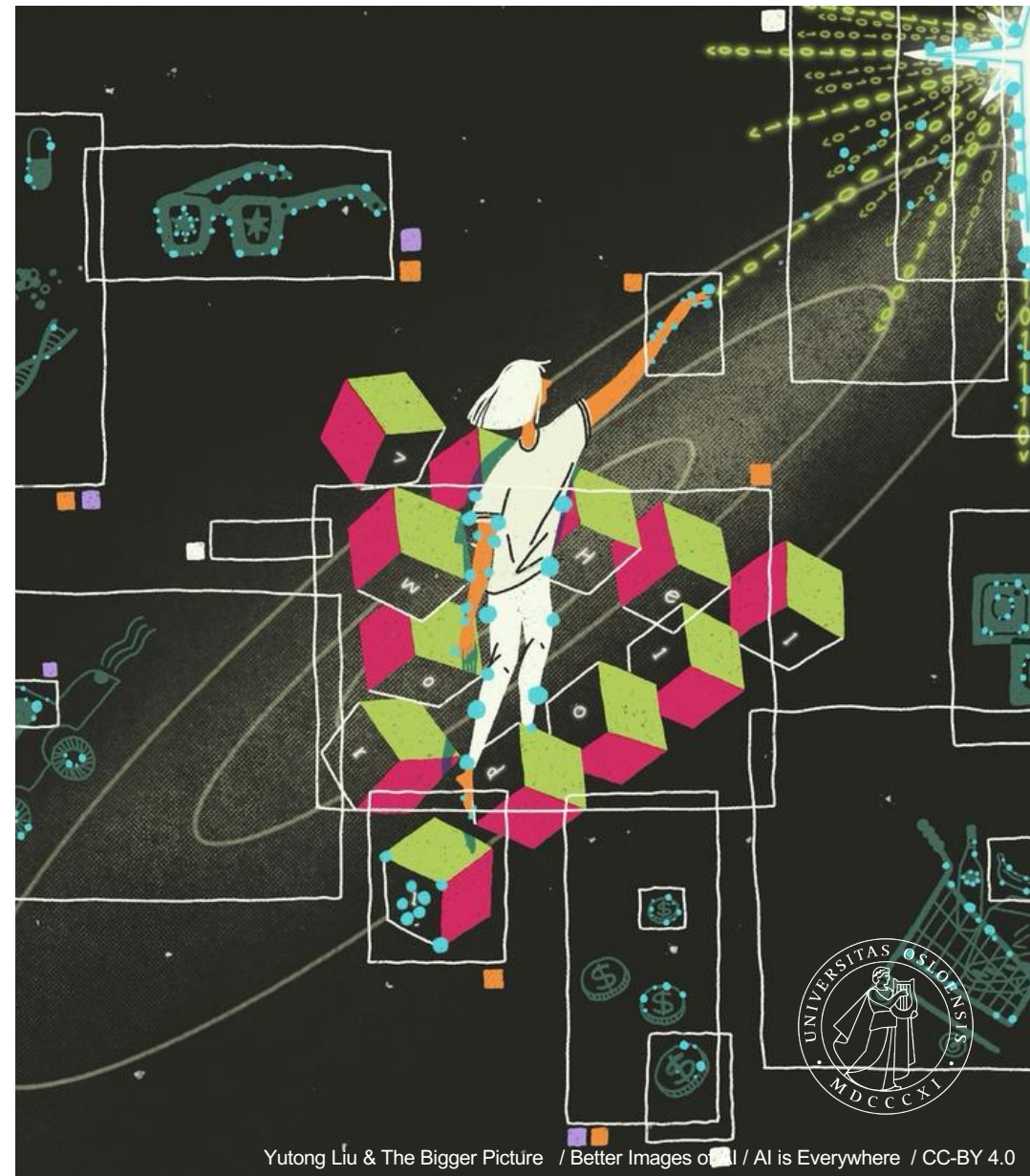


UNIVERSITY OF OSLO

Data and Digital Technology IN5090 – Lecture 2

Alexander Kempton
Associate Professor, Information Systems
Department of Informatics



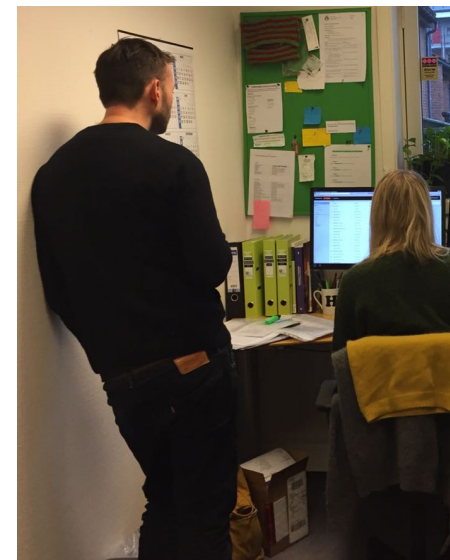
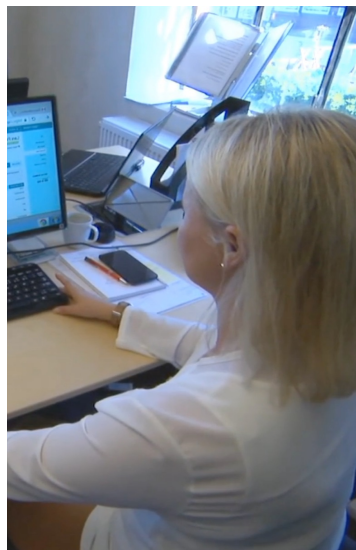
Yutong Liu & The Bigger Picture / Better Images of AI / AI is Everywhere / CC-BY 4.0

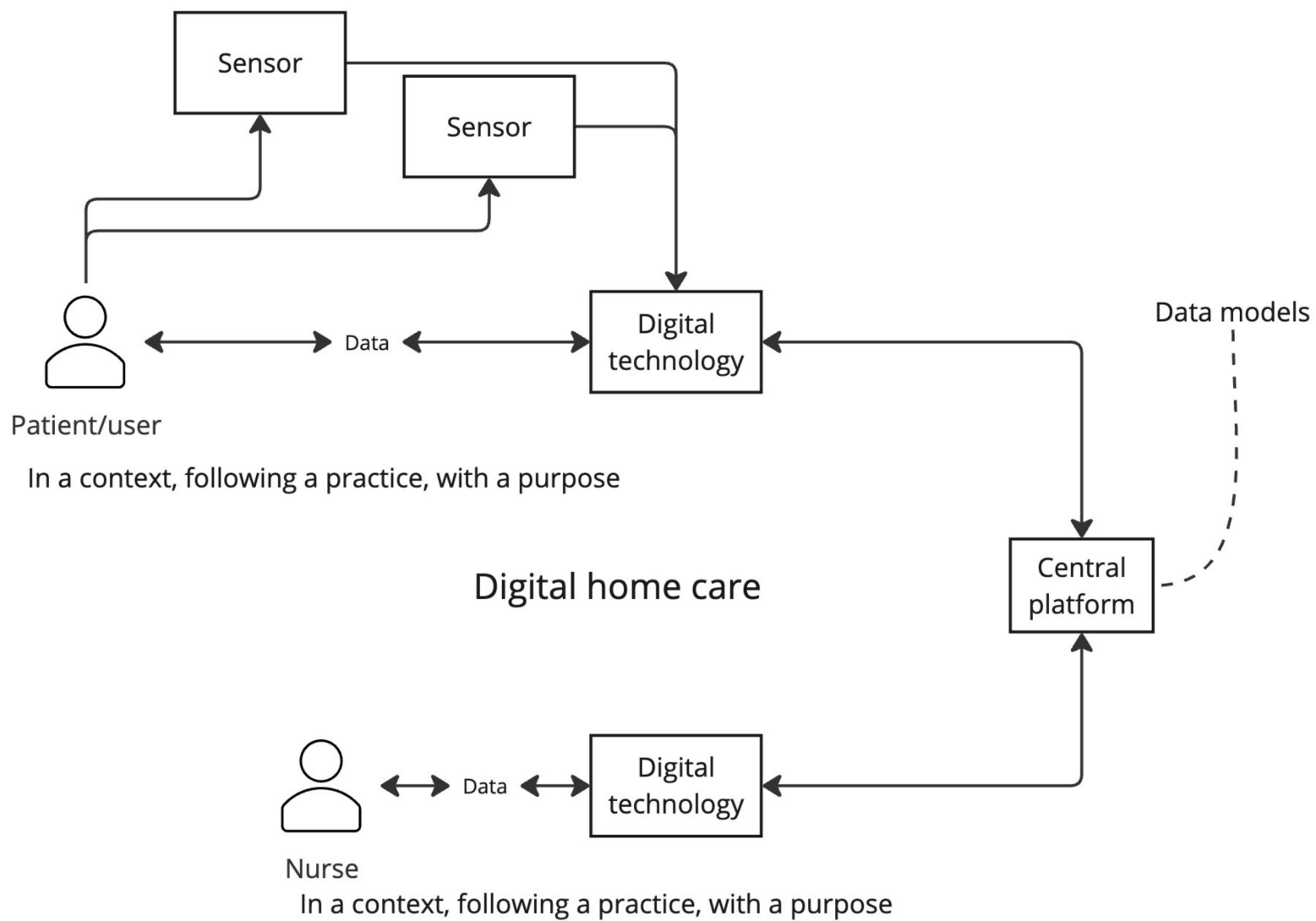
Agenda

- To complementary perspective on data
- Two example cases:
 - Remote care
 - Diabetic retinopathy (DR)
- Apply perspectives to DR case

