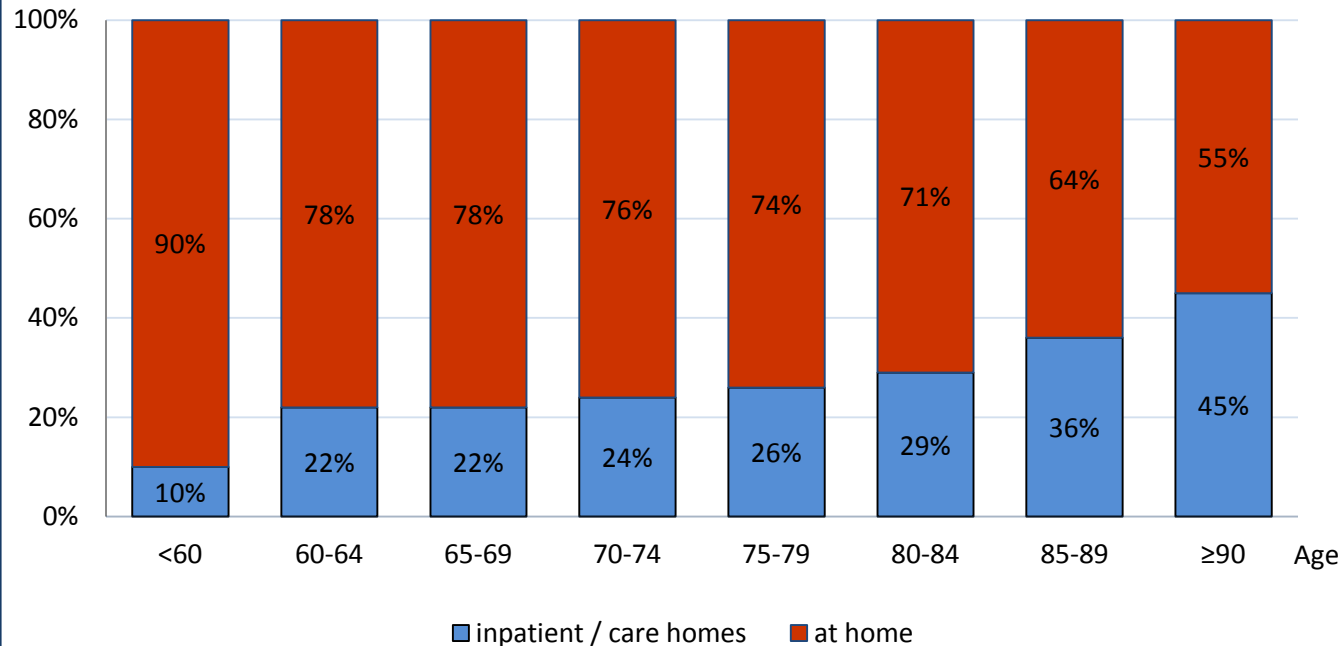**SeLe**

Sensoren für eine verbesserte Lebensqualität

"First impacts of a digital monitored exsiccosis system for long term care quality – implications for quality of life of elderly people as well as caregiver acceptance"

Christian Heidl, Sebastian Müller, Jürgen Zerth

Long term care in Germany

People in need of care depending on the type of care and ageing in Germany, 2013

Age	inpatient / care homes	at home
<60	10%	90%
60-64	22%	78%
65-69	22%	78%
70-74	24%	76%
75-79	26%	74%
80-84	29%	71%
85-89	36%	64%
≥90	45%	55%

■ inpatient / care homes   ■ at home

(Source: Own research based on Destatis, 2015a; Destatis, 2015b, p. 5)

- In 2013, 2,63 Million people in need of care, on basis of the long-term care insurance law (SGB XI).

- 1,86 Million (71 %) receive care at home.

- 1,25 Million people in need receive a care-giver's allowance (caring by relatives).

- 616.000 live in private households (caring by relatives or mobile nursing service).

- 764.000 people receive care in an inpatient care facility (Destatis, 2015).

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Definition Dehydration

- „Dehydration is the result of a fluid imbalance therefore an inadequate circulating volume resulting from either the consumption of too little fluid or due to a loss of too much fluid." (Metheny 2000; Mentes 2006; Wotton et al., 2010).

- „The degree of dehydration is correlated with the percentage of Total Body Water (TBW) lost and correlated with particular changes in signs and symptoms to be classified as mild to severe." (Wotton et al., 2010).

