



## UNIT 3 BASICS OF INFORMATION MANAGEMENT



Prof. Dr. Horst Kunhardt, THD

### 3.1 INFORMATION MANAGEMENT DATA

- Result of observations, experiments, investigations, simulations and calculations
- Measured and documented in different structures, formats and units
- Merging of data = data integration



# 3.1 INFORMATION MANAGEMENT DATA

Data type	Value range	Example
Boolean	True or False [0, 1]	Query about a gray value in an image (the gray value in the image exceeds the value 98 => true or false?)
Integer	Integer values (32 Bits)	Blood pressure values in mmHG are generally given as whole number values.



### 3.1 INFORMATION MANAGEMENT KNOWLEDGE

Education and training are a basis for the transfer of knowledge In patient treatment, knowledge is used for diagnostics, therapy and prevention

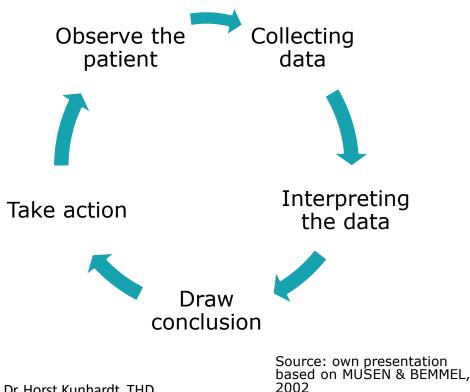
Medical knowledge can be classified by type:

- Factual knowledge (textbook knowledge)
- Empirical knowledge (external and ones own experience)
- Special knowledge (studies or data in patient records)



### **3.1 INFORMATION MANAGEMENT** INFORMATION CYCLES

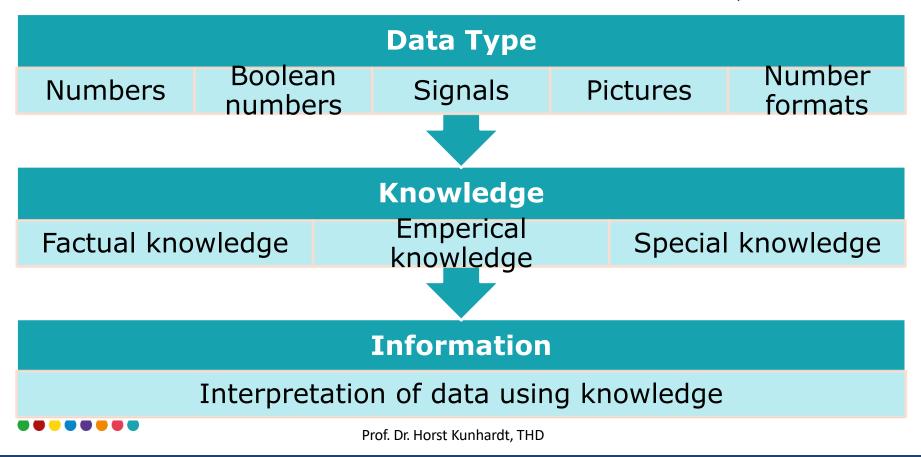
Interpreting data using knowledge creates information





Prof. Dr. Horst Kunhardt, THD

### **3.1 INFORMATION MANAGEMENT**



### 3.1 INFORMATION MANAGEMENT MANAGEMENT OF DATA, KNOWLEDGE AND INFORMATION

**Objective:** 

- Provision of data, knowledge and information
- For processes in healthcare, especially in diagnostics and therapy
- The storage and organization of data is defined in data structures



### 3.1 INFORMATION MANAGEMENT MANAGEMENT OF DATA, KNOWLEDGE AND INFORMATION

Functions of Files:

- Storage of patient records
- Reference files (index files, master patient index)
- System files for the operating system
- Application files



### 3.1 INFORMATION MANAGEMENT MANAGEMENT OF DATA, KNOWLEDGE AND INFORMATION

Database Management System (DBMS) The database maps the logical structure of an application's data onto physical storage

Exemplary functions of a DBMS:

- Access protection, e.g. controlled by a language (Data Control Language)
- Data protection (backup and restore)
- Simple report generation, export of data
- Interfaces of application programs

### 3.2 INFORMATION SYSTEMS INFORMATION SYSTEMS IN TECHNOLOGY

- EHR-based systems
- Mobile systems
- Web-based systems
- Knowledge-based systems (decision support)
- Health information exchange (HIE) based systems
- Health information management (HIM) based systems



### 3.2 INFORMATION SYSTEMS COMPONENTS OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT TECHNOLOGY)

- User interface consisting of screen with input possibility by keyboard, mouse, touch (touchscreen), speech, external device such as sonography and output unit for text and images, speech and sounds.
- Computing unit with different processors for the actual computing and the control of the screen and other units



