Challenges of Health Care in Germany – What health economic tools do we apply?

Riga 20.08.2018

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Agenda

1. Health Care System in Germany
2. Challenges in Health Care
3. Simulation as a solution tool (?)
Germany

- Area: 357,168 km²
- Population: 82,521,653 (2016, destatis.de);
- GDP (PPP): - total: $3,685 trillion (2017,)
- Capital: Berlin
  - population: 3,592,059 (Dec. 2017)

http://www.mygeo.info/landkarten/deutschland/Deutschland_in_Europa.png
Health Care System in Germany

Overview

![Map of Germany](http://www.weltkarte.com/uploads/pics/bundeslaender.png)
Health Care System in Germany

Overview

A lot of important aspects, data, information regarding Health Care Systems available – let’s focus …
Health Care System in Germany

Health Care Expenditure

**KEY FIGURES**

<table>
<thead>
<tr>
<th>Health expenditure 2016</th>
<th>EUR 356.5 bn</th>
</tr>
</thead>
<tbody>
<tr>
<td>By selected sources of funding</td>
<td></td>
</tr>
<tr>
<td>Statutory health insurance</td>
<td>58.1%</td>
</tr>
<tr>
<td>Private health insurance</td>
<td>8.7%</td>
</tr>
<tr>
<td>By selected facilities</td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td>25.9%</td>
</tr>
<tr>
<td>Offices of physicians</td>
<td>14.9%</td>
</tr>
<tr>
<td>By selected types of services</td>
<td></td>
</tr>
<tr>
<td>Medical services</td>
<td>26.8%</td>
</tr>
<tr>
<td>Nursing and therapeutic services</td>
<td>26.6%</td>
</tr>
</tbody>
</table>

Source:
https://www.destatis.de/EN/FactsFigures/SocietyState/Health/HealthExpenditure/HealthExpenditure.html;jsessionid=E47F96803D59008566A915BAC2814F7A.InternetLive1
Health Care System in Germany

Health Care Expenditure

Health expenditure in billion EUR

Health expenditure Percentage of gross domestic product (GDP)

Health expenditure EUR per capita

Source:
https://www.destatis.de/EN/FactsFigures/SocietyState/Health/HealthExpenditure/HealthExpenditure.html;jsessionid=E47F96803D59008566A915BAC2814F7A.InternetLive1
# Health Care System in Germany

## Health Personnel

### Key Figures

<table>
<thead>
<tr>
<th>Category</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health personnel</td>
<td>5.5 mn</td>
<td>5.6 mn</td>
</tr>
<tr>
<td>Men</td>
<td>24.2%</td>
<td>24.2%</td>
</tr>
<tr>
<td>Women</td>
<td>75.8%</td>
<td>75.8%</td>
</tr>
<tr>
<td>By selected facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td>20.7%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Medical practices</td>
<td>12.5%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Out-patient care</td>
<td>6.6%</td>
<td>6.6%</td>
</tr>
<tr>
<td>By selected professions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians</td>
<td>377,000</td>
<td>379,400</td>
</tr>
<tr>
<td>Dentists</td>
<td>74,000</td>
<td>76,000</td>
</tr>
</tbody>
</table>

Source: https://www.destatis.de/EN/FactsFigures/SocietyState/Health/HealthPersonnel/HealthPersonnel.html

### Health Personnel by Occupations 2010

- Physicians: 11,781,200
- Pharmacists: 181,100
- Dentists: 41,840
- Physiotherapists: 32,000

### Health Personnel by Age Groups 2010

- Total: 5,491,700
- Under 20 years: 21
- 20 - 29 years: 24
- 30 - 39 years: 24
- 40 - 49 years: 28
- 50 - 59 years: 178
- 60 years or over: 1,761