- **Acute** (associated with children) and **chronic dehydration** (commonly associated with older people) (Campbell et al., 2011).

Epidemiologic Data – SeLe

- „The prevalence of dehydration in older adults is significant whether they live in the community or in residential care facilities." (Thomas et al. 2003; Xiao et al. 2004).

- Prevalence of a manifest dehydration of hospital patients older than 65 years is approximately 5-10%. For people, who are vulnerable of dehydration is the risk about 50%. (Health autority in Bremen, 2016).

- "Patients admitted from care homes had 10-fold higher prevalence of hypernatraemia than those from their own homes." (Wolff et al., 2015).
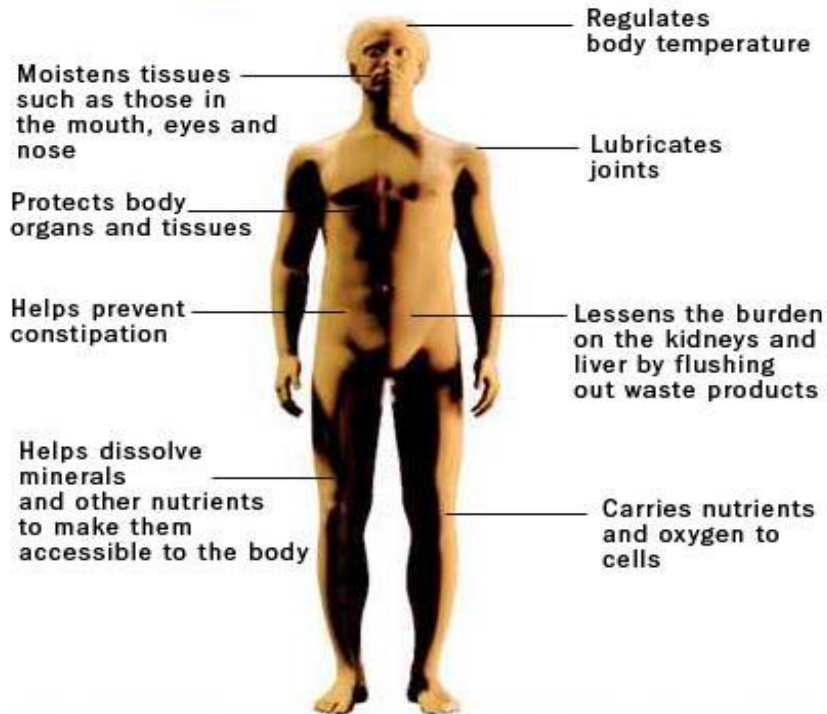
Background – recent studies of dehydration

- <u>Data and facts on the basis of:</u>
- Guidelines and expert standards for nursing: MDK, MDS, German society of nutrition etc.

- <u>Primarily studies/papers from England and the US:</u>
- **Transfer:** Wolf et al. (2015) Are patients admitted to hospitals from care home dehydrated? A retrospective analysis of hypernatraemia and in-hospital mortality?
- **Nursing perspective:** Campell et al. (2011). Dehydration: why is it still a problem?
- Wotton et al. (2008) Prevalence, risk factors and strategies to prevent dehydration in older adults
- **Economic perspective:** Xiao et al. (2004) Economic burden of dehydration among hospitalized elderly patients.
- **Sensor system + (outpatient) care:** Peterson et al. (2014) Identifying Early Dehydration Risk with home-based sensors during treatment.

How many liters should you drink a day - water?

Functions of water in the body

Moistens tissues such as those in the mouth, eyes and nose

Protects body organs and tissues

Helps prevent constipation

Helps dissolve minerals and other nutrients to make them accessible to the body

Regulates body temperature

Lubricates joints

Lessens the burden on the kidneys and liver by flushing out waste products

Carries nutrients and oxygen to cells

The Institute of Medicine determined that an adequate intake (AI):

- for men is roughly about 13 cups (3 liters) of total beverages a day. (Food and Drinks).

- The AI for women is about 9 cups (2.2 liters) of total beverages a day. (Food and Drinks).