Today's papers:

- Jones 2019: What we talk about when we talk about (big) data
- Oborn: Unity in Diversity: Electronic Patient Record Use in Multidisciplinary Practice





Grisot, M., Kempton, A., Hagen, L., & Aanestad, M. (2019). Data-work for personalized care: Examining nurses' practices in remote monitoring of chronic patients. *Health informatics journal*, 25(3), 608-616.

CREATE REPORT

CREATE REPORT

ALL MEASUREMENTS

TEMPERATURE

BLOOD PRESSURE

GLUCOSE

BODY WEIGHT

OXYGEN

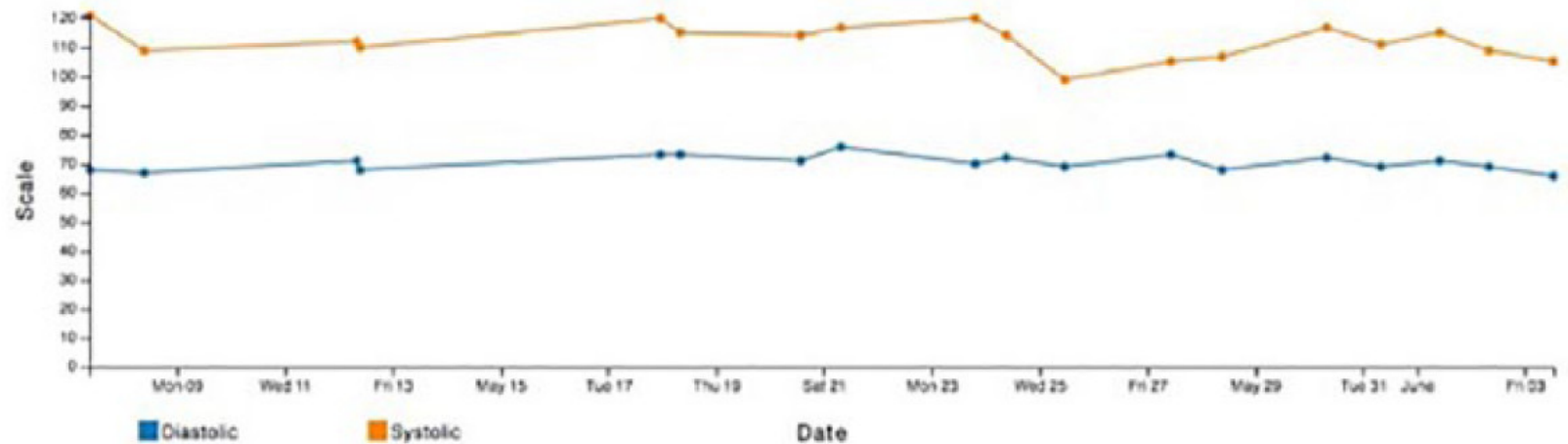
PULSE

FEV1

PEF

SURVEY

MS SENSOR



TYPE	VALUE (SYSTOLIC)	VALUE (DIASTOLIC)	TIME
blood_pressure	105	66	03/06/2016 12:27
blood_pressure	109	69	02/06/2016 07:45
blood_pressure	115	71	01/06/2016 09:46
blood_pressure	111	69	31/05/2016 07:33
blood_pressure	117	72	30/05/2016 07:20
blood_pressure	107	68	28/05/2016 08:59
blood_pressure	105	73	27/05/2016 10:13



DASHBOARD

EMPLOYEES

PATIENTS

ZONES

LOGS

SETTINGS

IMPORTANT
NUMBERSSupport
699 55 520



DASHBOARD

EMPLOYEES

PATIENTS

ZONES

LOGS

SETTINGS

IMPORTANT
NUMBERSSupport
699 55 520

BACK

NOTE

SMS

REMINDER

Anders A Andersen

18040853061

Svingen 1

City centre, East

MOBILE +4748043053

hakon+anders@dignio.com

The diagnostic process is the method by which health professionals select one disease over another, identifying one as the most likely cause of a person's symptoms. Symptoms that appear early in the course of a disease are often more vague and undifferentiated than those that arise as the disease progresses, making this the most difficult time to make an accurate diagnosis. Reaching an accurate co... [READ MORE](#)

NOTIFICATIONS

HISTORY

NOTES

DEVICES

FORWARD

TASKS

SURVEY

PERSONAL

+ ADD SURVEY

SURVEY	DESCRIPTION	# QUESTIONS	THRESHOLDS	TASK LIST
Long survey	The purpose of this survey is to test a long english survey	1. Did you take your medications today? 2. If you were asked to describe the quality of sleep last night, how would you rate it on a scale from 1 to 10 where 1 is very poor sleep and 10 is very good sleep. 3. Did you walk for at least 30 minutes today? 4. You were given a number of dietary advice from your family doctor. How would you rate your compliance to the advice on a scale from 1 to 10, where 1 indicates poor compliance and 10 indicates full compliance. 5. Did you shower today? 6. Did you get up and got dressed before 9.00 this morning?		Daily
Short survey		1. Did you have a walk today?		Daily

Two complementary perspectives on
data and digital technology:

structured (technical)

and

dynamic (sociotechnical)

Structured perspective

Descriptions of how data is or should be stored and processed

Structured perspective

Data model: a representation of the structure, relationships, and constraints of data in a system

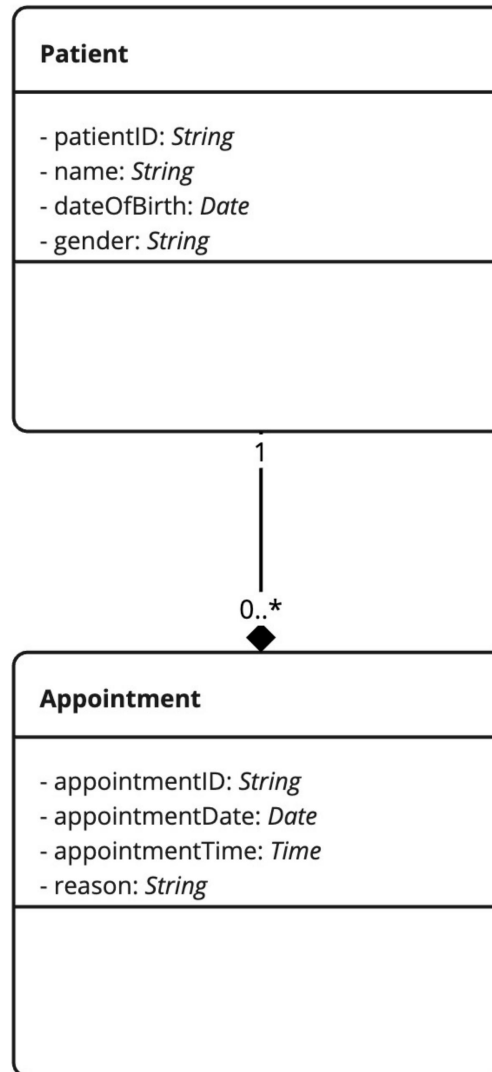
Data architecture: high-level design for processing of data across system

