

Human-Computer Interaction in Health Technology

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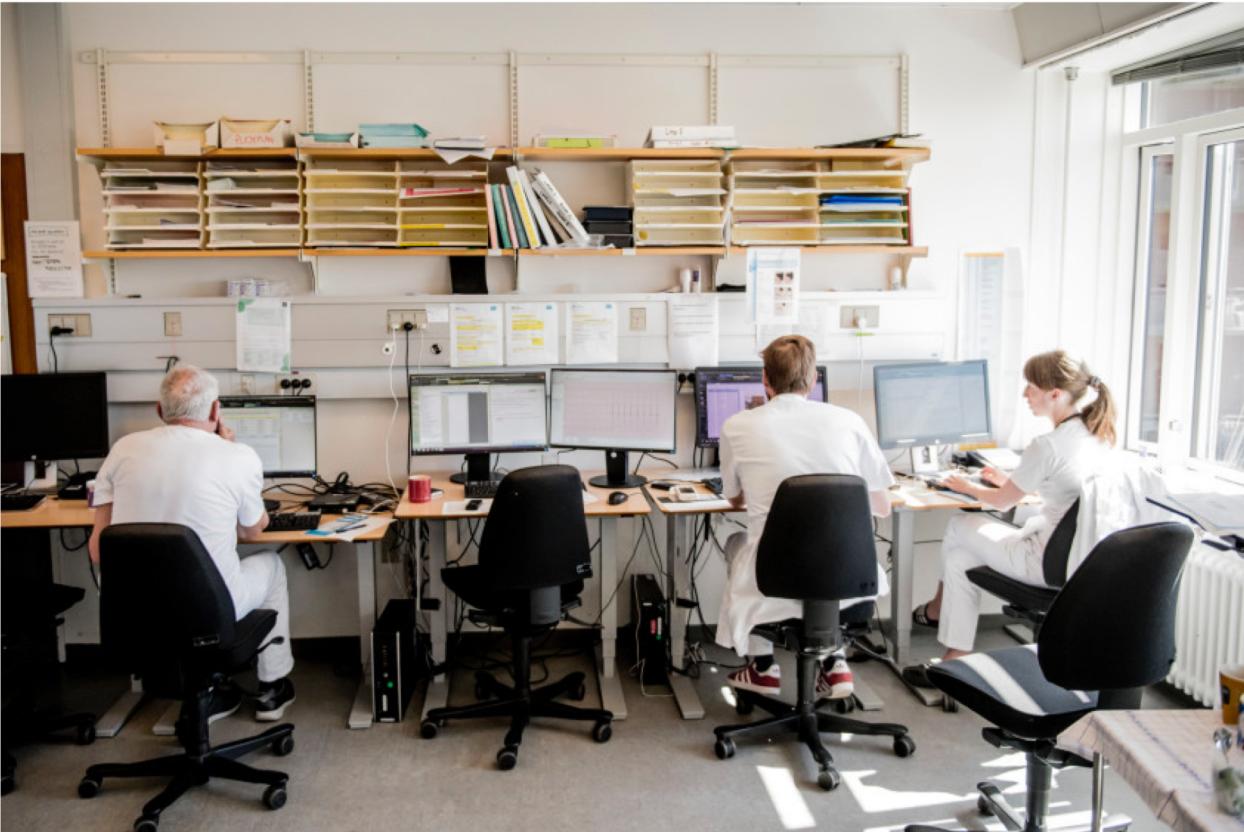




KØBENHAVN

2,5 år med Sundhedsplatformen: Kun tre ud af ti brugere er tilfredse

Overlægeforeningen kalder it-platformen for et "mareridt".



Kun tre ud af 10 mener, at
systemet understøtter
deres arbejde på en
tilfredsstillende måde.
(Foto: ASGER
LADEFOGED © Scanpix)



Kilde: Politiken / Heidi Skibsted og Johannes Skov Andersen

SUNDHEDSPLATFORMEN

Fra 9 til 90 sekunder: Nu skal lægen klikke 32 gange med musen for at bestille en blodprøve

På Gigtklinikken er overlæge Philip Bennett frustreret over alle de oplysninger, som Sundhedsplatformen har tvunget ham til at indtaste.

