Diabetes Management in hospital care:
GlucoTab - A medical device to improve insulin treatment of patients with diabetes type 2

JOANNEUM RESEARCH Forschungsgesellschaft mbH

HEALTH – Institute for Biomedicine and Health Sciences

Medical University of Graz

Division of Endocrinology and Metabolism

JOANNEUM RESEARCH (JR) – Institute HEALTH

- JR: non-university research organisation
- Approx. 400 employees
- HEALTH – Institute for Biomedicine and Health Sciences (http://www.joanneum.at/en/health.html)
- Approx. 60 employees
- Focus on development of medical devices and health care research

- Stephan Spat
- Technician
- Focus on medical software, decision support systems and usability
- Project leader of the GlucoTab development

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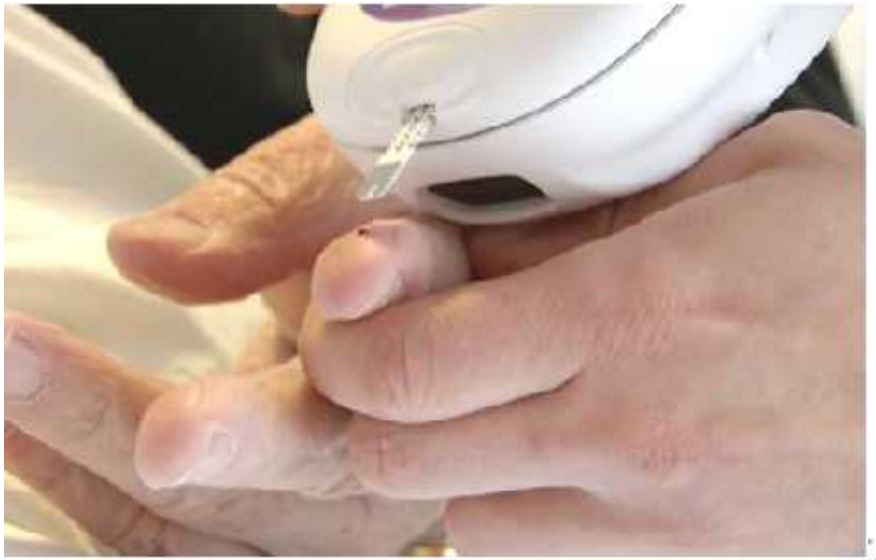
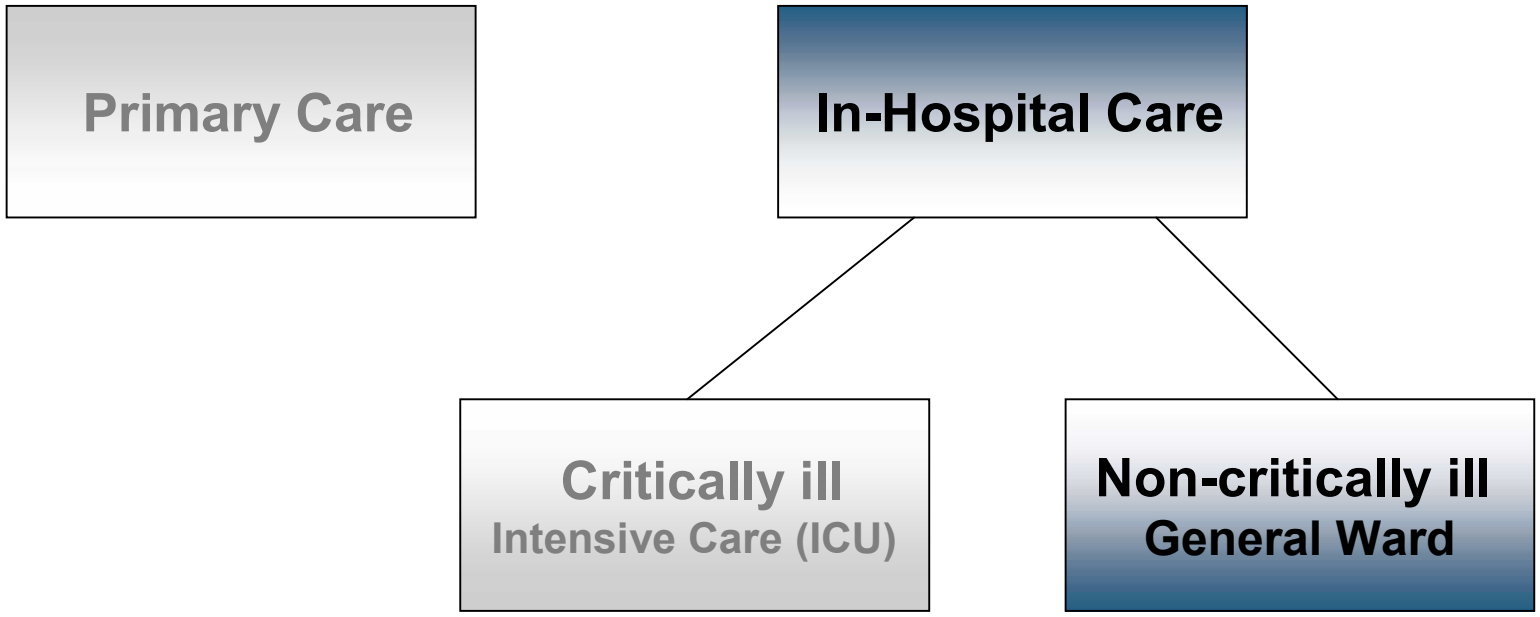
Glycaemic control in hospital