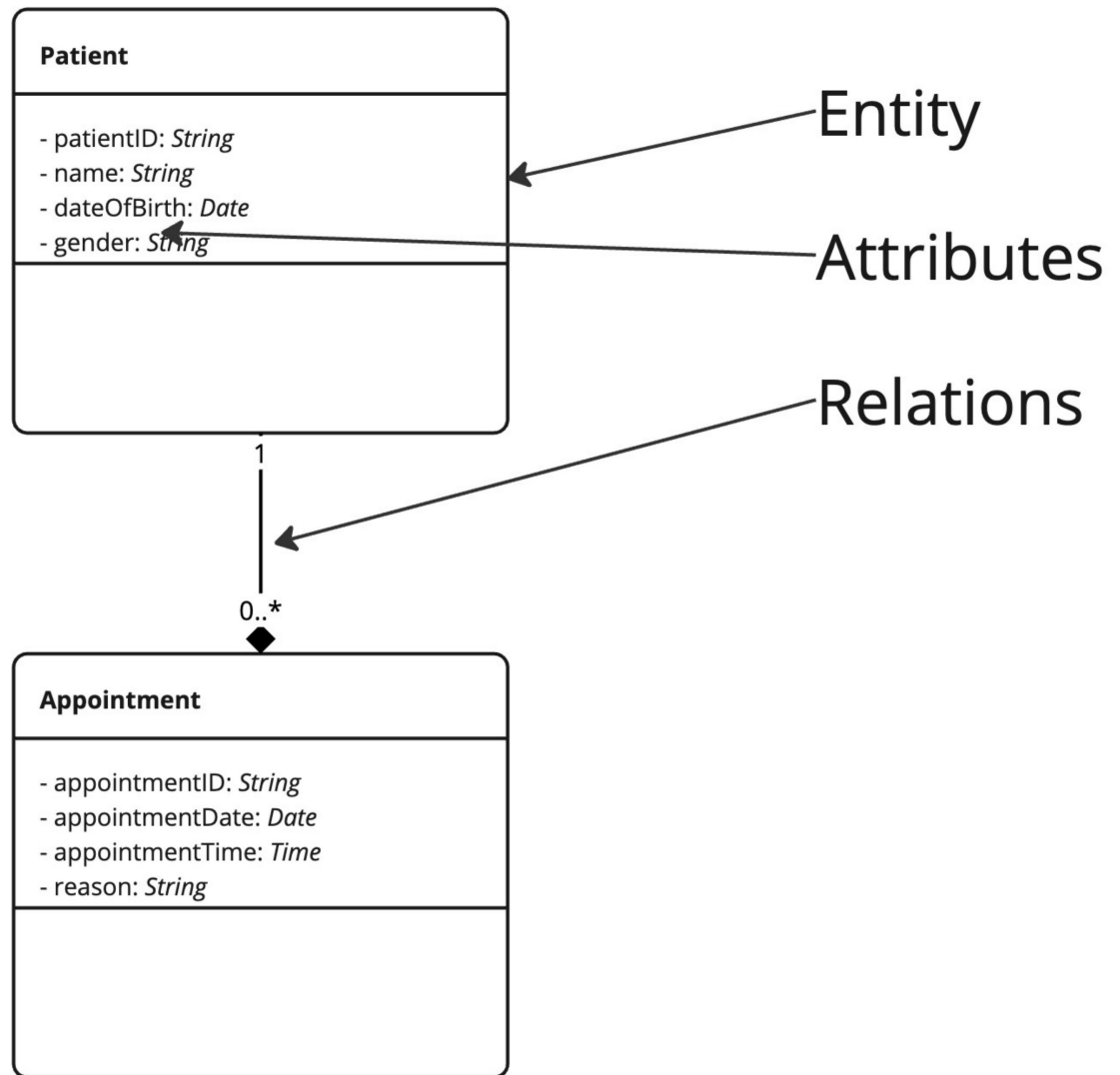
Data standards: agreed-upon set of rules, guidelines, or specifications that define how data should be structured, stored, exchanged, and interpreted within and across systems

Data model

A formal representation of the structure, relationships, and constraints of data in a system

Purpose: Typically to model an object or an event so that a digital technology can process information about them