Philip Bennett, der er overlæge på Gigtklinikken på Gentofte Hospital, viser, hvordan han tidligere gjorde, når han skulle bestille en blodprøve. Han sætter tre kryds'er på et ark papir, skriver sine initialer og noterer, at patienten skal have en ny tid om to måneder.

Det tog 9 sekunder.



MEST LÆST

Skiløber knuste dans nu er ulykken blevet principiel norsk rets

Trumps tidligere adv med skarp: »Han er en bedrager. Han er en svindlere»



I efteråret 2017 indføres Sundhedsplatformen i Regi

Det bekymrer mig alvorligt, at sundhedsplatformens tidsrøveri vil begrænse min mulighed for at betjene så mange patienter som muligt bedst muligt

Bedre kvalitetskontrol og bedre mulighed for statistikker kan utvivlsomt være til stor gavn, men prisen synes at blive alt for høj.

DEBATINDLÆG 1. MAJ 2017 KL. 20.56

PETER MARCKMANN
Læge

*Dette er et debati
holdninger, som*

rammer, er velkomne, og du kan også sende os din mening [her](#).



Arkivfoto: Jens Dresling/POLFOTO

Indførelsen af Sundhedsplatformen i Region Hovedstaden har efter mange lægers mening ført til at for meget tid bag skærmen.

Dette er en Kronik. Kroniken er udtryk for skribentens holdning. Du kan indsende Kronik-forslag [her](#).

KRONIKEN 24. AUG. 2017 KL. 00.00

JØRGEN P. BANSLER

Professor i datalogi på Københavns Universitet

JES SØGAARD

Afdelingschef i Kræftens Bekæmpelse og professor i sundhedsøkonomi på Syddansk Universitet

KRONIKEN

Stop med at afvise, ignorere og nedgøre

ALT DU BEHØVER
VIDE FRA
MORGENSTUNDE

Tilmeld dig vores
morgennyhedsbrev o
en god start på dager
håndplukket overblik
væsentligste nyhede

Indtast din email

PROBLEMKATALOG

2. Hovedtyper af problemer som følge af Sundhedsplatformens indføring.

2.1. Forøget patientrisiko.

SUN 2.2. Manglende brugervenlighed.

2.3. Utilstrækkelig oplæring og support af brugerne.

2.4. Man-

2.5. Neg-

2.6. Meg-

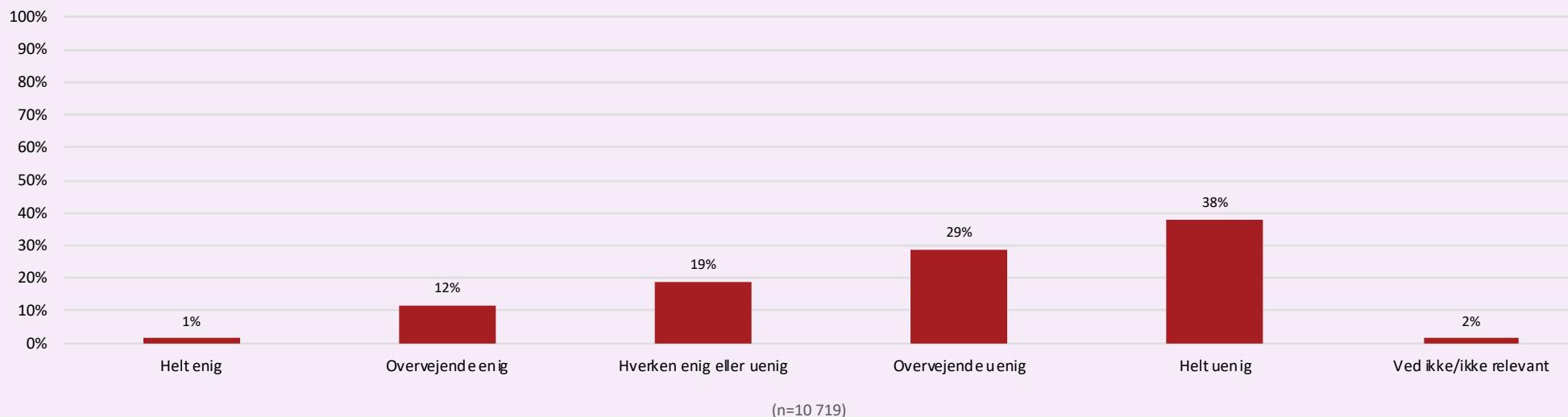
2.7. Prob-

Hvor enig eller uenig er du i følgende udsagn?

