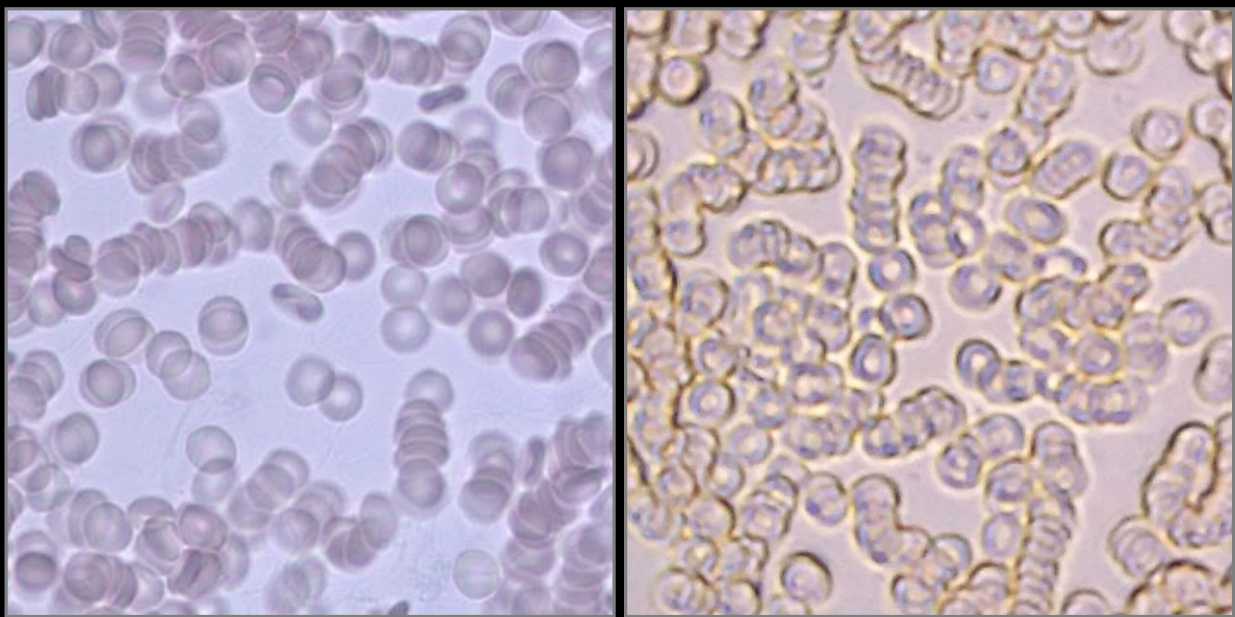
Themenfeld III

Teilprojekt E: *Point-of-care* als *Lab-on-a-chip:* patientennnahe Labordiagnostik

Teilprojekt F: *Point-of-care-ultrasound:* patientennahe Bildgebung *(mobile imaging)* an Brennpunkten der ambuilanten Versorgung

Patient-side lab for simultaneously analyzing of up to 8 lab parameters
made-to-measure for the follow-up of particular patients at-risk

4 big reservoirs (with pumps underneath)

4 small reservoirs (with pumps underneath)

Sample reservoir (with pump underneath)

TIRF sensor

Electrical contacts for pump control

Electrochemical sensor

Smartphone-based, mobile microscopy system
for out-patient blood count diagnostics

Complete Blood Count Results

VARIABLE	RESULTS	REFERENCE RANGE	CONCLUSION
White blood cells ($\times 10^3$/uL)	28.1	3.88–14.57	Increased
Segmented neutrophils ($\times 10^3$/uL)	15.88	2.1–11.2	Increased
Lymphocytes ($\times 10^3$/uL)	9.07	0.78–3.36	Increased
Monocytes ($\times 10^3$/uL)	0.89	0–1.2	Within normal limits (WNL)
Eosinophils ($\times 10^3$/uL)	1.32	0–1.2	Increased
Basophils ($\times 10^3$/uL)	0.94	0–0.13	Increased
Hematocrit (%)	31.2	37.5–60.3	Decreased
Reticulocyte count ($\times 10^3$/uL)	0.08	0.0064–0.0815	WNL
Platelets ($\times 10^3$/uL)	564	129–395	Increased

Mobile, integrated lab-on-a-chip system (iLOCS), laptop sized, for detecting nucleic acids of common hospital infections

patient-side acquisition of images at hot spots of out-patient care
(at home, country doctor's office, ambulance, in palliative care) and transferring to a reference center

& establishing a training program for family doctors, palliative care doctors, and specialized physicians' assistants

The body as a source of data: transforming healthcare

Monitoring (e.g., vital signs)
Managing (e.g., adherence)

One more thing...

THE INFORMATION GAP

Mapping the journey of our patients

Changing the way we interact with our caregivers
Driving better clinical outcomes and patient care

Der geschützte Lebensweg
The Sheltered Way

Kurt J.G. Schmailzl
Thomas Thiessen

DIGITAL HEALTH. HEALTH 4.0

~~Delivering health-related information~~

~~'Medical Care Center'~~

New data, new pathways to the patient

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Patient Safety Summit 2017

Federal Ministry of Health

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