© Statistisches Bundesamt (Destatis), 2010
Health Care System in Germany

Hospitals

### KEY FIGURES

<table>
<thead>
<tr>
<th>Health Care System in Germany</th>
<th>Hospitals, 2016</th>
<th>1,951</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (number of cases)</td>
<td>19.5 mn</td>
<td></td>
</tr>
<tr>
<td>Average length of stay</td>
<td>7.3 days</td>
<td></td>
</tr>
<tr>
<td>Bed occupancy rate</td>
<td>77.9%</td>
<td></td>
</tr>
<tr>
<td>Hospital costs (2016)</td>
<td>€ 101.7 bn</td>
<td></td>
</tr>
<tr>
<td>Reference value for hospitals (2017)</td>
<td>2.11%</td>
<td></td>
</tr>
<tr>
<td>Hospital stays in 2016 due to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>heart failure</td>
<td>455,680</td>
<td></td>
</tr>
<tr>
<td>acute alcohol intoxication</td>
<td>113,456</td>
<td></td>
</tr>
<tr>
<td>atrial fibrillation and flutter</td>
<td>304,755</td>
<td></td>
</tr>
</tbody>
</table>

Source: https://www.destatis.de/EN/FactsFigures/SocietyState/Health/Hospitals/Hospitals.html
Health Care System in Germany

Cost of Illness

KEY FIGURES

Costs of illness 2015: 338.2 bn €
- Male: 44.0%
- Female: 56.0%

By selected disease categories:
- Diseases of the circulatory system: 13.7%
- Mental and behavioural disorders: 13.1%
- Diseases of the musculoskeletal system: 10.1%

Cost of illness, 2015:
According to selected diseases, in %
- Other diseases: 14%
- Diseases of the circulatory system: 13%
- Mental and behavioural disorders: 12%
- Diseases of the digestive system: 10%
- Diseases of the musculoskeletal system and connective tissue: 51%

Total: EUR 338.2 bn

Cost of illness, 2015:
According to age and gender, in %
- Male: Blue
- Female: Green

Age from ... to under ... years:
- under 15
- 15-30
- 30-45
- 45-65: 20, 35
- 65-85: 30, 35
- 85 or over

Source: https://www.destatis.de/EN/FactsFigures/SocietyState/Health/CostIllness/CostIllness.html
In- and out-patient services
What do you think are the biggest (future) challenges in health care?
Challenges in Health Care

Medical-technical progress

Demographic development

Multimorbidity

Scope of Treatment

Staff requirements and availability

Social change

Processes

Fig.: Challenges in Health Care (Selection).
Source: Own.
Challenges in Health Care

Demographic development
- Multimorbidity
- Scope of Treatment

Medical-technical progress

Staff requirements and availability
- Social change
- Processes

Fig.: Challenges in Health Care (Selection).
Source: Own.
Challenges in Health Care

Source: https://service.destatis.de/bevoelkerungspyramide/.
Challenges in Health Care

Population by age group in %

- 2013: 18, 16, 15, 13
- 2060: 61, 51, 20, 13

Population at working age 20 to 64 years million

- Model calculation: net migration 300,000 people
- Relatively young population
- Continued trend based on lower immigration
- Continued trend based on higher immigration

From 2014, results of the 13th coordinated population projection.
© Statistisches Bundesamt, Wiesbaden 2015

Population aged 65 years and over million

- Total, aged 65 years and over
- Aged 65 to 79 years
- Aged 80 years and over

From 2014, results of the 13th coordinated population projection.
© Statistisches Bundesamt, Wiesbaden 2015

Source: www.destatis.de.
Challenges in Health Care

Fig.: Health management and economics. A field of tension? Source: Own based on Welk (2006), p. 140.
Challenges

What kind of (Health-) Economic Modelling can be distinguished?

- Markov Modelling
- Decision Trees
- System Dynamics
- Agend-Based Modelling
- Discrete Event Simulation
- ...