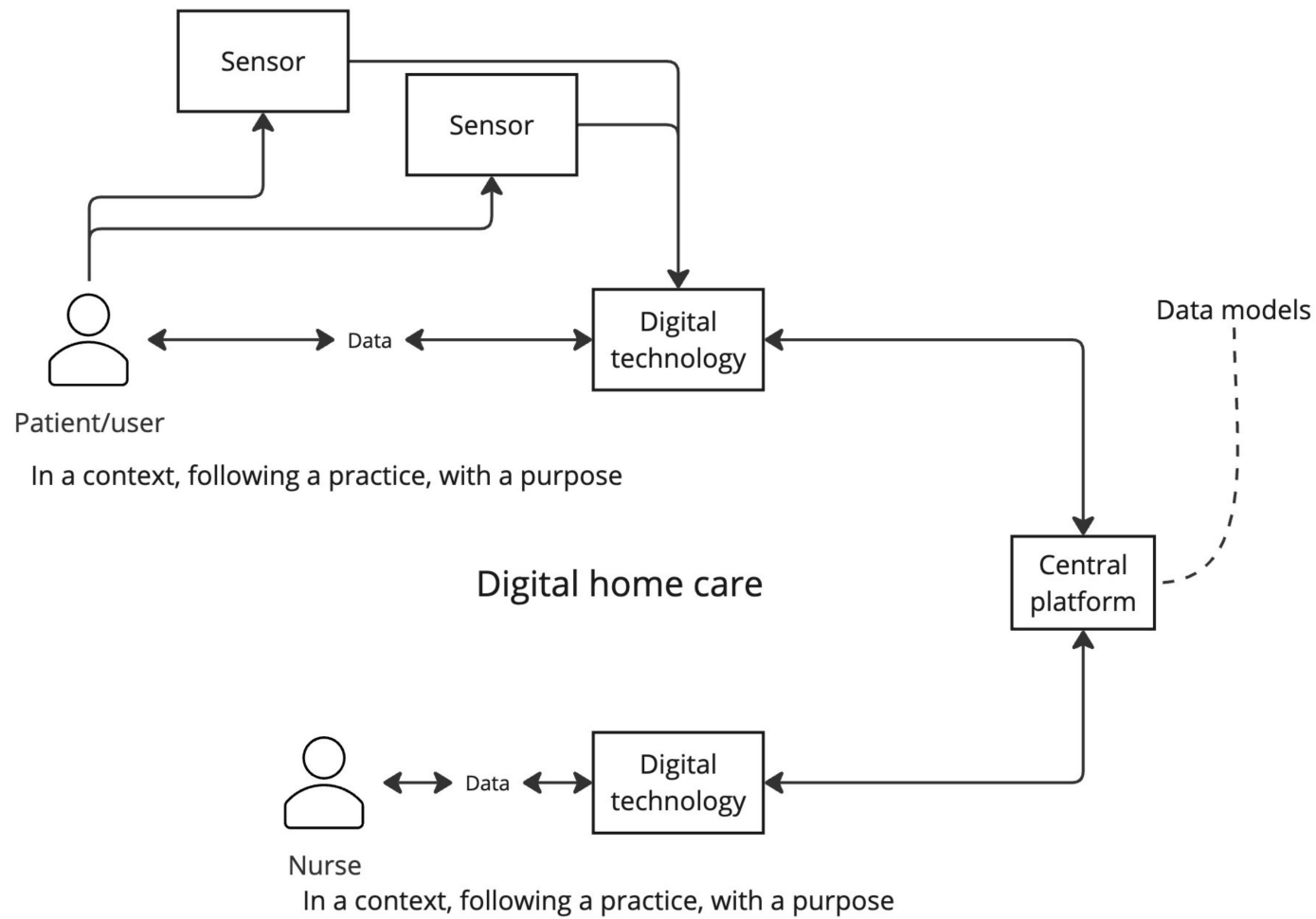


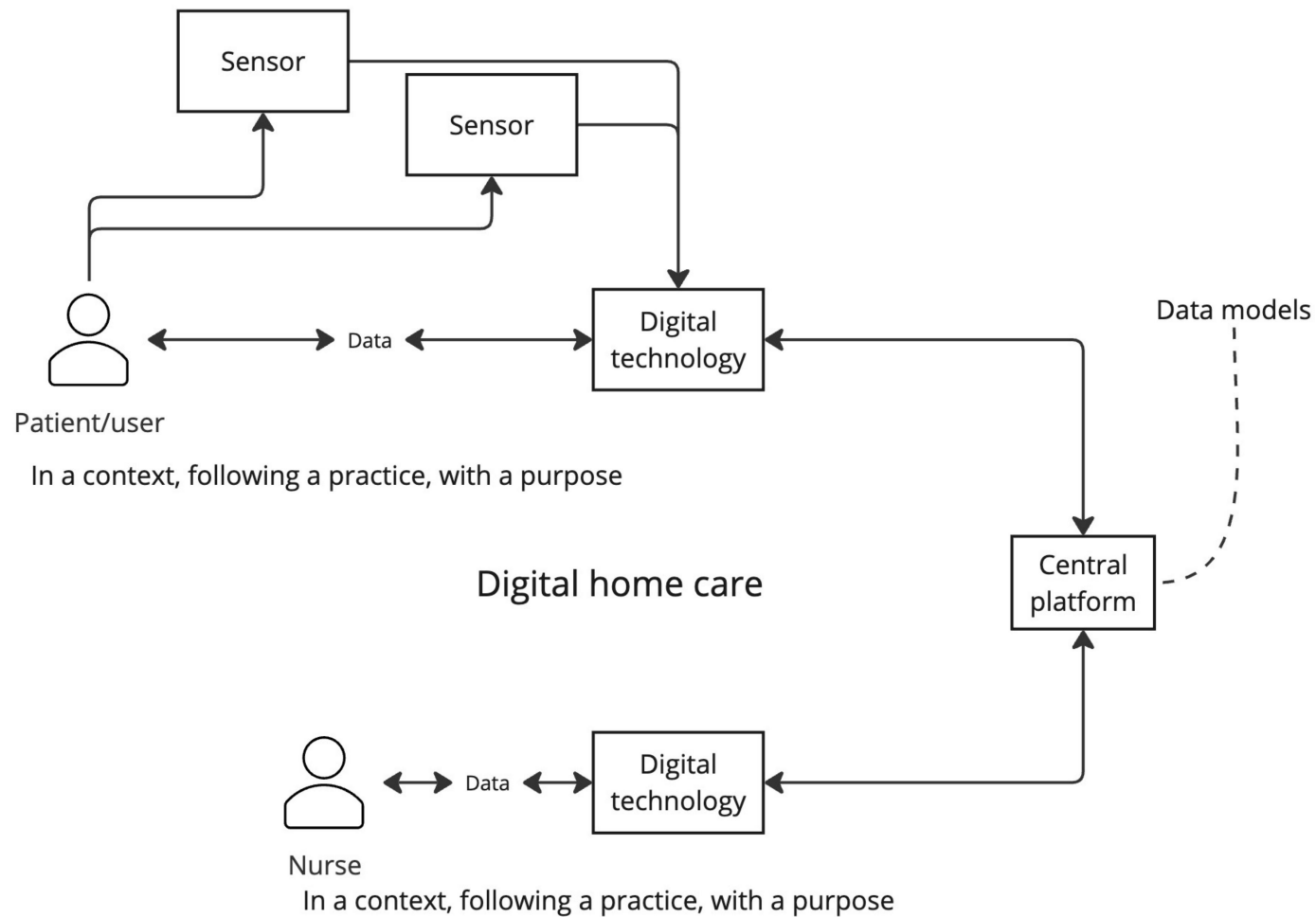


Data architecture

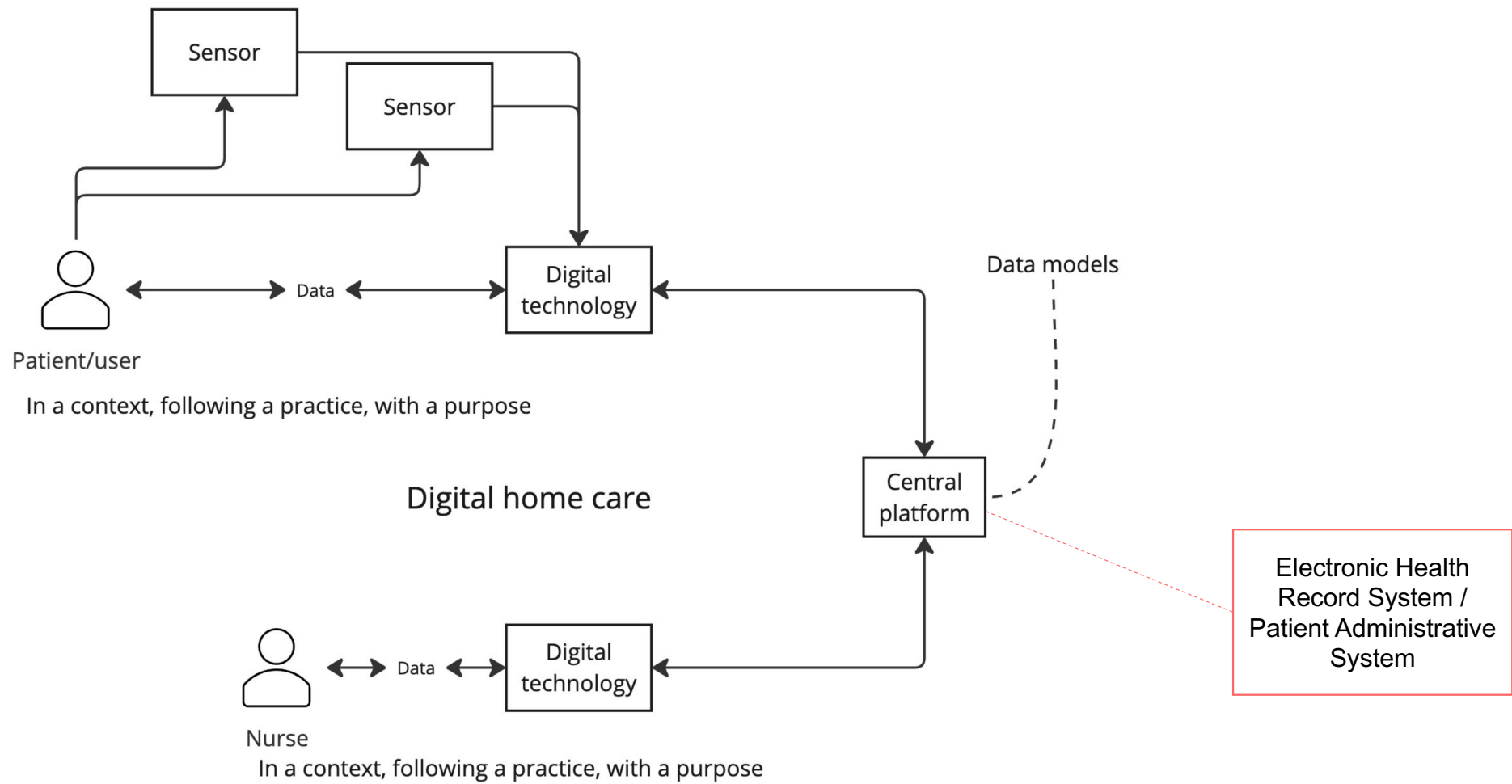
High-level design for processing of data across system

Purpose: Principles and modularization of data across systems





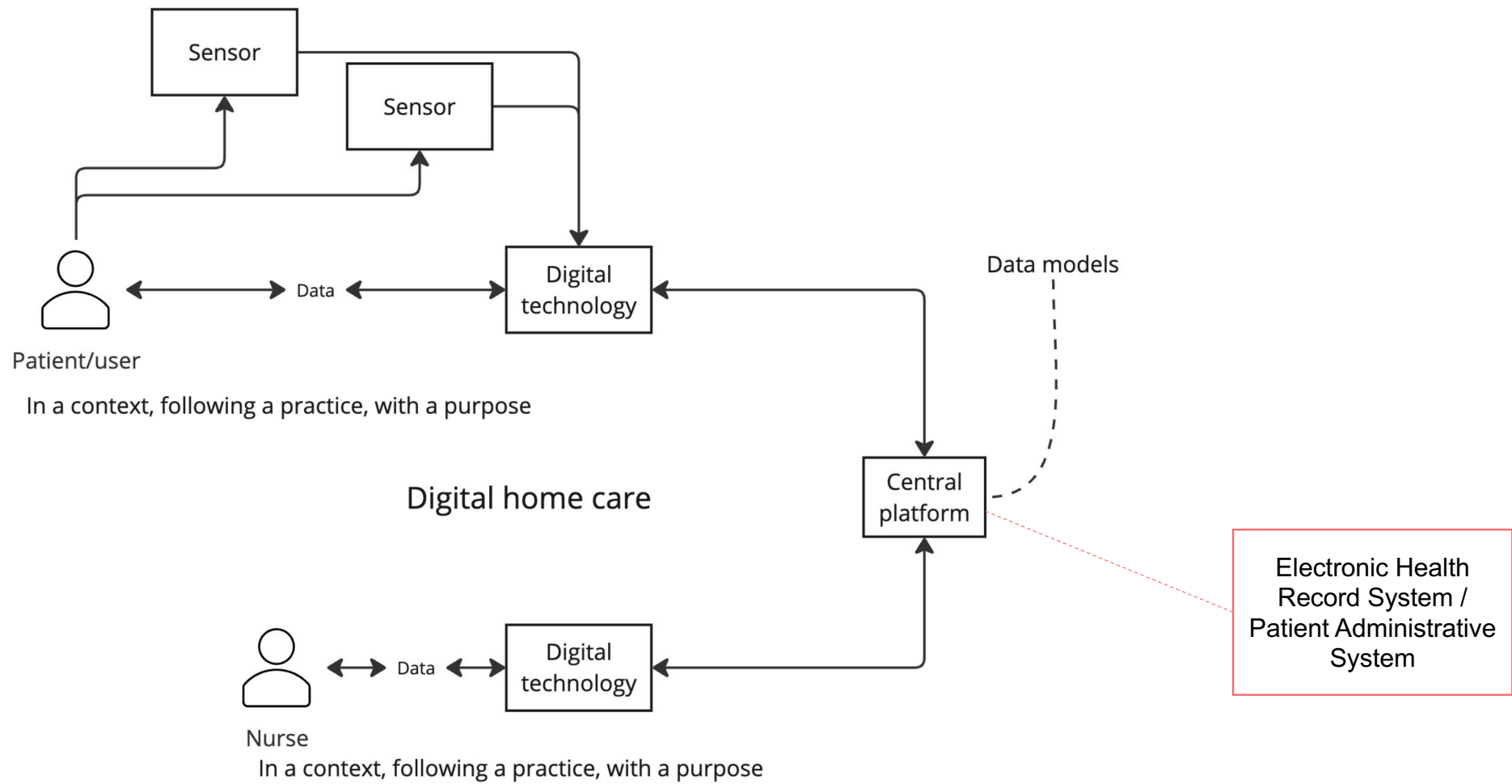
Electronic Health
Record System /
Patient Administrative
System