Sundhedsplatformen er brugervenlig – dvs. nem og intuitiv at anvende

Bestyr
Foreningen Sundheds

Oktobe



Source: EPINION. Brugerundersøgelse af Sundhedsplatformen.

Outline of Talk

What is Human-Computer Interaction (HCI)?

- definition
- science(s)
- methods
- technology
- applications

(Personal) Examples from designing Health Technology

- electronic medical records
- clinical logistics

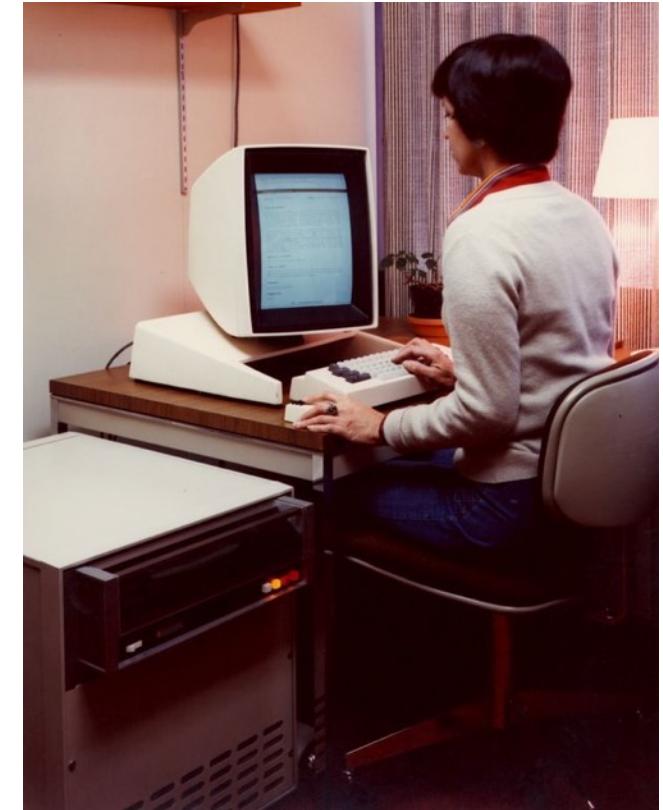


WHAT IS HUMAN-COMPUTER INTERACTION?

A photograph of a man with dark hair and glasses, wearing a light blue button-down shirt, sitting at a desk. He is looking down at a laptop screen. In front of him are three laptops: a silver HP on the left, a silver Apple in the center, and a white laptop on the right displaying social media icons. The background shows a window with a view of a city skyline.

Human-computer interaction (HCI)...

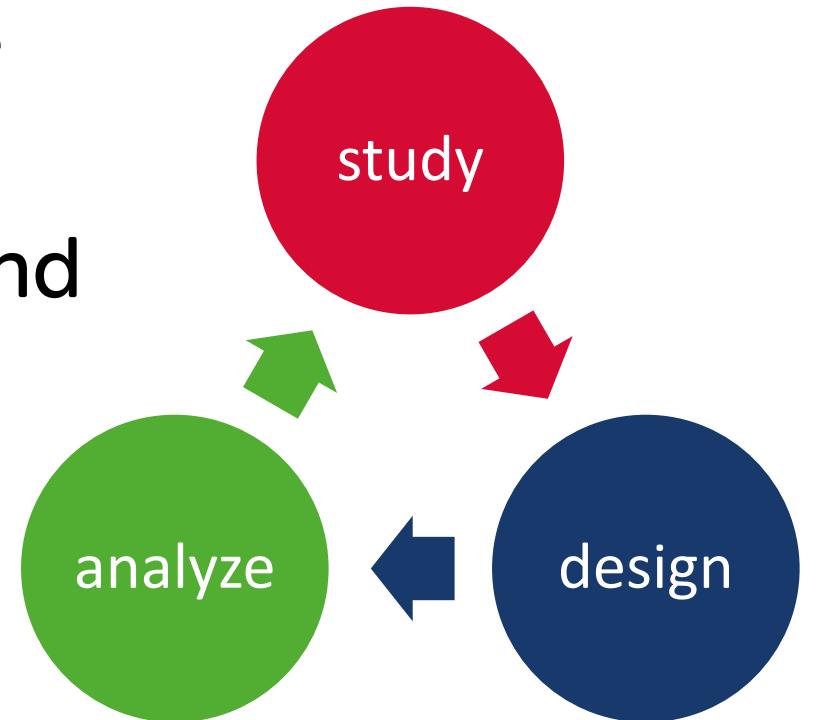
- ... researches the **design** and **use** of computer technology
 - focused on the **interfaces** between people (users) and computers
- Researchers in HCI both
 - **observe** the ways in which humans interact with computers
 - **design** technologies that let humans interact with computers in novel ways