Setting the scene: Diabetes Care



National Diabetes Inpatient Audit England: 2010-2012

- Prevalence of diabetes in hospitalized adult patients ranges between 6% and 26% in England
  - Patients with diabetes have an increased length of hospital stay (8 versus 5 days).
- The mean number of **“good diabetes days”** (BG-readings between 72-198 mg/dl) is **58%** in England.
- Room for improvement of diabetes treatment in hospitals!

NaDIA 2012

Recommandation for in-hospital BG management

„We recommend **insulin therapy** as the **preferred method** for achieving glycaemic control in hospitalized patients with hyperglycaemia.“ (Umpierrez et al. 2012)

„We recommend **clinical decision aids** at the point of care to guide prescribers in **implementing evidence-based guidelines**.” (Draznin et al. 2013)

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The GlucoTab System

Intended use and development process

Intended Use

The GlucoTab is a **stand-alone software system** to support **healthcare professionals** during **hospitalization** of **type 2 diabetes mellitus** patients who are treated with **subcutaneous insulin**.

The GlucoTab system provides **two main functionalities**:

(1) **Supporting** healthcare professionals to manage the **treatment workflow** for patients with type 2 diabetes mellitus by …

(2) Providing **automated recommendations** for

a) the **total daily insulin dose**

b) splitting the total daily insulin dose into **separate insulin administrations**

…

Development methods

- Evolutionary development approach (currently GlucoTab R2.0)
- Interdisciplinary groups
- Usability tests