(Source: http://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256999999 [Stand: 31.05.2016])

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Level of dehydration

Level of dehydration – Volume depletion	Form of symptoms and clinical findings
> 1% – 2% „subclinical"	None or ongoing minimal symptoms or clinical findings (scientific subject of the discussion)
> 2% – 5% „mild"	Mild symptoms and clinical findings
> 5% – 10% „moderate"	Moderate pronounced symptoms and clinical findings
> 10% – 15% „severe"	Severe clinical symptoms and clinical findings
> 15% „extreme"	Acute danger of life

(Source: Hensen, 2016)

Sensors for a better quality of life (SeLe)

- In the project 'SeLe' a sensor-based system for long term care will be developed that controls the liquid balance of a person to a valid and reliable level and, therefore, prevents health risks by physical dehydration.

- Consequently on basis of an innovative sensor technology (microwave-sensors) and newest integration technology an early warning dehydration system is currently investigated and will be implemented in inpatient as well as in outpatient care-settings.

- The aim is, on one hand to increase and improve the quality of life for the elderly, and on the other hand to modify the quality of the healthcare system for long-term care.

Research questions – SeLe (work in progress)

1. Which capabilities exist to analyze dehydration at present? (Guidelines, the context of inpatient and outpatient care)?

2. Which capabilities exist in the context of inpatient and outpatient care to analyze dehydration and which impact has SeLe on the workflow in general?

3. What are the results of a socio-economic market- and user analysis of SeLe?

4. What are the use-cases in the field of medicine and long-term care and who are the primary and secondary stakeholders?