Xerox Alto – the first personal computer w. GUI, mouse, CPU, network, laser printer, etc. Released 1973.

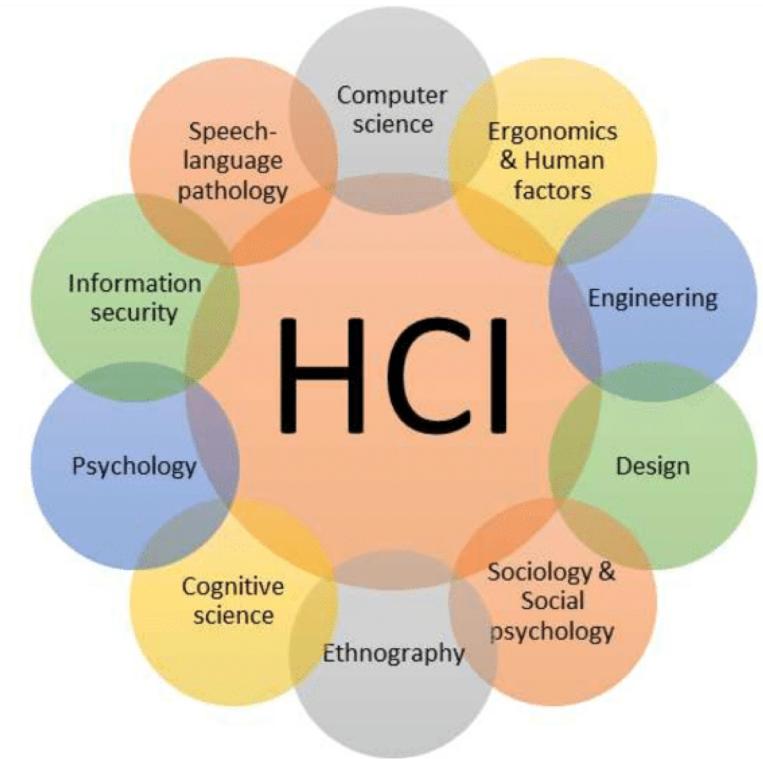
The practice of HCI

- **study**, observe, learn how people use computers (or other things)
- **design** user interfaces, technology, and the entire user experience (UX)
- **analyze**, evaluate, assess human-computer interaction



The Science(s) of HCI

- “study”
 - ethnography, psychology, sociology, ...
- “design”
 - design theory, engineering, ergonomics, computer science, ...
- “analyze”
 - human factors, psychology, cognitive science, ...



HCI Research

- **methods** – developing new methods for study, design, and analysis
- **theory** – new theoretical models for HCI
- **technology** – new hardware and software technology for HCI
- **insight** – novel insights on HCI in specific domain (e.g. healthcare)
- **applications** – novel user-centered systems in specific domains

