UNIT 3 BASICS OF INFORMATION MANAGEMENT

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DATA

= Result of observations, experiments, investigations, simulations and calculations

- Measured and documented in different structures, formats and units
- Merging of data = data integration

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.

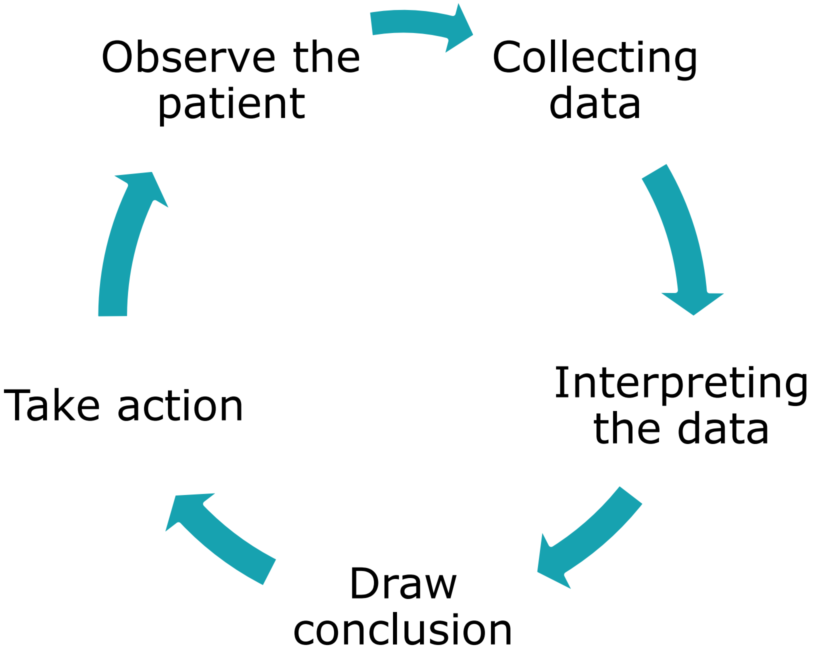
KNOWLEDGE

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



Source: own presentation based on MUSEN & BEMMEL, 2002

3.1 INFORMATION MANAGEMENT

Source: own representation

Data Type

Numbers	Boolean numbers	Signals	Pictures	Number formats

↓

Knowledge

Factual knowledge	Emperical knowledge	Special knowledge

↓

Information

Interpretation of data using knowledge

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

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:

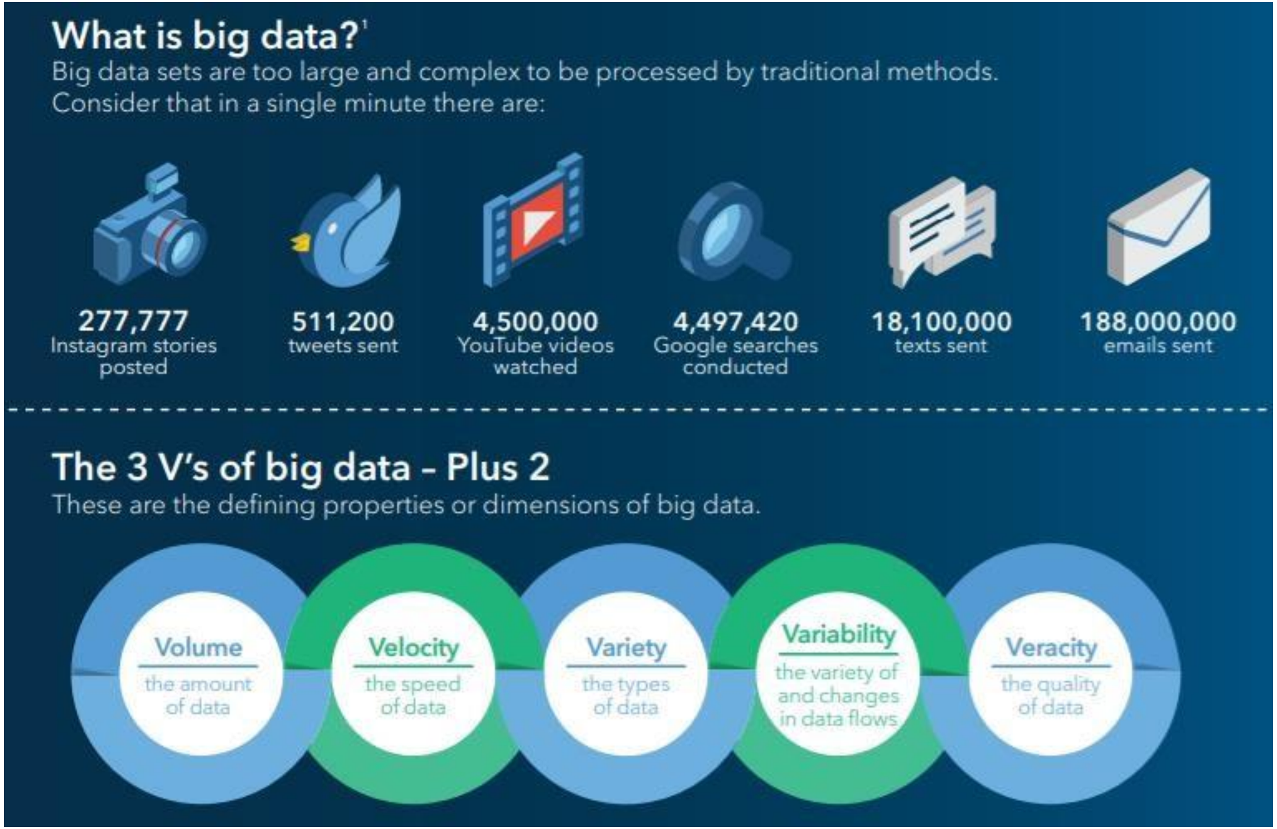
- Increase in the quality of medical work
- Reduction of costs
- Increasing the effectiveness and efficiency of the practice organization
- Strengthening of competitiveness and better use of training and further education offers