Application of the SeLe-System

SeLe — Sensoren für eine verbesserte Lebensqualität

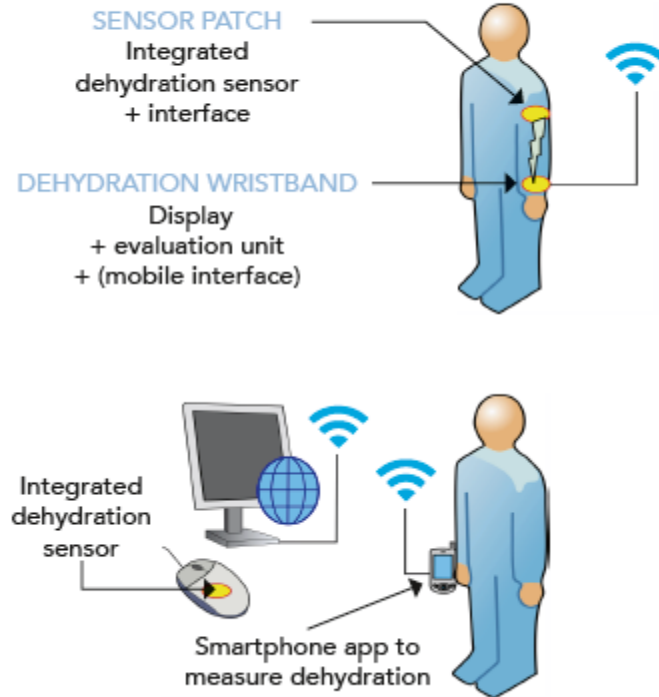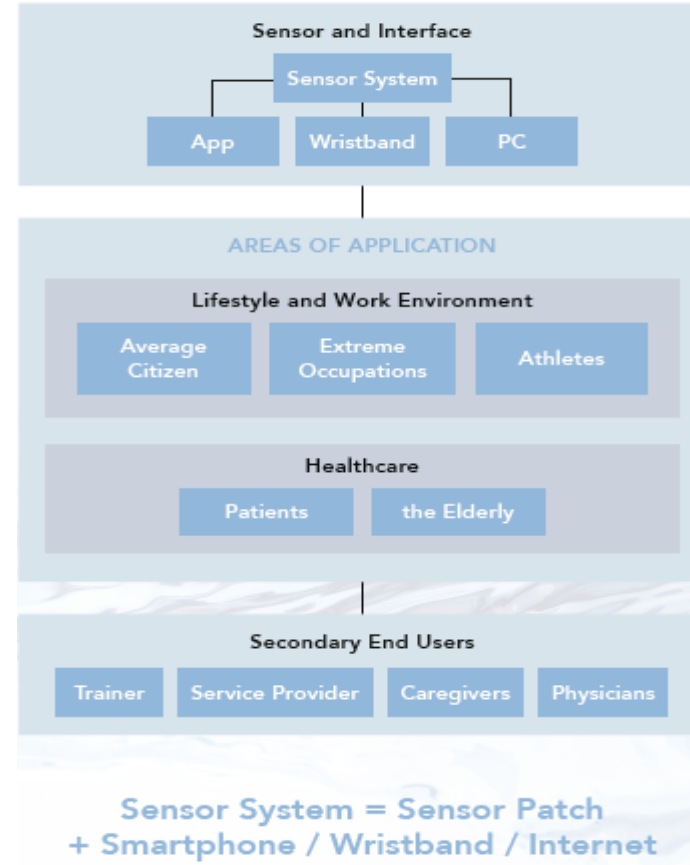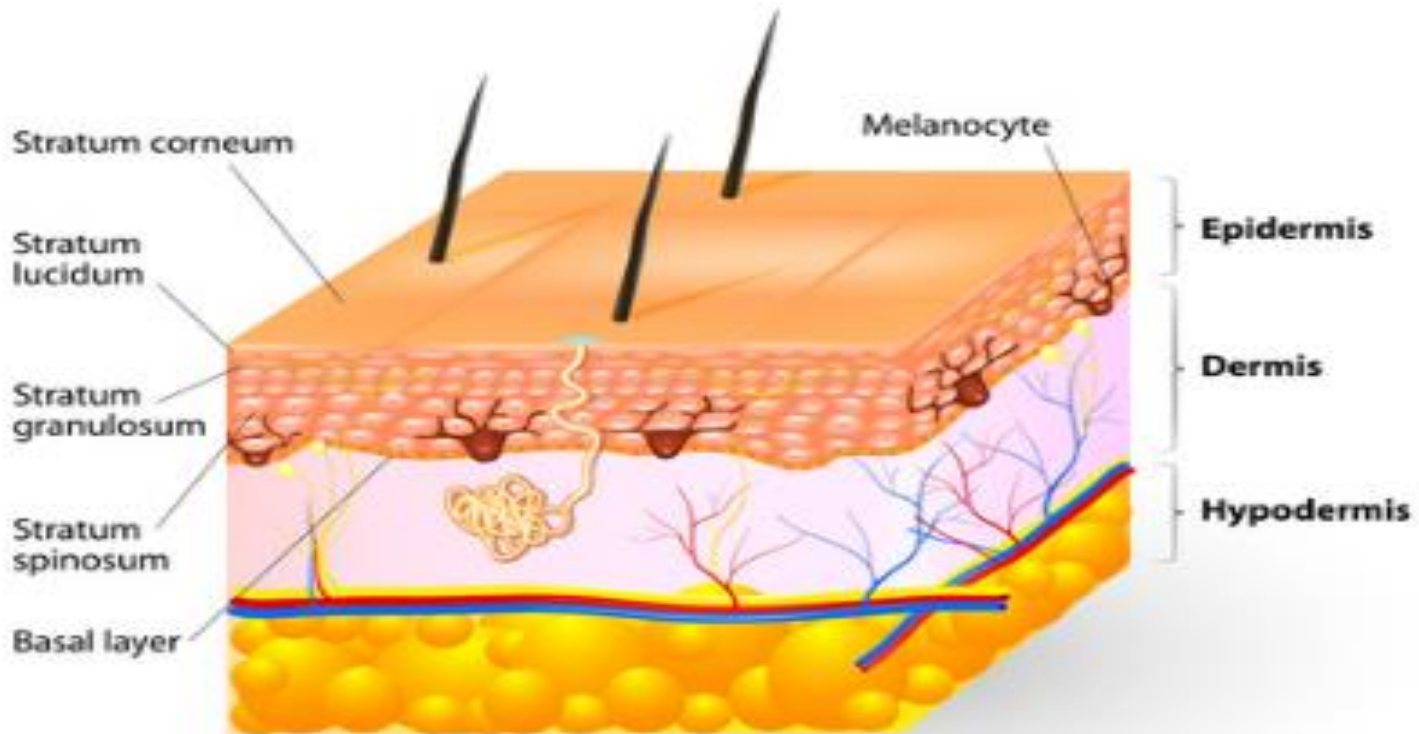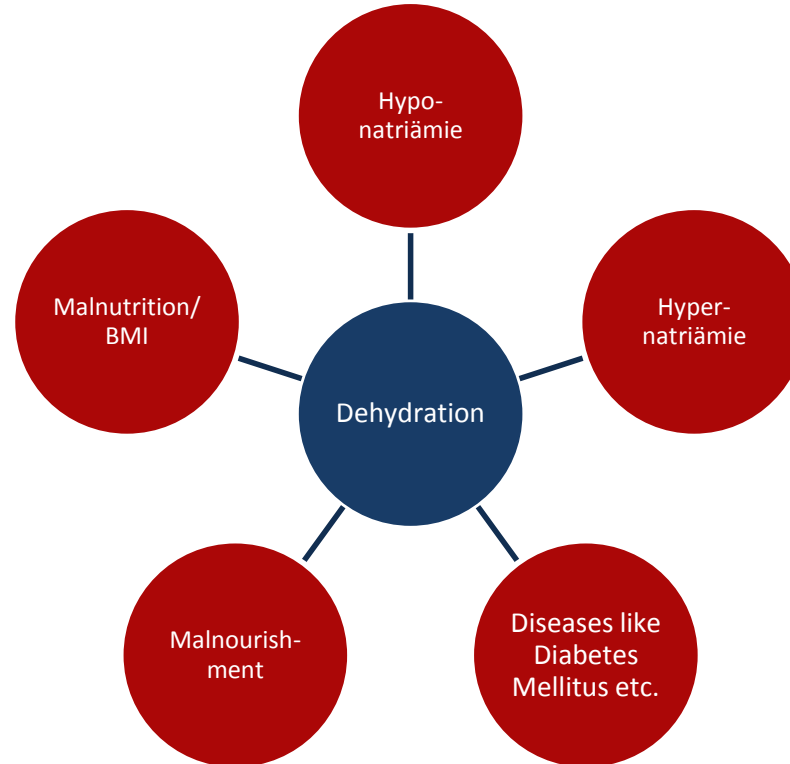| Sensor	Interface	Scenario	End-user	Aim	Secondary user
- Sensorpatch	- Bracelet - App - PC	- Lifestyle - Professional environment - Medicine - **Long term care**	- Athletes - Average citizen - Extreme occupations - **Patients** - **Seniors**	Active and passive health and performance monitoring: - Sportsman - Extreme athlete - Secretary - **Elderly people** - **People in need of care** - **Dementia patient**	- Trainer - Service provider - Doctor - **Nurse**