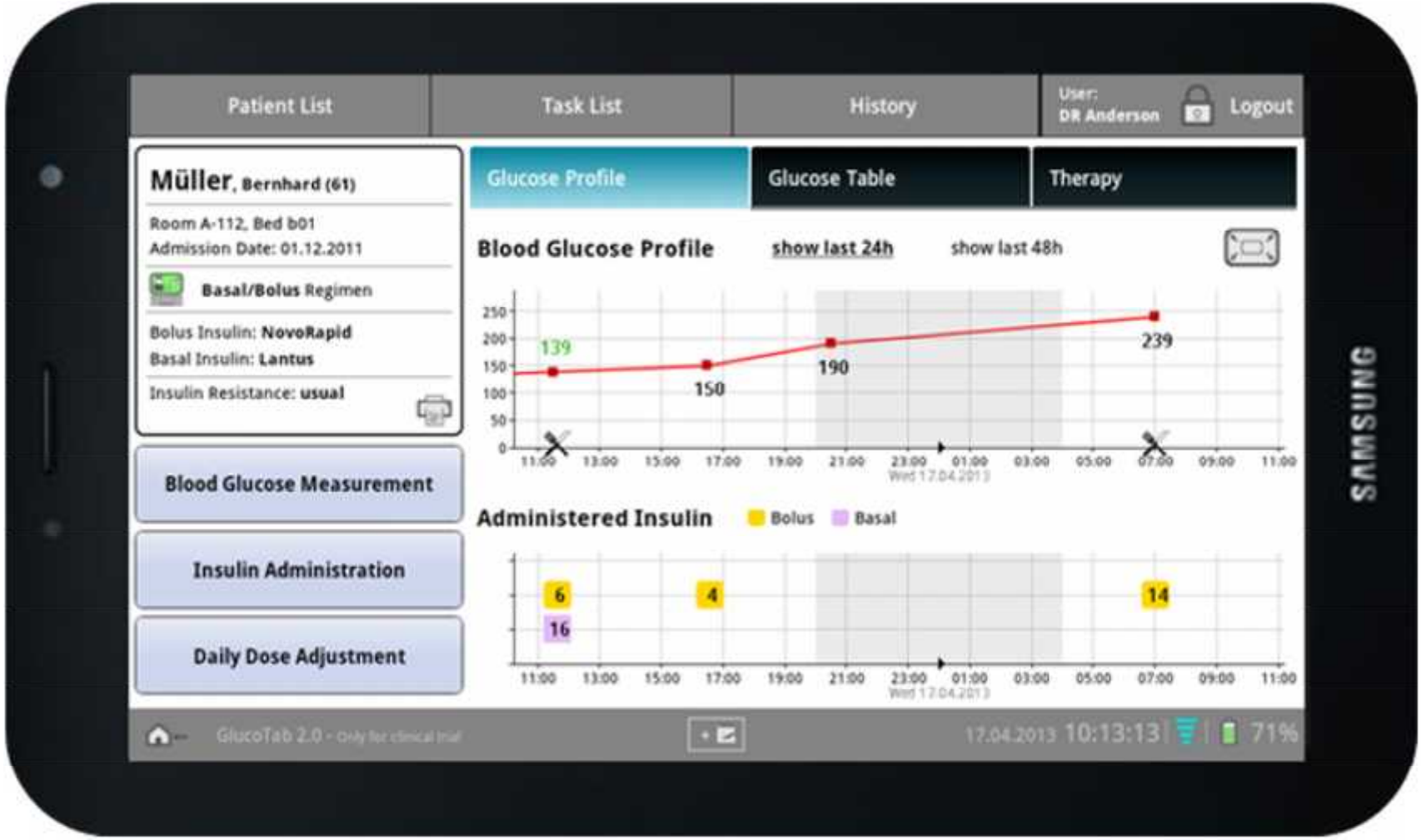
- Mobile, tablet-based user interface (Samsung Galaxy Tab 7” Plus , Google Android 3.2)
- Client/Server System (Java App. Server)
- Standard Interfaces to Hospital Information System (HL7)
- Development according to international standards (e.g. IEC 62304, ISO 13485, ISO 14971)

GlucoTab Evolution

The GlucoTab System

Main function

Therapy Profile



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The GlucoTab System

A Medical Device

Laws and Directives

- Relevant EU directive
  - Council Directive 93/42/EEC concerning medical devices
- Relevant Austrian laws
  - Medizinproduktegesetz – MPG
  - Compliance with the revised directive became mandatory on 21st March, 2010
  - National law in Austria since 30th December, 2009

BUNDESGESETZBLATT

FÜR DIE REPUBLIK ÖSTERREICH

Jahrgang 2009 | Ausgegeben am 30. Dezember 2009 | Teil I

143. Bundesgesetz: Änderung des Medizinproduktegesetzes und des Arzneimittelgesetzes
(NR: GP XXIV RV 466 AB 549 S. 49. BR: AB 8236 S. 780.)
[CELEX-Nr.: 320071.0047, 320091.0120]

- Guidelines
  - MEDDEV 2.1/6 Qualification and Classification of stand alone software

What is a Medical Device?

Article 1 MDD; §2 (1) MPG

- A “medical device” means any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, together with any accessories, including the software … to be used for human beings for the purpose of:
  - diagnosis, prevention, monitoring, treatment or alleviation of disease,
  - diagnosis, monitoring, treatment, alleviation of or compensation for an injury or handicap,
  - investigation, replacement or modification of the anatomy or of a physiological process,
  - control of conception

What was new?