3.2 INFORMATION SYSTEMS COMPONENTS OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT TECHNOLOGY)

- Software as a control element for the various components
- Storage as random access memory, image and data storage



### 3.2 INFORMATION SYSTEMS COMMUNICATION TECHNIQUES

- Physical transfer of data on data carriers, such as memory chip in the health card, memory sticks, external magnetic disks and CDs/DVDs, SSDs (solid state discs).
- Sharing (communication) in networks, either wireless (wireless LAN, mobile network) or wired



### 3.2 INFORMATION SYSTEMS INTEROPERABILITY

The cooperation of devices and systems

- Fixed standards enable data transmission
- Programs use a specific language (syntax), which is defined according to format and content
- Interoperability is only possible when standards are used!



### 3.3 HEALTHCARE DATA PURPOSE OF COLLECTED HEALTH DATA

### Benefits to society as a whole:

- Increasing the distributive equity of care
- Increasing the effectiveness and efficiency of scientific research and education

### **Benefits for patients:**

- Improvement in quality of care
- Improvement in utilization Conditions



### 3.3 HEALTHCARE DATA PURPOSE OF COLLECTED HEALTH DATA

### **Benefits for physicians:**

- Increase in the quality of medical work
- Reduction of costs
- Increasing the effectiveness and efficiency of the practice organization
- Strengthening of competitiveness and better use of training and further education offers



### 3.3 HEALTHCARE DATA PURPOSE OF COLLECTED HEALTH DATA

### **Benefits for hospitals:**

- Increase the quality of care
- Lowering the costs
- Increase the organizational effectiveness and efficiency
- Strengthening the competitiveness
- Strengthening the effectiveness of research, education and training



### 3.3 HEALTHCARE DATA BIG DATA

#### What is big data?'

Big data sets are too large and complex to be processed by traditional methods. Consider that in a single minute there are:



277,777 Instagram stories posted



511,200 4,500,000 tweets sent YouTube videos watched



4,497,420 Google searches



18,100,000

texts sent

188,000,000 emails sent

### The 3 V's of big data - Plus 2

These are the defining properties or dimensions of big data.



Prof. Dr. Horst Kunhardt, THD

Source:

https://www.sas.com/content/ dam / SAS / documents / infographi cs / 2019 / en-bigdata-\_110869.pdf retrieved at the\_03/01/2021



### 3.3 HEALTHCARE DATA BIG DATA

Source: https://www.sas.com/co ntent/dat the/S.A.S./dOcumen\_ts / infographics / 2019 / enbig-data-110869.pdf retrieved at the 03/01/2021



#### Trends in big data<sup>2</sup>

Mobile and real-time data dominate.

Artificial intelligence transforms the norm.

Security stays significant.

By 2025, over a quarter of data will be real time in nature and IoT real-time data will account for more than 95% of it.

Insights are generated via new technologies like machine learning and natural language processing

With increasing amounts of data being produced, protection and security of sensitive and private information is crucial.

IoT means massive amounts of big data. Learn 101 IoT terms in this non-geek's guide.

1. visualcapitalist.com/big-data-keeps-getting-bigger

 IDC. Data Age 2025. The Digitization of the World From Edge to Core. David Reinsel, John Gantz and John Rydning. Sponsored by Seagate. US44413318. November 2018.

019 SAS Institute Inc. Cary, NC, USA. All rights reserved. 110869\_G111019US.0919

**S**sas

Prof. Dr. Horst Kunhardt, THD

### 3.3 HEALTHCARE DATA HEALTHCARE ANALYTICS

### **Healthcare Analytics Adoption Model**

= Level model of the adoption of Big Data in everyday clinical practice.

The higher the level, the more likely and more a clinical facility is already implementing the Big Data approach.

Most facilities can already work very well and effectively at level 5 or 6, while those at level 3 or 4 still work very inefficiently