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WLH WILHELM LÖHE HOCHSCHULE

(Source: SeLe –Sensors for a better quality of Life, 2016)

THE LAYERS OF HUMAN SKIN

Stratum corneum

Stratum lucidum

Stratum granulosum

Stratum spinosum

Basal layer

Melanocyte

Epidermis

Dermis

Hypodermis

(Source: http://www.skin-remedies.com/images/dreamsHumanSkin2.jpg)

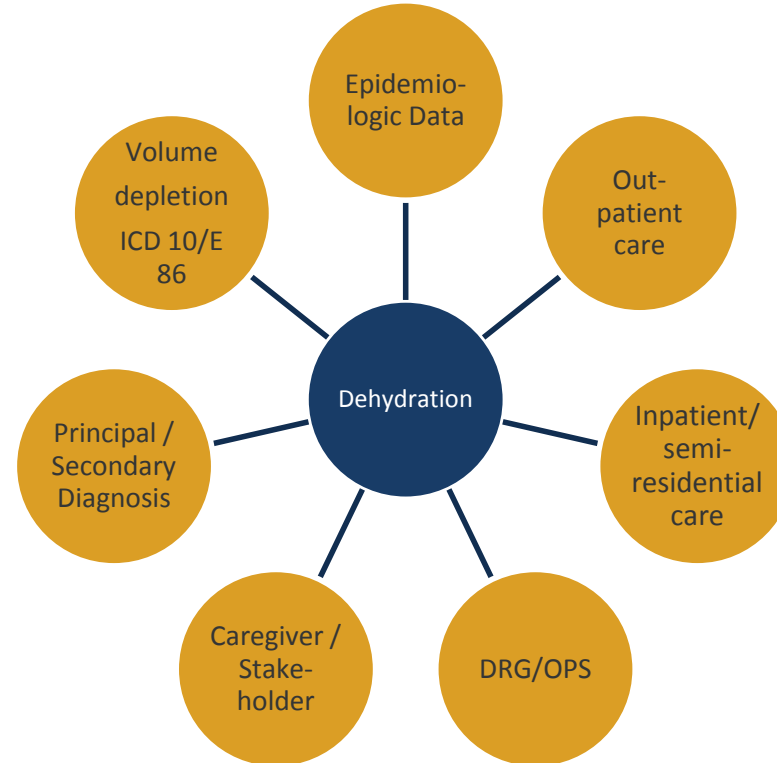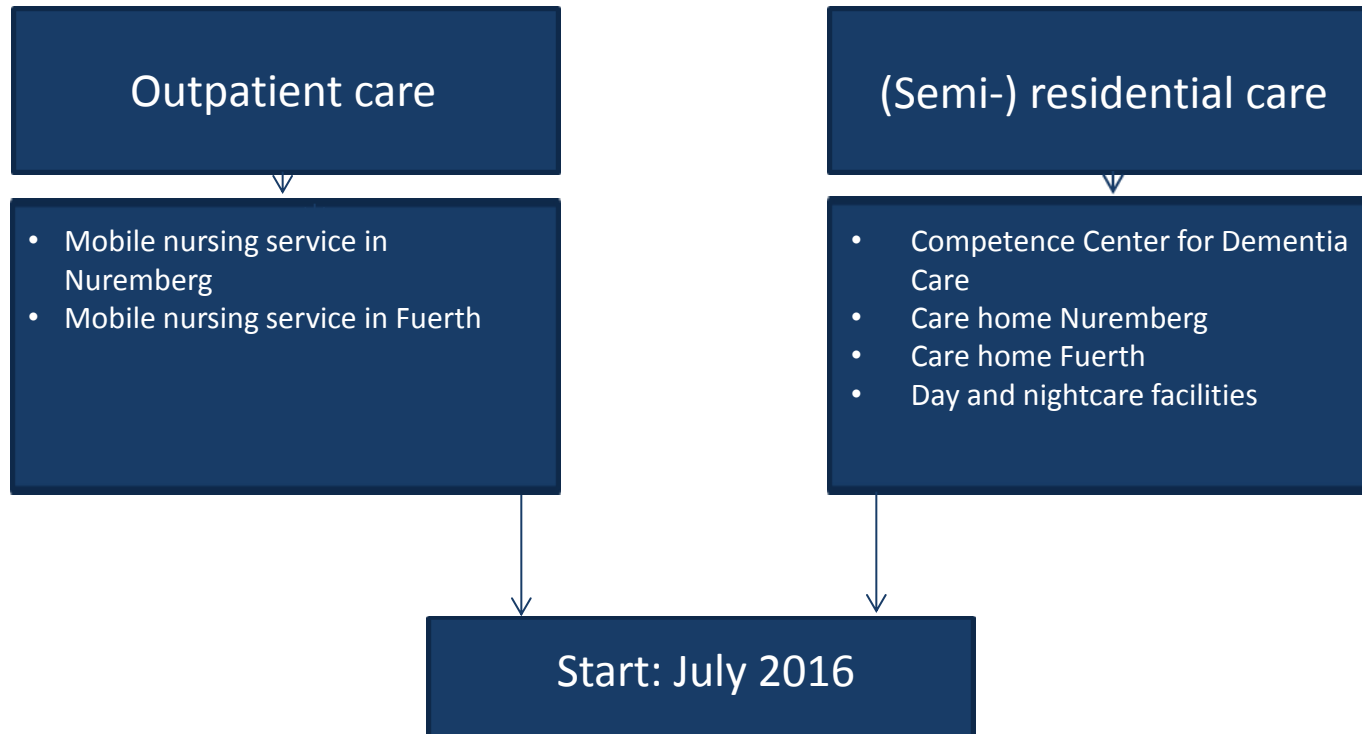C. Heidl, S. Mueller, J,. Zerth, EAST Workshop Budapest, 11-12.06.2016

Characteristics of dehydration

How is it possible to operationalize dehydration?

Methodology – stakeholder analysis and prozess-modeling

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┌─────────────────────────┐        ┌─────────────────────────┐
│    Outpatient care      │        │ (Semi-) residential care│
└─────────────────────────┘        └─────────────────────────┘
            │                                   │
            ▼                                   ▼
┌─────────────────────────┐        ┌─────────────────────────┐
│ • Mobile nursing service│        │ • Competence Center for │
│   in Nuremberg          │        │   Dementia Care         │
│ • Mobile nursing service│        │ • Care home Nuremberg   │
│   in Fuerth             │        │ • Care home Fuerth      │
│                         │        │ • Day and nightcare     │
│                         │        │   facilities            │
└─────────────────────────┘        └─────────────────────────┘
            │                                   │
            └───────────────┬───────────────────┘
                            ▼
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                │    Start: July 2016   │
                └───────────────────────┘
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Methodology – stakeholder analysis and prozess-modeling

Focus of socioeconomic research:

Stakeholders and direct users (inpatient and outpatient care):

- Stakeholders (persons who has to "accept" the technology)

- Especially direct users (member, patient, inhabitants etc.)