- **Medical Software** is regarded as a **Medical Device,** and therefore the MDD applies to Medical Software
- **Clinical Evaluation**

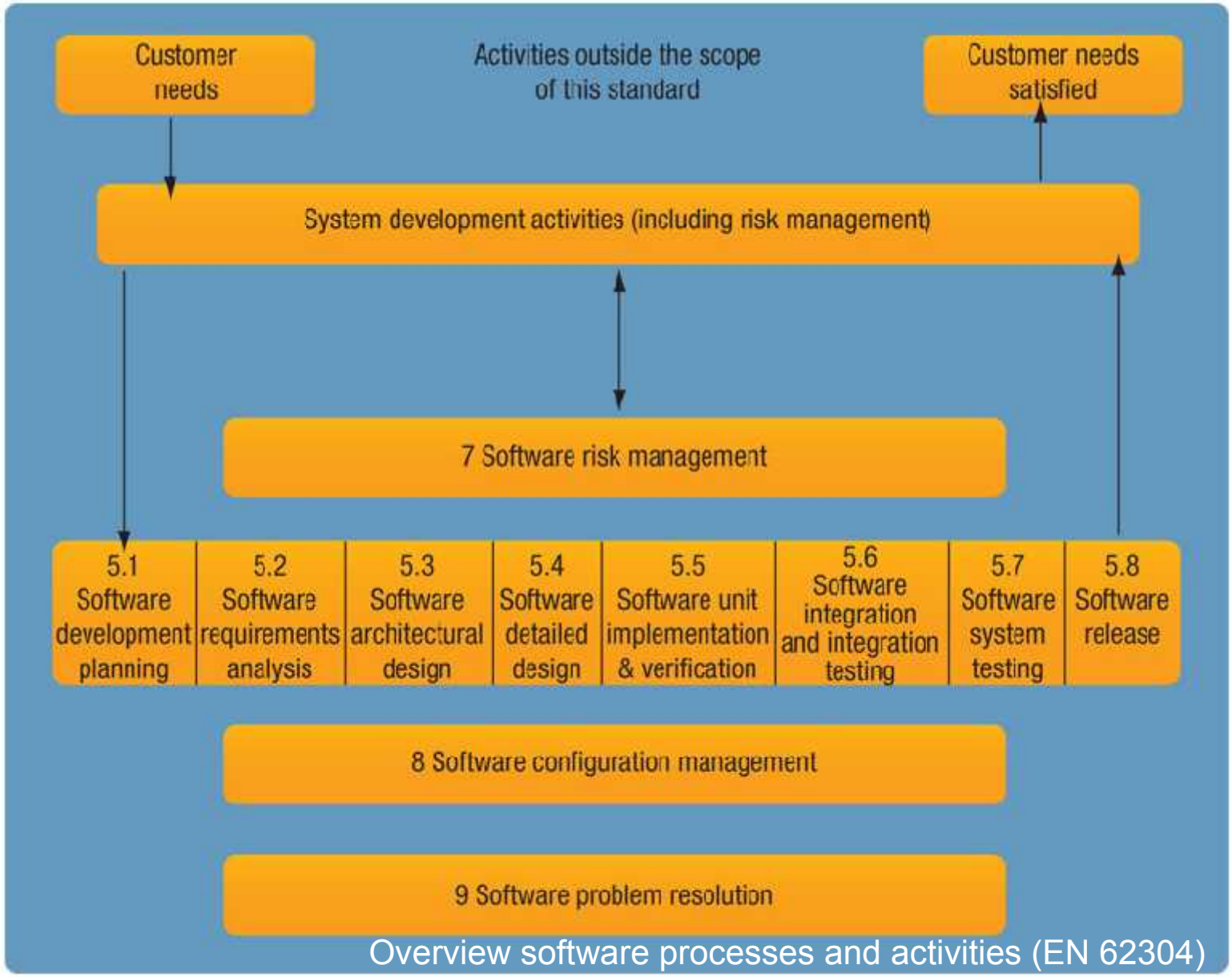
QM-standards at JR-HEALTH

- The institute HEALTH is certified according to:
  - EN ISO 9001
    - since 1995
  - EN ISO 13485 + Software
    - since 2009 since 2013
  - GLP
    - since 2012