Data standards

Agreed-upon set of rules, guidelines, or specifications that define how data should be structured, stored, exchanged, and interpreted within and across systems

Purpose: Enable interoperability between systems



Data standards



[Forsiden](#)

Anbefaling om bruk av HL7 FHIR for datadeling

Nasjonal veileder



Denne veilederen ble utarbeidet av Direktoratet for e-helse, og vil bli oppdatert som en del av arbeidet

- 1 Om veilederen
- 2 **Anbefaling**
- 3 Om datadeling
- 4 Kort om hva FHIR er
- 5 Hvorfor FHIR anbefales for datadeling
- 6 Referanser
- 7 Endringshistorikk

Søk i nasjonal veileder

1. Om veilederen

2. Anbefaling

```
{
  "resourceType": "Patient",
  "id": "example-001",
  "identifier": [
    {
      "system": "http://hospital.example.org/patients",
      "value": "23018828945"
    }
  ],
  "name": [
    {
      "family": "Nordmann",
      "given": ["Ola"]
    }
  ],
  "birthDate": "1985-03-15",
  "gender": "male"
}
```

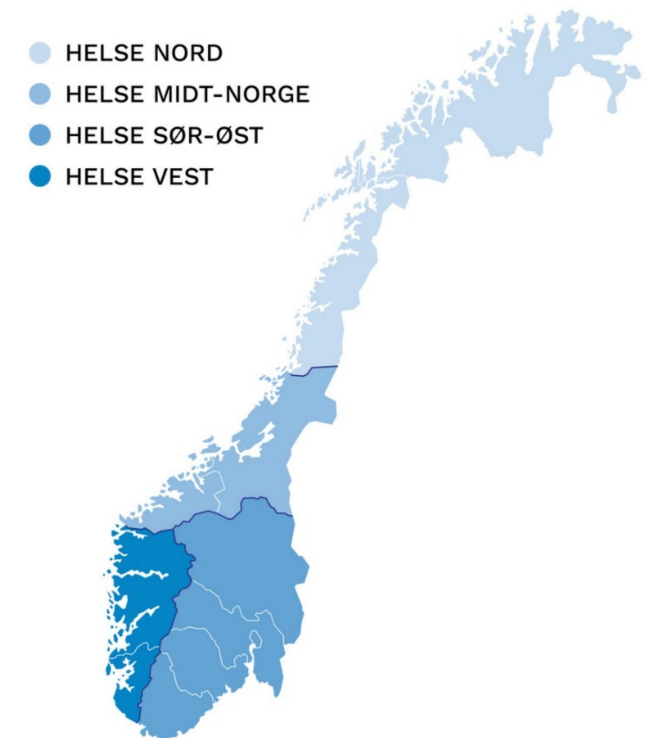
Structured perspective is key to design of digital technologies

What data is required and how this data related to other data?

How can this data be efficiently stored and processed in the technology and transferred between them?

OpenEHR and DIPS Arena

- OpenEHR - a framework for data modelling
- Used in development of DIPS from 2011
- National committees
- arketyper.no



The screenshot shows the DIPS Arena patient record for GUNDERSEN, Roland (150763-05663, 56 år, Mann). The interface includes a patient summary at the top, a list of journal groups on the left, and a detailed view of the 'Arera Sykemelding' (Sick Leave) on the right.

Journalgruppe	Dokument	Sortering	Åpnet	Gruppering	Ingen
30. nov 2021 kl 13:06	KIR	Arera Sykemelding	Arera Sykemelding		
25. nov 2021 kl 14:33	KIR	Digital sykemelding	Digital sykemelding		
05. nov 2021 kl 13:28	KIR	Epileptisk polioetisk - Arera	Epileptisk polioetisk - Arera		
05. nov 2021 kl 13:28	KIR	Epileptisk SO UH	Epileptisk SO UH		
05. nov 2021 kl 13:28	KIR	Pasientover - innstilling	Pasientover - innstilling		
05. nov 2021 kl 13:28	KIR	Legg - innstilling	Legg - innstilling		
05. nov 2021 kl 13:28	KIR	Vaksinasjon Denna	Vaksinasjon Denna		
05. nov 2021 kl 13:28	KIR	Vaksinasjon Denna	Vaksinasjon Denna		
07. apr 2021 kl 09:22	KIR	Nutall koordinert leggesjournal	Nutall koordinert leggesjournal		
25. mar 2021 kl 13:23	KIR	Epileptisk SO UH	Epileptisk SO UH		
25. mar 2021 kl 13:23	KIR	Epileptisk SO UH	Epileptisk SO UH		
25. mar 2021 kl 13:23	KIR	Epileptisk SO UH	Epileptisk SO UH		
12. jan 2021 kl 13:03	KIR	Epileptisk SO UH	Epileptisk SO UH		
28. okt 2021 kl 12:39	KIR	Digital sykemelding	Digital sykemelding		
08. okt 2021 kl 13:16	KIR	Tarmkreft	Tarmkreft		
08. okt 2021 kl 13:16	KIR	DM Karskaper	DM Karskaper		
16. sep 2021 kl 13:04	KIR	Karfeiring - Sidsle vasker	Karfeiring - Sidsle vasker		
07. sep 2021 kl 13:04	KIR	Karfeiring - Sidsle vasker	Karfeiring - Sidsle vasker		
07. sep 2021 kl 13:04	KIR	Diagnosestilling til fyllingskompette	Diagnosestilling til fyllingskompette		

Arera Sykemelding
Denna, Marianne | Sykemelding | Dag, kl 13:06

Sykemelding
Når 100 % sykemelding som pasienter 0, 17 eller 39 uker, skal utstedt sykemelding fylles ut.
Vi du opprette utstedt sykemelding?