2019 SPECIALIZED CONFERENCES

Conference Name	Dates	Location			
HRI '19: ACM/IEEE International Conference on Human-Robot Interaction humanrobotinteraction.org/2019/	03/11 – 03/14	Daegu, Korea	UIST '19: The 32nd Annual ACM Symposium on User Interface Software and Technology uist.acm.org	10/20 – 10/23	New Orleans, LA, US
TEI '19: Thirteenth International Conference on Tangible, Embedded, and Embodied Interaction tei.acm.org	03/17 – 03/20	Tempe AZ, USA	CHIPLAY '19: The annual symposium on Computer-Human Interaction in Play chiplay.acm.org/2019	10/22 – 10/25	Barcelona, Spain
IUI '19: 24th International Conference on Intelligent User Interfaces iui.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CSCW '19: Computer Supported Cooperative Work cscw.acm.org	11/09 – 11/13	Austin, TX, USA
TVX '19: ACM International Conference on Interactive Experiences for TV and On tvx.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/10 – 11/13	Daejeon, Korea
UMAP '19: 27th Conference on User Modeling, Adaptation and Personalization um.org/umap2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
IDC '19: Interaction Design and Children idc.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
CI '19: Collective Intelligence ci.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
EICS '19: ACM SIGCHI Symposium on Engineering Interactive Computing System eics.acm.org	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
DIS '19: Designing Interactive Systems Conference dis.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
C&C '19: Creativity and Cognition cc.acm.org/2019	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
ETRA '19: 2019 Symposium on Eye Tracking Research and Applications etra.acm.org	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
Ubicomp '19: The 2019 ACM International Joint Conference on Pervasive and Ub ubicomp.org	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
RecSys '19: 13th ACM Conference on Recommender Systems recsys.acm.org	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
AutomotiveUI '19: 11th International Conference on Automotive User Interfaces & Vehicular Applications auto-ui.org/19/	03/17 – 03/20	Seattle, WA, USA	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
MobileHCI '19: 21st International Conference on Human-Computer Interaction with Mobile Devices and Services mobilehci.acm.org/	10/01 – 10/04	Taiwan	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
ICMI '19: International Conference on Multimodal Interaction icmi.acm.org/2019	10/14 – 10/18	Suzhou, China	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia
SUI '19: Symposium on Spatial User Interaction sui.acm.org	10/19 – 10/20	New Orleans, LA, US	CHI '19: ACM SIGCHI Conference on Human Factors in Computing Systems chi.acm.org/2019	11/12 – 11/15	Parramatta, Australia

Past and upcoming CHI conferences [edit]

Past^[10] and future^[11] CHI conferences include:

Year	City	Country	Link	Total attendance ^[12]
2019	Glasgow	UK	https://chi2019.acm.org/	TBC
2018	Montreal	Canada	https://chi2018.acm.org/	3,372
2017	Denver	US	https://chi2017.acm.org/	2,939
2016	San Jose	US	http://chi2016.acm.org/	3,624
2015	Seoul	South Korea	http://chi2015.acm.org/	2,896
2014	Toronto	Canada	http://chi2014.acm.org/	3,001
2013	Paris	France	http://chi2013.acm.org/	3,443
2012	Austin, Texas	US	http://chi2012.acm.org/	2,616
2011	Vancouver	Canada	http://www.chi2011.org/	2,822
2010	Atlanta	US	http://www.chi2010.org/	2,384
2009	Boston	US	http://www.chi2009.org/	2,358
2008	Florence	Italy	http://www.chi2008.org/	2,361
2007	San Jose	US	http://www.chi2007.org/	2,620
2006	Montreal	Canada	http://www.chi2006.org/	2,250
2005	Portland	US	http://www.chi2005.org/	1,947



SIGCHI



EXAMPLES FROM DESIGNING HEALTH TECHNOLOGY

2 examples



ABC – activity-based computing for electronic medical records [2002-09]



iHospital – ubiquitous computing for clinical logistics [2003-06]

Common Research Methodology

1. Extensive **field studies** and in-depth analysis of problems domain using ethnographic methods
2. Iterative, user-centered, participatory **design** process
3. Physical **prototyping**, video, mockups, hw & sw prototypes
4. **Implementation** of novel user interface technology (hardware & software)
5. Clinical **evaluation** and deployment



2 examples



ABC – activity-based computing for electronic medical records [2002-09]



iHospital – ubiquitous computing for clinical logistics [2003-06]

Background & Goals



- Background & Methods
 - extensive ethnographic field studies of clinical work in hospitals
 - design of clinical applications in hospitals
 - cooperation with EHR and PACS vendors
 - research within ubiquitous computing
- Goals
 - hw & sw ubiquitous computing infrastructure for hospitals
 - technology framework for clinical applications