Relevant Standards for GlucoTab

- Several standards to be considered
  - EN 62304 “Medical device software - Software life cycle processes”
  - EN 62366 “Application of usability engineering to medical devices”
  - EN ISO 13485 “Quality management systems”
  - EN ISO 14155 “Clinical investigation of medical devices for human subjects - Good clinical practice”
  - EN ISO 14971 “Application of risk management to medical devices”

Processes to be documented



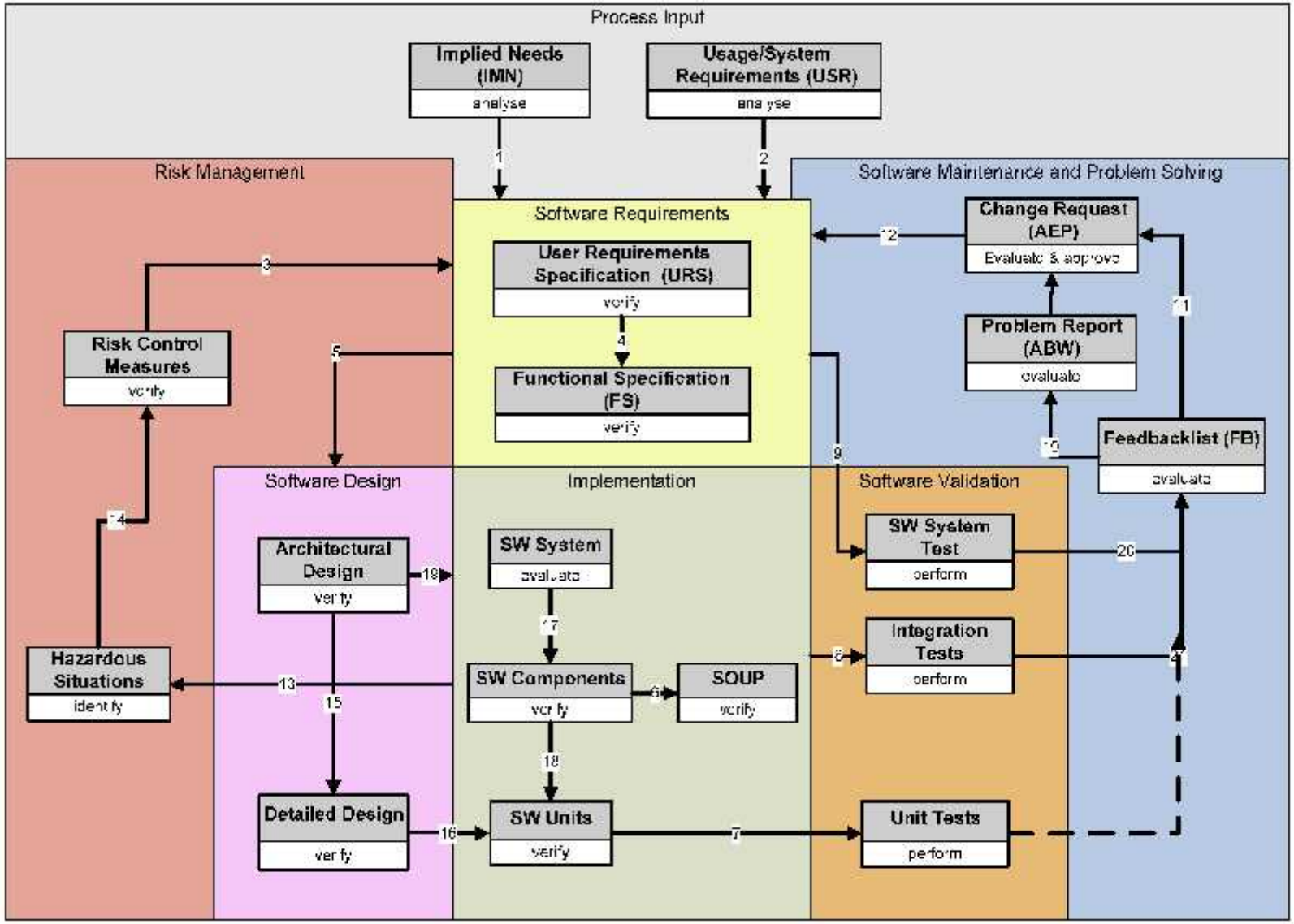
Overview software processes and activities (EN 62304)