Is Simulation and DES an appropriate tool to solve the challenges in Health Care?
## Several Challenges, Focus and Tools for Hospitals

<table>
<thead>
<tr>
<th>Health Care and Health Care Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Challenges:</strong></td>
</tr>
<tr>
<td>- Financial aspects</td>
</tr>
<tr>
<td>- High utilization rate</td>
</tr>
<tr>
<td>- Resources</td>
</tr>
<tr>
<td>- Locations</td>
</tr>
<tr>
<td>- Clients</td>
</tr>
<tr>
<td>- Quality of treatment</td>
</tr>
<tr>
<td><strong>Focus:</strong></td>
</tr>
<tr>
<td>- Economic analyses</td>
</tr>
<tr>
<td>- Processes</td>
</tr>
<tr>
<td>- Utilization of resources</td>
</tr>
<tr>
<td>- workflow</td>
</tr>
<tr>
<td>- Patient flow, Clinical</td>
</tr>
<tr>
<td><strong>Tools:</strong></td>
</tr>
<tr>
<td>- Process Management</td>
</tr>
<tr>
<td>- Process Analysis</td>
</tr>
<tr>
<td>- Process Optimization</td>
</tr>
<tr>
<td>- Simulation</td>
</tr>
<tr>
<td>- OR Management</td>
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</tbody>
</table>

Discrete-Event-Simulation (DES)

Processes in Hospitals, Outpatient Departments

OR, ED, ICU
What is Simulation and what is DES?

Simulation
- Method for analyzing systems (too complex for analytical solutions)
- Replication of real systems, objects, or processes as a model
- Conducting experiments with the help of models to gather inferences on the real system
- Analyzing "What if" and "How to achieve" scenarios

Discrete-Event Simulation
- Modeling dynamic systems, in which the state of the model can be described by state variables
- Variables change at several points of time caused by the appearance of events

Why Simulation?
- Investigation of the real system is too expensive, time consuming, ethical unacceptable, dangerous
  - Real system doesn´t exist yet
  - A direct or indirect observation of the real system isn´t possible
  - Modification of the model
  - Educational reasons
  - Reproduction of experiments

Discrete-Event-Simulation (DES)

Case Study
Operational processes in OR
Different methods required for gathering the data for Modelling and Simulation

**Methods**
- Data Analysis (Hospital information system)
- Time Study
- Interviews
- Questionnaire
- Observation

**Modelling and Simulation**

**Basic Model:**
- Objectives
  - Representation of a system (behavior, performance, etc.) as a model

**Scenarios:**
- Analyzing different strategies
- What if?
- How to achieve?

- Process Management
- HR Management
- Accounting
- Planning
- Decision Making
- ...

Data Analysis
Observation
Interviews
Questionnaire
Time Study
Simulation based analysis of operational processes of a general hospital
Examination Question

Illustration and investigation of the performance of a surgical department with a special focus on an alternative use of the surgical capacity and the potential impact of a redesign of operational processes on selected key process indicators and costs.
Case Study – How does such a Simulation look like?
Case Study – What kind of Scenarios were investigated?

Objectives (Scenarios):
- Can the operations be done in two Operating Rooms?
- How many days a third Operating Room would be necessary to provide that the operating time of the OR is max. 15.30 o’clock?

Key Indicators
- "Less Resource Usage?"

Costs
- "Alternative Ressource Usage?"
Case Study – What were the main Results?

- Reduction of Operating Rooms possible (3 → 2)
- Effects on
  - OR utilization
  - Process Indicators
  - Human Resource Usage
  - Costs
- Alternative usage of OR Resources important
Conclusions

- Is Simulation a tool to solve problems in Health Care Management? ✓

- Can Simulation be used to increase efficiency in hospitals? ✓

- Is DES a powerful tool to provide substantial support in Health Care Management? ✓

- Can Simulation and DES be a tool to solve problems and help decision makers in Health Care Management? ✓

- Is Simulation a useful instrument to be included in a Summer School? ✓

Modelling complex scenarios, reducing complexity, supporting decisions
Increasing utilization (OR, HR), reducing costs, providing information
Modelling and Simulation of processes, developments, scenarios, “What-If”, “How-to-achieve”
Process Management, providing information for decisions, projects with Health Care Organizations
(Clinical) Process Management, Service Operations Management, Strategic and Operational Hospital Management, etc.
Liels paldies par jūsu uzmanību.

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Are there any questions?
Literature


Literature


Literature


- Winter Simulation Conference –(http://www.wintersim.org/)


- https://www.destatis.de