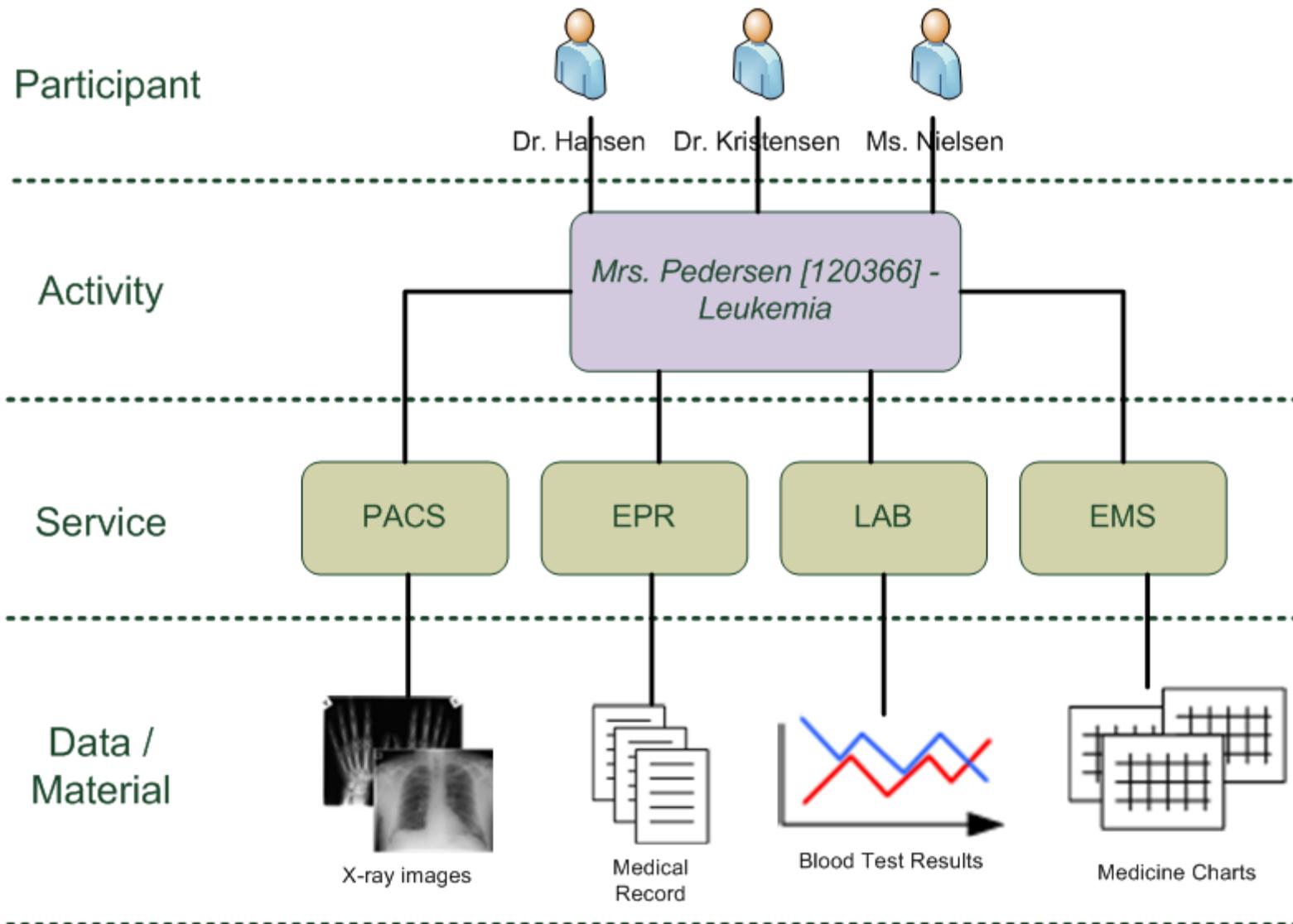
Ethnographic Observation



- **Clinicians ...**
 - handle huge data sets
 - organize work in tasks
 - is constantly **multi-tasking**
 - is highly **mobile**
 - extremely **collaborative**
 - are often **interrupted**
 - works with **physical “stuff”**
 - does not have a **desk**
 - do not have a **personal computer**



Activity-Based Computing (ABC)