Processes to be documented

- Risk Management
- Development Process
- Problem Solving/Deviation Management
- Software Maintenance
- Change Management
- Configuration Management
- Verification and Validation
- Traceability

Traceability

Traceability map JR HEALTH
(modification based on Sven Wittdorf)



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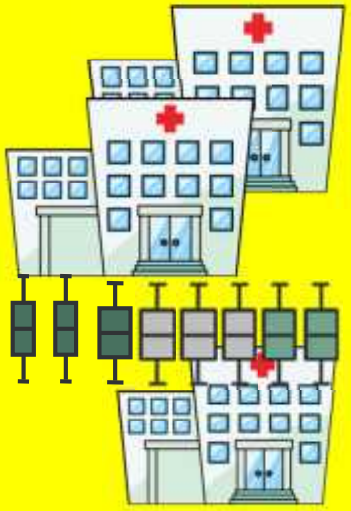
Clinical study



ClinDiab0x

The GlucoTab System

Clinical validation

Medical Device Directive
Annex X Clinical Evaluation (§38 MPG)

- **Confirmation of conformity with the requirements** under the normal conditions of use of the device, and the evaluation of the side-effects and of the acceptability of the benefit/risk ratio must be **based on clinical data**.

  - Relevant scientific **literature**
  - **Critical evaluation** of the results of all **clinical investigations made**
  - **Critical evaluation** of the **combined clinical data** provided above
  - **Clinical investigation** (mandatory for implantable and class III devices)

What does it mean to be a medical device?

- Ethical committee and legal authorities (AGES, BASG) ask for documents:
  - Conformance to the essential requirements of the MDD
  - Conformance to the standards
  - Declaration of conformity

FDA: „If it is not documented it did not happen“

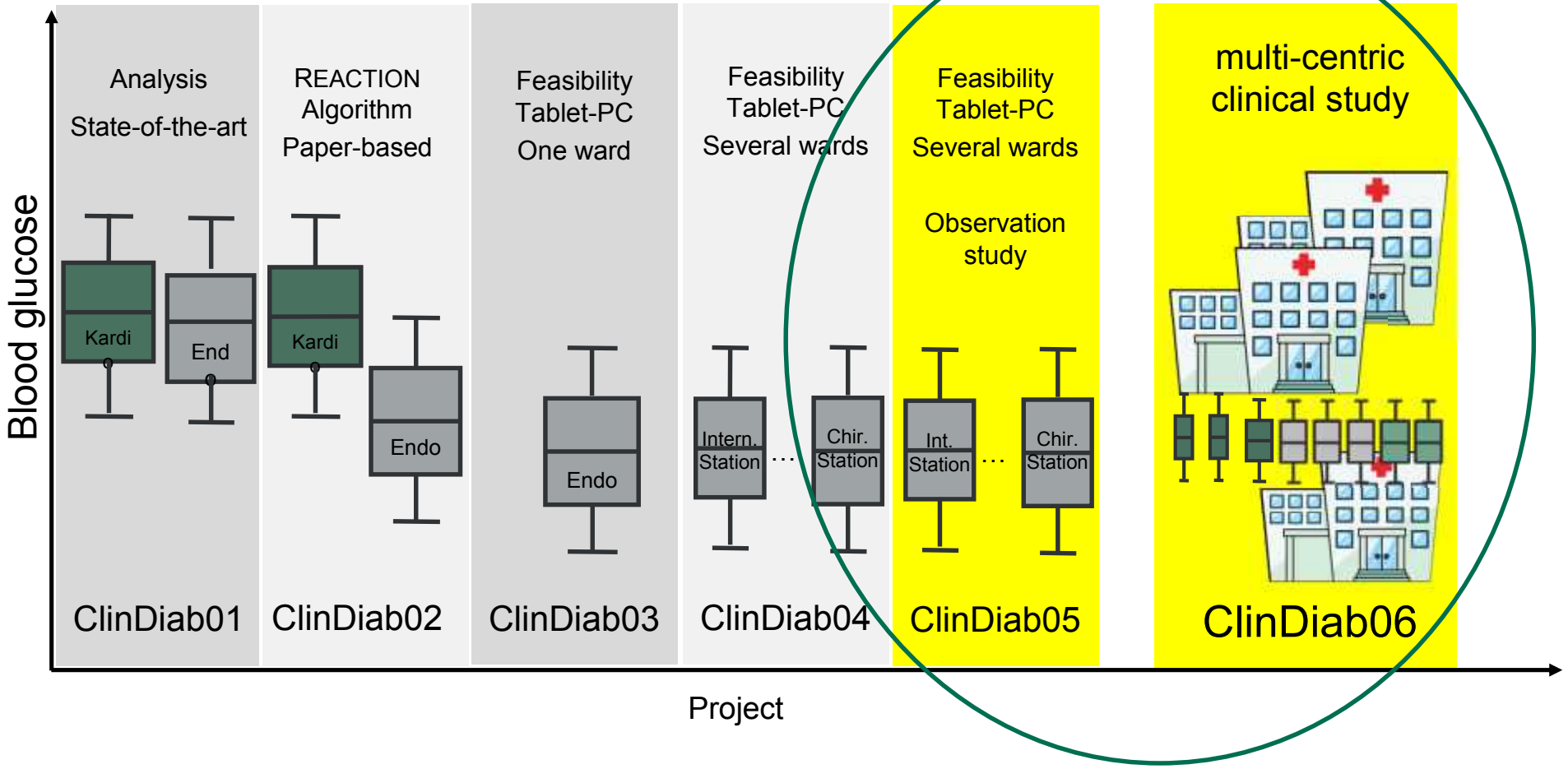
ISO 14155 - Clinical investigation of medical devices for human subjects