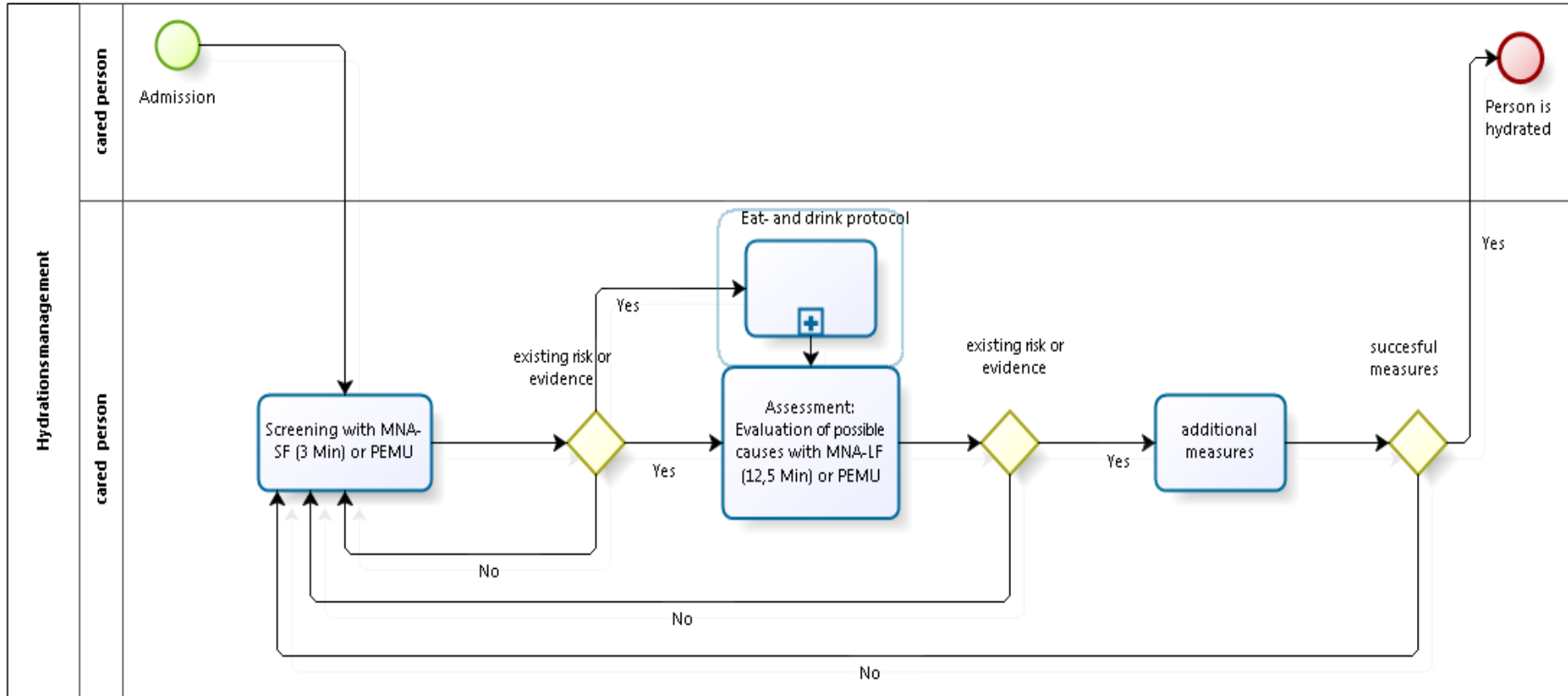Form of investigation: Standardized – semi-open questionnaires

Inpatient:

- Guided expert interviews (Stakeholders of the facilities: management, care management, residential sector manager etc.)

Outpatient:

- Guided expert interviews (Stakeholders of the facilities : management, care management etc.)

(Source: On basis of DNQP, 2010)

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Elderly Person/ Patient

Healthcare system

Quality of care

(Minor) costs

Stakeholders

Workflow/Process of care

Thank you very much!

(Source: http://nutritionmyths.com/wp-content/uploads/2015/09/P0358_elderly_man_drinking_water_34262768.jpg)

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