### 3.3 HEALTHCARE DATA HEALTHCARE ANALYTICS ADOPTION MODEL

Data binding grows in complexity with each Level

Level 8	Personalized Medicine & Prescriptive Analytics	Tailoring patient care based on population outcomes and genetic data. Fee-for-quality rewards health maintenance.
Level 7	Clinical Risk Intervention & Predictive Analytics	Organizational processes for intervention are supported with predictive risk models. Fee- for-quality includes fixed per capita payment.
Level 6	Population Health Management & Suggestive Analytics	Tailoring patient care based upon population metrics. Fee-for-quality includes bundled per case payment.
Level 5	Waste & Care Variability Reduction	Reducing variability in care processes. Focusing on internal optimization and waste reduction.
Level 4	Automated External Reporting	Efficient, consistent production of reports & adaptability to changing requirements.
Levei 3	Automated Internal Reporting	Efficient, consistent production of reports & widespread availability in the organization.
Level 2	Standardized Vocabulary & Patient Registries	Relating and organizing the core data content.
Level 1	Enterprises Data Warehouse	Collecting and integrating the core data content.
Level O	Fragmented Point Solutions	Inefficient, inconsistent versions of the truth. Cumbersome internal and external reporting.
		Prof. Dr. Horst Kunhardt, THD

https://downloads.healthcatalyst.com/wpcontent / uploads / 2014/02 / HAAM.jpg (retrieved at the 01.03.2021)

Source:

Mechanisms for ensuring the **confidentiality** of communications:

- A more secure communication channel is physically created in the form of a bilateral dedicated line that is not accessible to anyone else, or
- the exchanged messages are encrypted in a way that allows only the addressee to read them



- Ensuring that the stated identity of the author of a message also corresponds to the actual identity.
- Authenticity verification is not always relevant only at the time of arrival of a message or attached documents, but it is also necessary to be able to re-verify at a later time



### Authenticity

If, for example, electronic documents are stored in a crossinstitutional electronic patient file, users who view this file at a later time must also be able to verify the authenticity of documents stored in it.

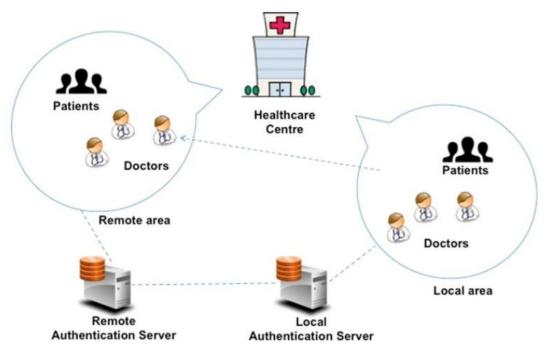


### Integrity

= Unforgeability of messages

Unambiguous verification that the incoming message and its attachments (e.g., electronic doctor's letter) are still available in exactly the same form and with exactly the same content as they were sent or signed by the sender through digital signatures or by preventing unauthorized modification during transport through encryption processes.





Source: <u>https://www.evolis.com/markets/card-printing/electronic-signatures-healthcare-facilities-printing</u>. retrieved on 01.02.2021 Prof. Dr. Horst Kunhardt, THD



### **3.5 DATA RESILIENCE**

### Persistence

Keeping data available over a long period of time (on storage media, such as CD, hard disk or databases)

### Reliability

Reliability of data collection (to what extent can identical results be obtained under the same conditions)

### Validity

Quality criterion that tests data for plausibility (information is compared between a target and an actual state)



### REFERENCES

Ciampa M. & Revels M. (2012): Introduction to healthcare information technology.

Fatemeh Rezaeibagha, Yi Mu (2018). Practical and secure telemedicine systems for user mobility. Journal of Biomedical Informatics, Volume 78, Pages 24-32.

Federal Ministry of Health (BMG) (2006). "Electronic health cards-European perspectives", Germany.

Hoyt R.E., Yoshihashi A. (2014). Health Informatics: Practical Guide for Healthcare and Information Technology Professionals. 6th.

L.ANGKAFEL, P. (Ed., 2014): Big Data in medicine and Health economy. Diagnosis, Therapy, Side effects. medhochzwei Publishing company: Heidelberg.

M.ARKL, V. (2012): Research, innovation and training on Big Data Analytics - opportunities and Challenges. In: E.BERPÄCHER, J. & O.

Nelson R., Staggers N. (2018). Health Informatics: An Inter- professional Approach. Elsevier, St. Louis, USA.



### REFERENCES

Schug, SH. (2002) European and International Perspectives on Telematics in Healthcare "International study of the Health Telematics action Forum in Germany"

Venot A., Burgun A., Quantin C. (2014). Medical Informatics, e- Health. Springer, Paris/Heidelberg.

Federal Office For security in the Information technology: IT basic protection, available at: <u>https://www.bsi.bund.de/SharedDocs/Downloads/DE/BSI/Grundschutz/Kompendium/IT Grundschutz</u> <u>Kompendium Edition2021.pdf? blob = publicationFile & v = 6th (Accessed: 02/17/2021).</u>

Research Training Group Knowledge representation the university Leipzig, Decision supporter Systems, available at: <u>http://www.informatik.uni-leipzig.de/~brewka/gk/teil6.html</u> (Accessed: 02/17/2021).