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



Source: [https://www.sas.com/content/dam / SAS / documents / infographi cs / 2019 / en-big-data- _110869.pdf retrieved at the](https://www.sas.com/content/dam/SAS/documents/infographics/2019/en-big-data-110869.pdf) 03/01/2021

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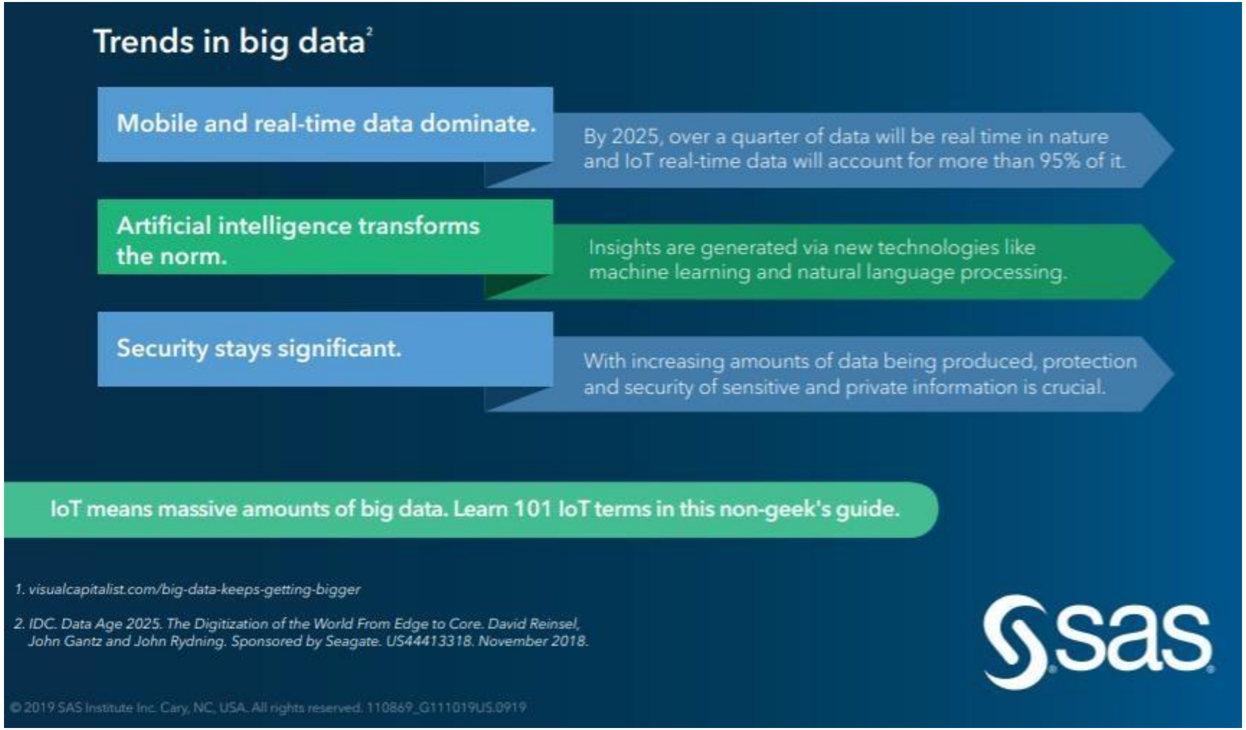