- ISO 14155 addresses good clinical practice for the design, conduct, recording and reporting of clinical investigations carried out in human subjects to **assess** the **safety** or **performance** of medical devices for regulatory purposes

Clinical Evaluation Key Parameters

- **SAFETY**
- **EFFICACY**
- **USABILITY**

Clinical Trials



Current Status of GlucoTab and QMS

- **Documents**

  SOPs: 9 new SOPs (SW specific)
  update of 12 existing SOPs (EN ISO 13485)

  Forms: ≈ 40 (for „daily“ documentation)

  Improved risk management file for software

- **Internal Audit** (4th of June, 2013)
  - software development according to IEC 62304, by Prof. Johner

- **Certification Audit by TÜV** (9th of July, 2013)
  - QM-System Upgrade for Software (EN ISO 13485)
  - Technical documentation of GlucoTab
  - Clinical Data GlucoTab (ClinDiab03, pilot trial)

- **CE Certificate GlucoTab** (18th of Nov. 2013)
  - subsequent filing to TÜV
  - Clinical Data for registration trial (ClinDiab04)

Typical pitfalls

- **No clear commitment to QM from the management**
- **Non-involvement of all employees (developer, team leader, …)**
- **Missing specific QM Know-How**
  in-house or external (via coaching)
- **No critical assessment of current internal processes**
- **Establishment of QM processes is more than establishment of tools**
- **Risk management starts too late**
- **Underestimation of needed time**
  QM is necessary prior to clinical studies (“fulfilment of the essential requirements”)

Thank you for your attention

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Requirements for Operators

Relevant Laws and Standards

- Austrian Laws
  - Medizinproduktebetreiberverordnung - MPBV
  - (Gesundheitstelematikgesetz – GTelG)
  - (Kranken- und Kuranstaltengesetz – KAKuG)
- Standards
  - IEC 80001 „Application of Risk Management for IT-networks incorporating Medical Devices”

Medical Devices Operator Regulation (AT) „Medizinproduktebetreibervorordnung“

- Carry out initial inspection on receipt of the device or have carried out by a third party
- Instruct personnel
- Keep an inventory (Bestandsverzeichnis)
- Maintenance
- Recurring safety check-up
- (Measurement check-up)
- Device file

Practical Requirements Related to Mobile Devices

- Provide remote maintenance / helpdesk funtions
- Domain integration
- Software inventory
- Software distribution, in-house App-Market
- Access Control Management and Enforcement
- User Authentication and Profiles
- 3rd Party Solutions
  - AirWatch, SAP Afaria, MobileIron,