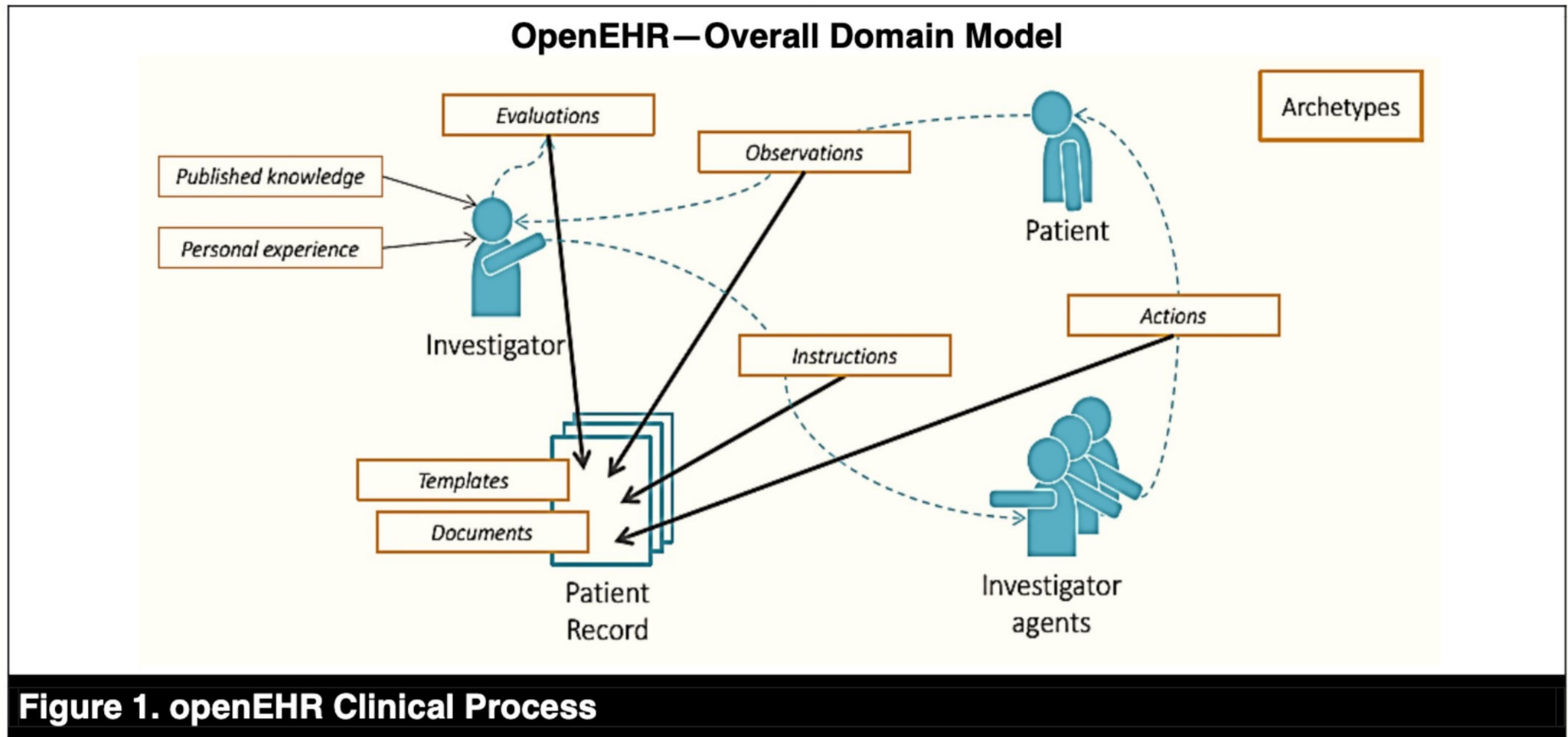
6 Når startet det sykemeldte fraværet? 30. nov 2021

1 Pasientopplysninger	2 Arbeidsgiver
1.1.1 Etternavn Gundersen	2.1.1 Fødselsår En arbeidsgiver
1.1.2 Fødselsår 1957/10/16	2.2.1 Arbeidsgiver for denne sykemeldingen Arera
1.2.1 Fødselsnummer 15076305663	2.2.1 Varslingsfor dette sykemeldings Arera
1.3.1 Tittel 100 %	2.4.1 Tilleggsinformasjon 100 %
1.4.1 Navn på pasientens fyllingskompette Fyllingskompette	

3 Diagnose
Kodepasienter 10-10
[Link til arketyper.no](#)

3.1 Hoveddiagnose	3.1.1 Diagnose (aktuell kontakt)
✓ Sidsle kreftsyndrom fra aktuell kontakt (E400)	3.1.2 Diagnose (aktuell kontakt) Aktuelt Underernæring

3.2 Biddiagnose
3.2.1 og 3.2.2 Kode og diagnose (E400) Middel underernæring



Silsand, L., & Ellingsen, G. (2014). Generification by translation: designing generic systems in context of the local. *Journal of the Association for Information systems*, 15(4), 3.

Blood pressure

LATEST REVISION / LATEST PUBLISHED | 10 [2.0.9]

ADIP

English

Header

Attribution

Data

State

Protocol

Events

Reference model

Concept Name

Blood pressure
[SNOMED-CT(2003)::364090009 | Systemic arterial pressure]

Concept Description

The local measurement of arterial blood pressure which is a surrogate for arterial pressure in the systemic circulation.
Comment: Most commonly, use of the term 'blood pressure' refers to measurement of brachial artery pressure in the upper arm.

Keywords

observations, measurement, bp, vital signs, mean arterial pressure, pulse pressure, systolic, diastolic, RR, NIBP

Purpose

To record the systemic arterial blood pressure of an individual.

Use

Use to record all representations of systemic arterial blood pressure measurement, no matter which method or body location is used to record it.

The archetype is intended to capture blood pressure measurements in all clinical scenarios - for example:

- self-measurement with a home blood pressure machine;
- an emergency assessment of systolic using palpation and a sphygmomanometer;
- measurements taken in clinical consultations or during exercise stress testing; and
- a series of measurements made by a machine in Intensive Care.

There is a rich state model that supports interpretation of measurements through identifying patient position, exercise, confounding factors and angle of a tilt table in research.

Named events have been limited to average over a 24 hour period, however templates can further constrain the default 'any event' to cater for specific requirements for blood pressure measurements such as recording Blood Pressure against specific points in time, or over a range of intervals (+/- mathematical functions).

Blood pressure

LATEST REVISION / LATEST PUBLISHED | 10 [2.0.9]

ADIP

English

Header

Attribution

Data

State

Protocol

Events

Reference model

Systolic

Q Quantity
Optional
[SNOMED-CT(2003)::271649006 | Systolic blood pressure]

Peak systemic arterial blood pressure - measured in systolic or contraction phase of the heart cycle.

Property: Pressure
Units: 0.0..<1000.0 mmHg
Limit decimal places: 0

Diastolic

Q Quantity
Optional
[SNOMED-CT(2003)::271650006 | Diastolic blood pressure]

Minimum systemic arterial blood pressure - measured in the diastolic or relaxation phase of the heart cycle.

Property: Pressure
Units: 0.0..<1000.0 mmHg
Limit decimal places: 0

Mean arterial pressure

Q Quantity
Optional

The average arterial pressure that occurs over the entire course of the heart contraction and relaxation cycle.

Property: Pressure
Units: 0.0..<1000.0 mmHg
Limit decimal places: 0

Pulse pressure

Q Quantity
Optional

The difference between the systolic and diastolic pressure.

Property: Pressure
Units: 0.0..<1000.0 mmHg
Limit decimal places: 0

Clinical interpretation

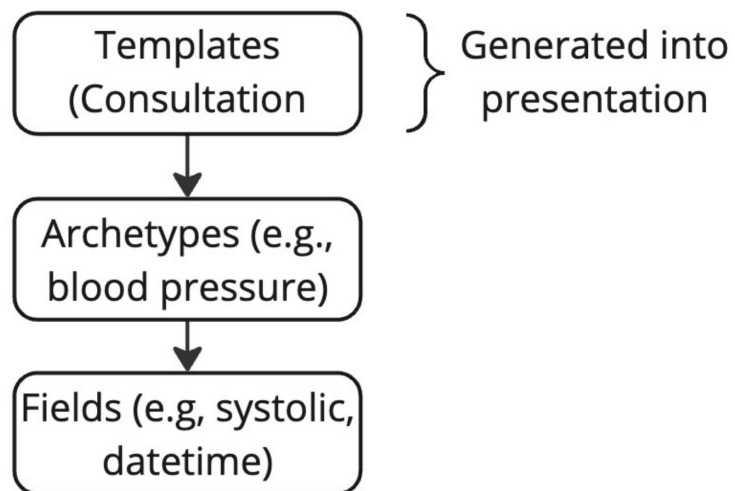
T Text
Optional

Single word, phrase or brief description that represents the clinical meaning and significance of the blood pressure measurement.

Comment

T Text
Optional

Additional narrative about the measurement, not captured in other fields.



Dynamic perspective



Health data is typically produced and used by a person, or by a technology (like a sensor) chosen by a person, in a context, following a practice, with a purpose

Dynamic perspective

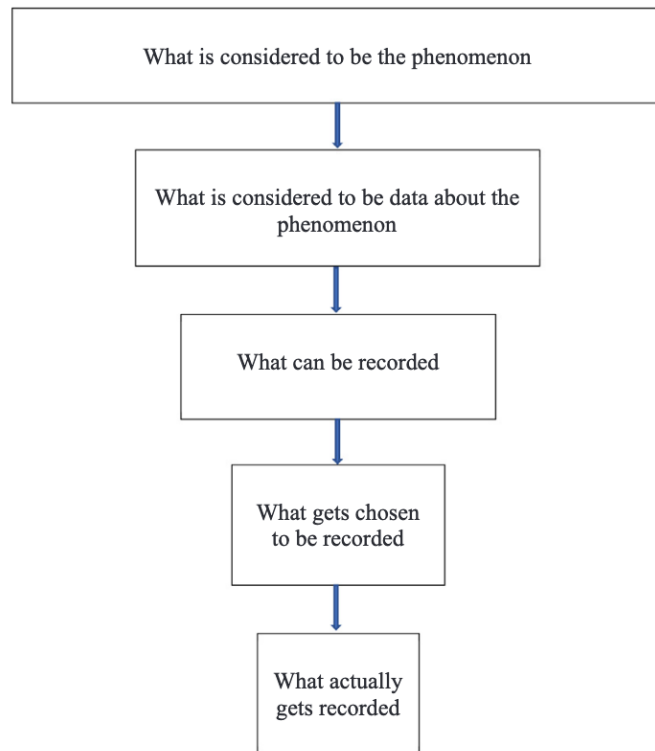


Fig. 2. How data come to be.