Source: https://www.sas.com/content/dat the/S.A.S./dOcumen_ts / infographics / 2019 / en-big-data-110869.pdf retrieved at the 03/01/2021

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

Source:
https://downloads.healthcatalyst.com/wp-content / uploads / 2014/02 / HAAM.jpg
(retrieved at the 01.03.2021)

3.4 INFORMATION SECURITY
CONFIDENTIALITY - AUTHENTICITY - INTEGRITY

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

3.4 INFORMATION SECURITY
CONFIDENTIALITY - AUTHENTICITY - INTEGRITY

Authenticity

- 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

3.4 INFORMATION SECURITY
CONFIDENTIALITY - AUTHENTICITY - INTEGRITY

Authenticity

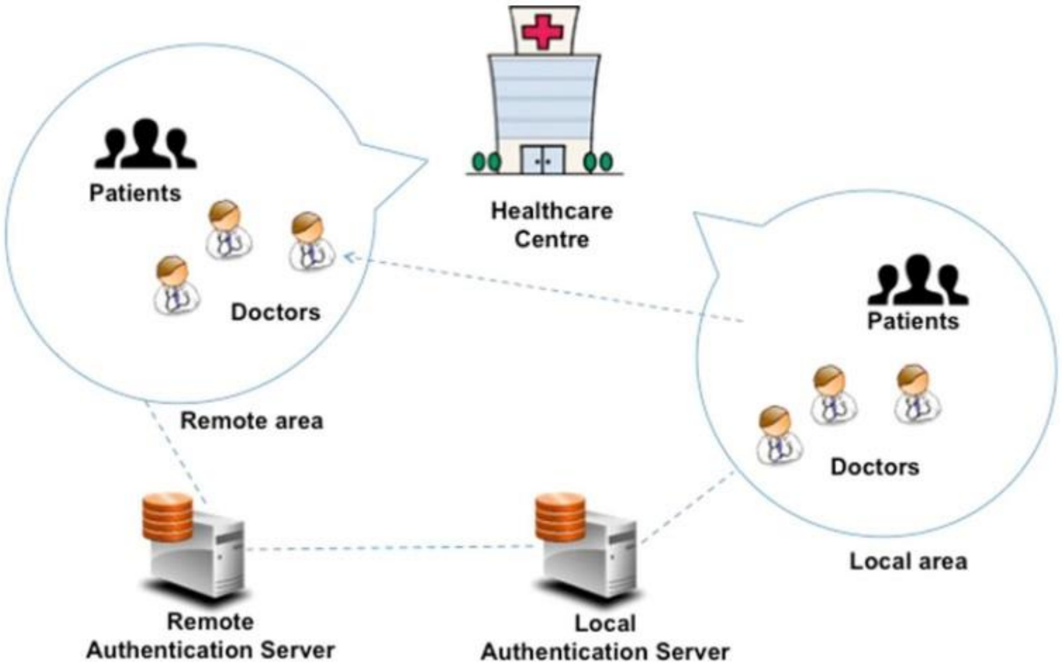
If, for example, electronic documents are stored in a cross-institutional electronic patient file, users who view this file at a later time must also be able to verify the authenticity of documents stored in it.

3.4 INFORMATION SECURITY
CONFIDENTIALITY - AUTHENTICITY - INTEGRITY

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.

3.4 INFORMATION SECURITY
CONFIDENTIALITY - AUTHENTICITY - INTEGRITY



Source: https://www.evolis.com/markets/card-printing/electronic-signatures-healthcare-facilities-printing. retrieved on 01.02.2021

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)

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