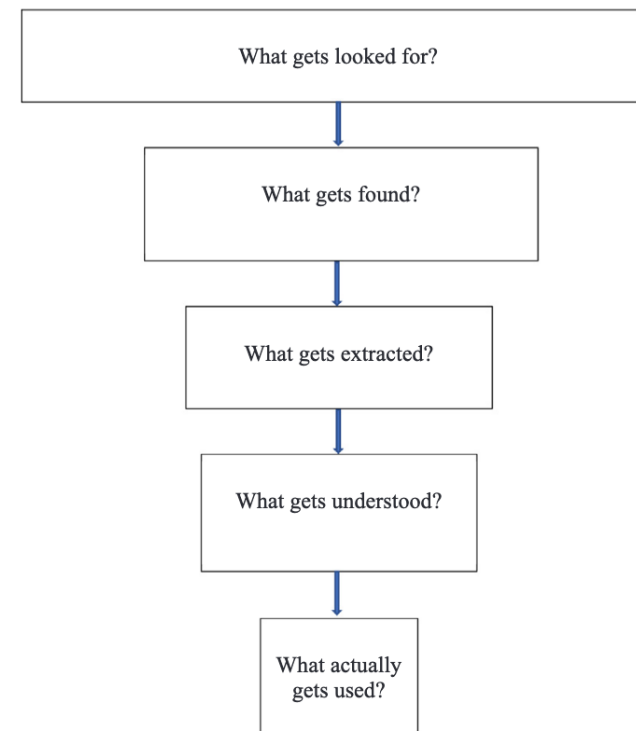
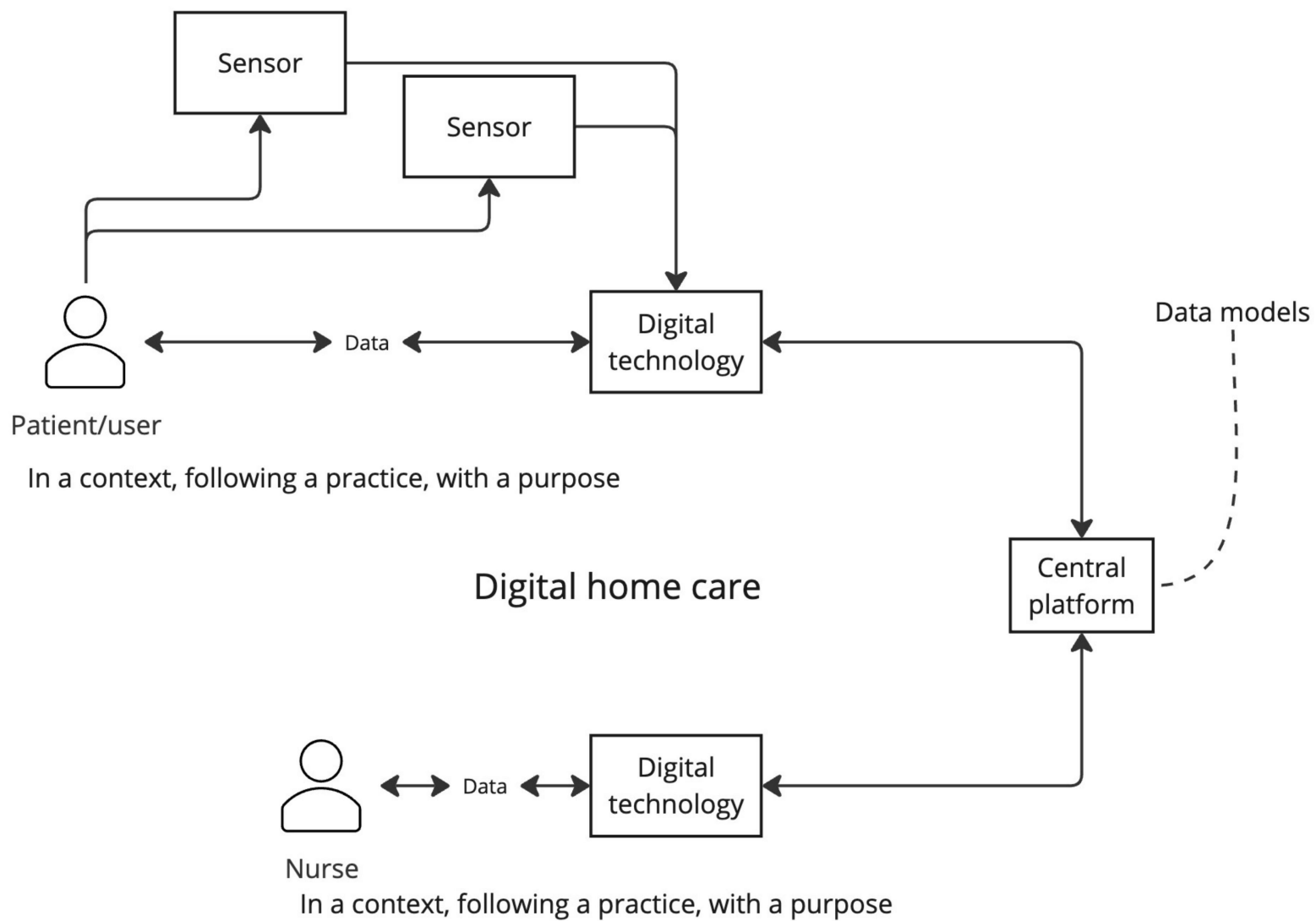


Fig. 3. How data come to be used.



Grisot, M., Kempton, A., Hagen, L., & Aanestad, M. (2019). Data-work for personalized care: Examining nurses' practices in remote monitoring of chronic patients. *Health informatics journal*, 25(3), 608-616.

- Preparatory work
- Continuous adjustment
- Question fine-tuning

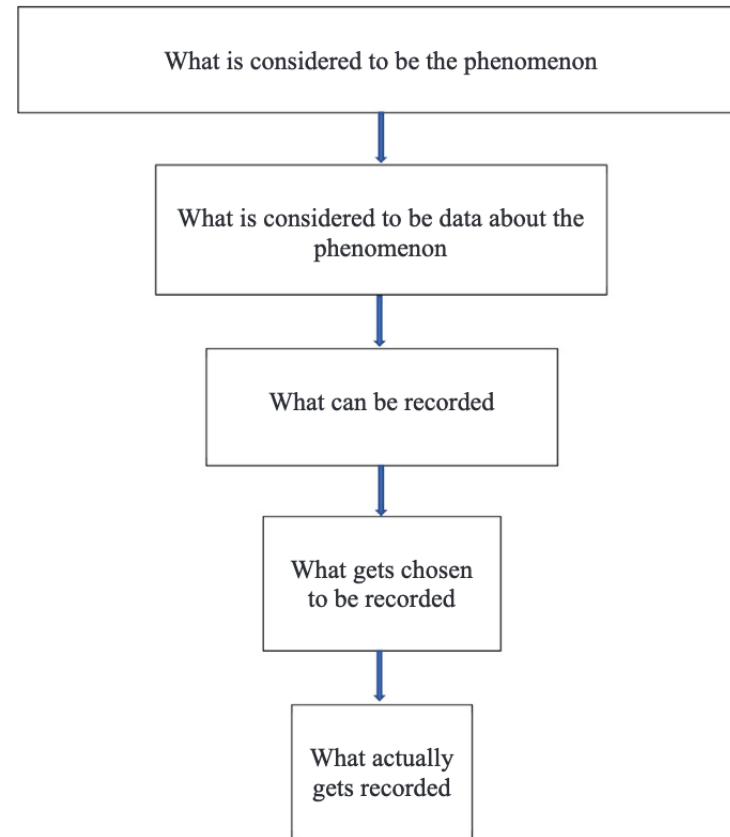


Fig. 2. How data come to be.

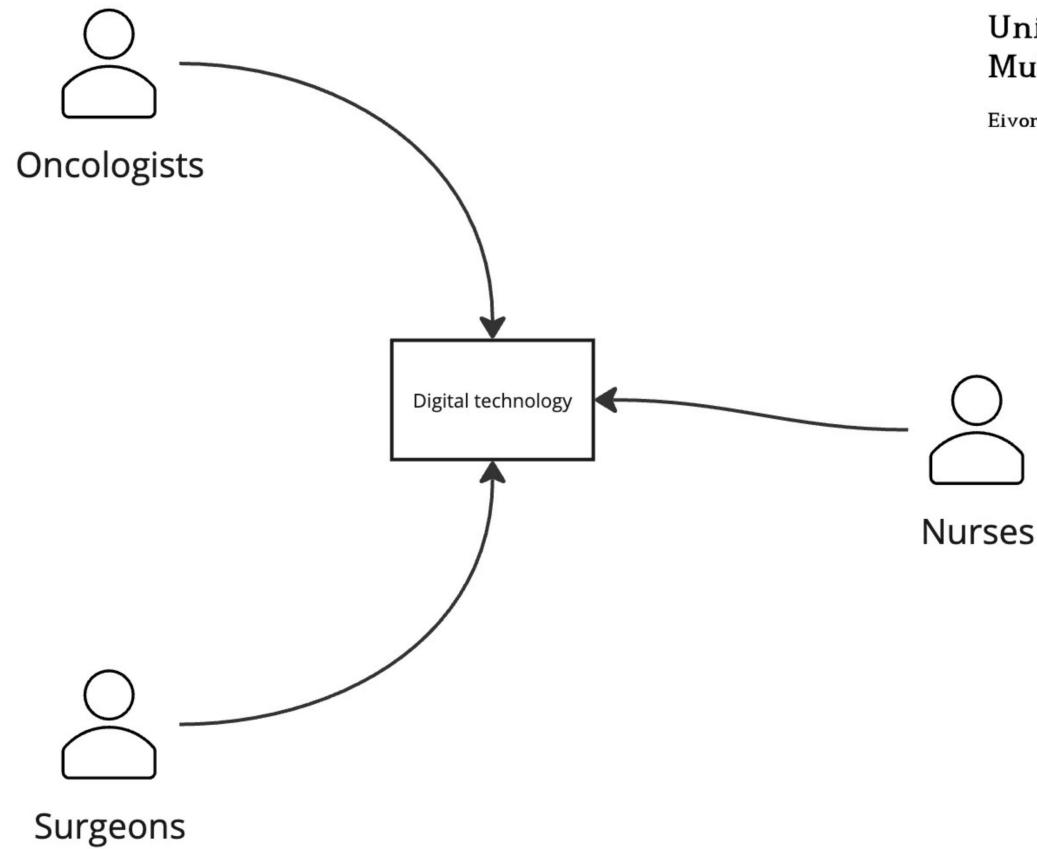
Grisot, M., Kempton, A., Hagen, L., & Aanestad, M. (2019). Data-work for personalized care: Examining nurses' practices in remote monitoring of chronic patients. *Health informatics journal*, 25(3), 608-616.

Information Systems Research

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

Unity in Diversity: Electronic Patient Record Use in Multidisciplinary Practice

Eivor Oborn, Michael Barrett, Elizabeth Davidson,



DR Case

Case: Diabetic Retinopathy Screening

- Diabetes damages small blood vessels in the retina that can lead to blindness. Often asymptomatic until advanced stages
- Early detection enables effective treatment; late-stage disease often causes irreversible vision loss
- Traditional screening requires trained graders and ophthalmologists
- Structured data make diagnosis and treatment for efficient
- Compelling case for AI

Apply a structured perspective: what is relevant through this perspective?

Apply a dynamic perspective: what is relevant through this perspective?

Person, context, practice, purpose

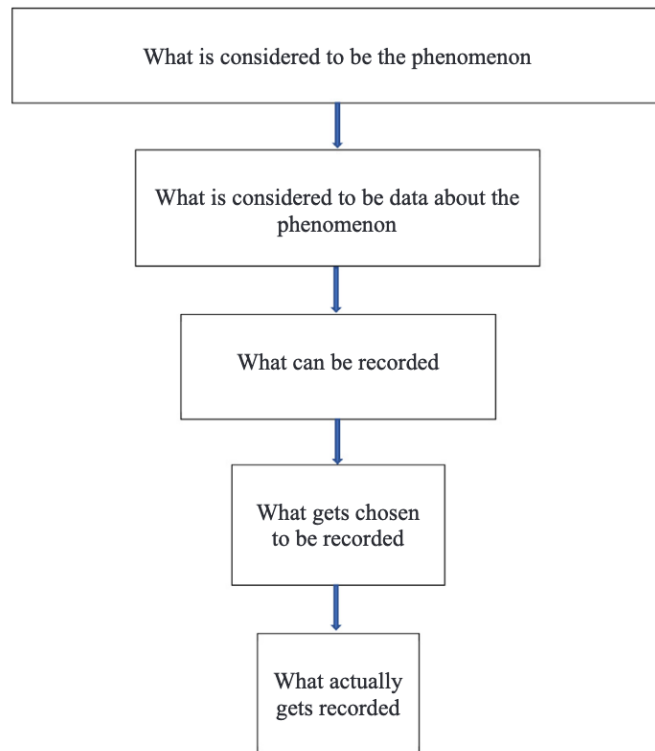


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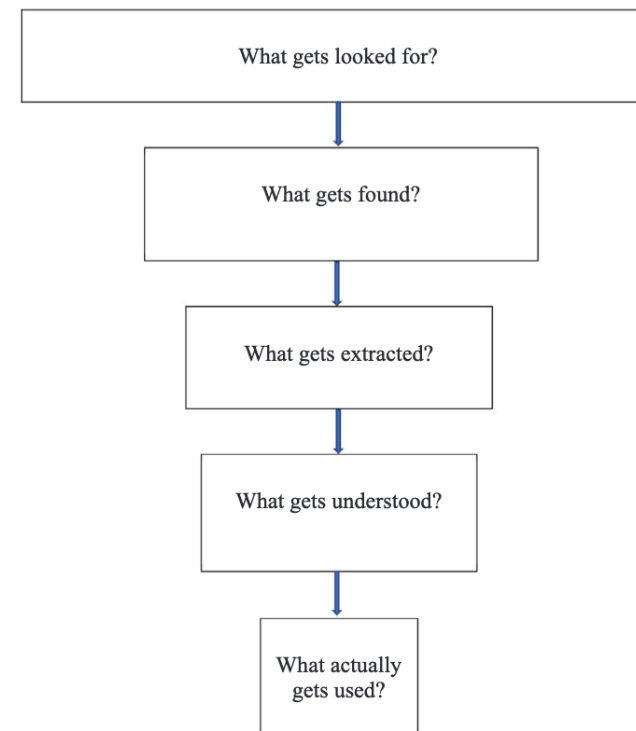


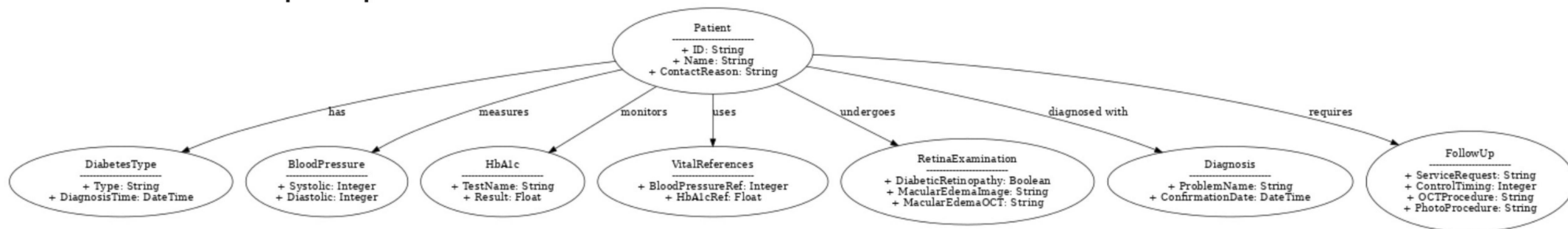
Fig. 3. How data come to be used.

Apply a structured perspective: what is relevant through this perspective?

Apply a dynamic perspective: what is relevant through this perspective?

What did we see from a structured perspective?

A structured perspective



Blodtrykk

→ data

Uspesifisert hendelse Δ [0..*] to [1..1]

→ data

Systolisk

Diastolisk

→ state

→ protocol

HbA1c NAME (from: 'Laboratorieresultat')

→ data

Uspesifisert hendelse Δ [0..*] to [0..1]

→ data

Undersøkelsesnavn Δ Values changed

Undersøkelsesresultat

Analyseresultat Δ [0..*] to [0..1]

Analysenavn Δ Values changed

Analyseresultat Δ Types set changed

→ state

What did we see from a dynamic perspective?