ABC Principles

- **Activity Centered** – Integration of related services & data
- **Activity Suspend & Resume** – Many concurrent activities
- **Activity Roaming** – The user's session is distributed across different devices
- **Activity Sharing** – An activity has several participants, shared in real-time
- **Activity & Context Awareness** – An activity is aware of the users' real world activity context

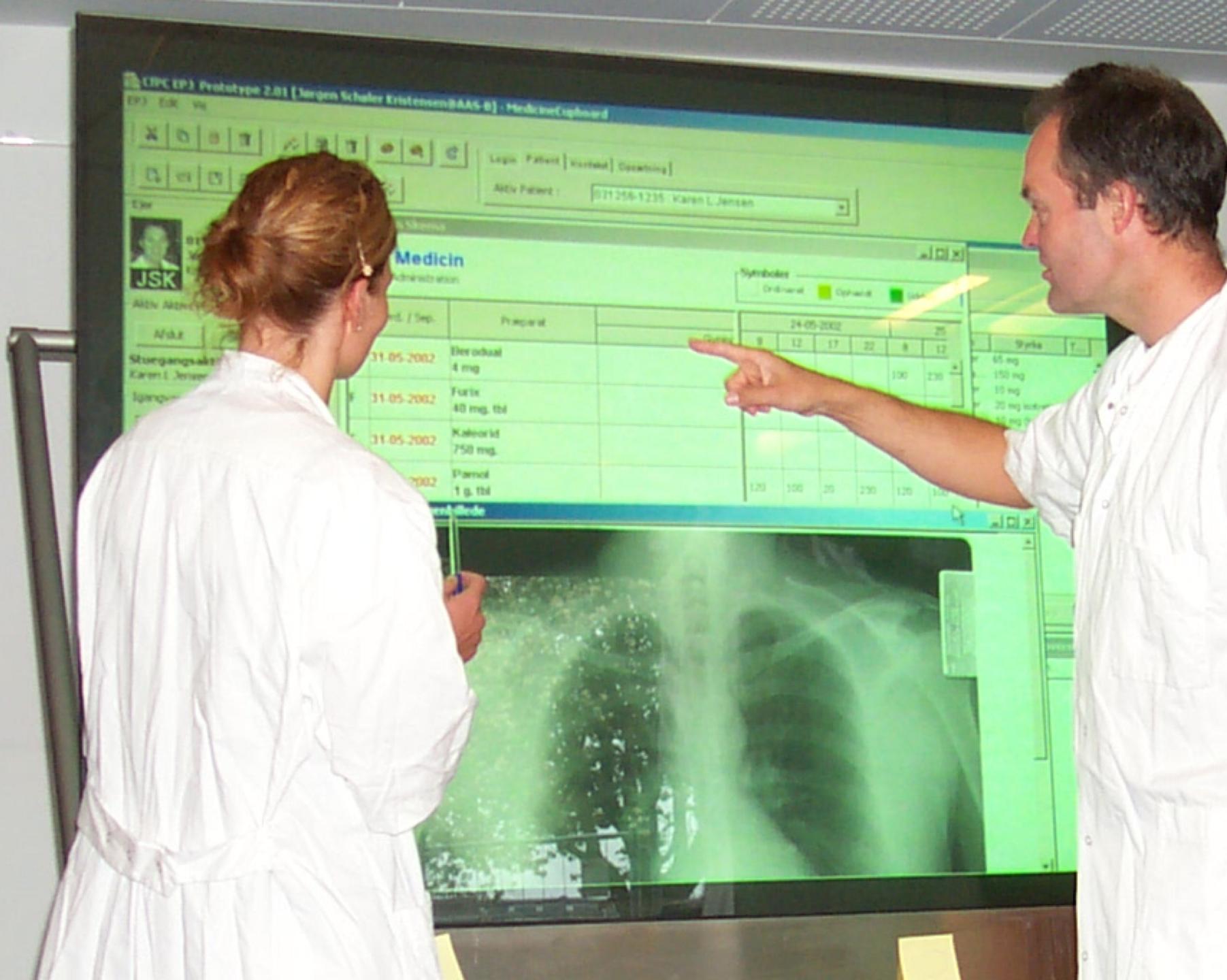


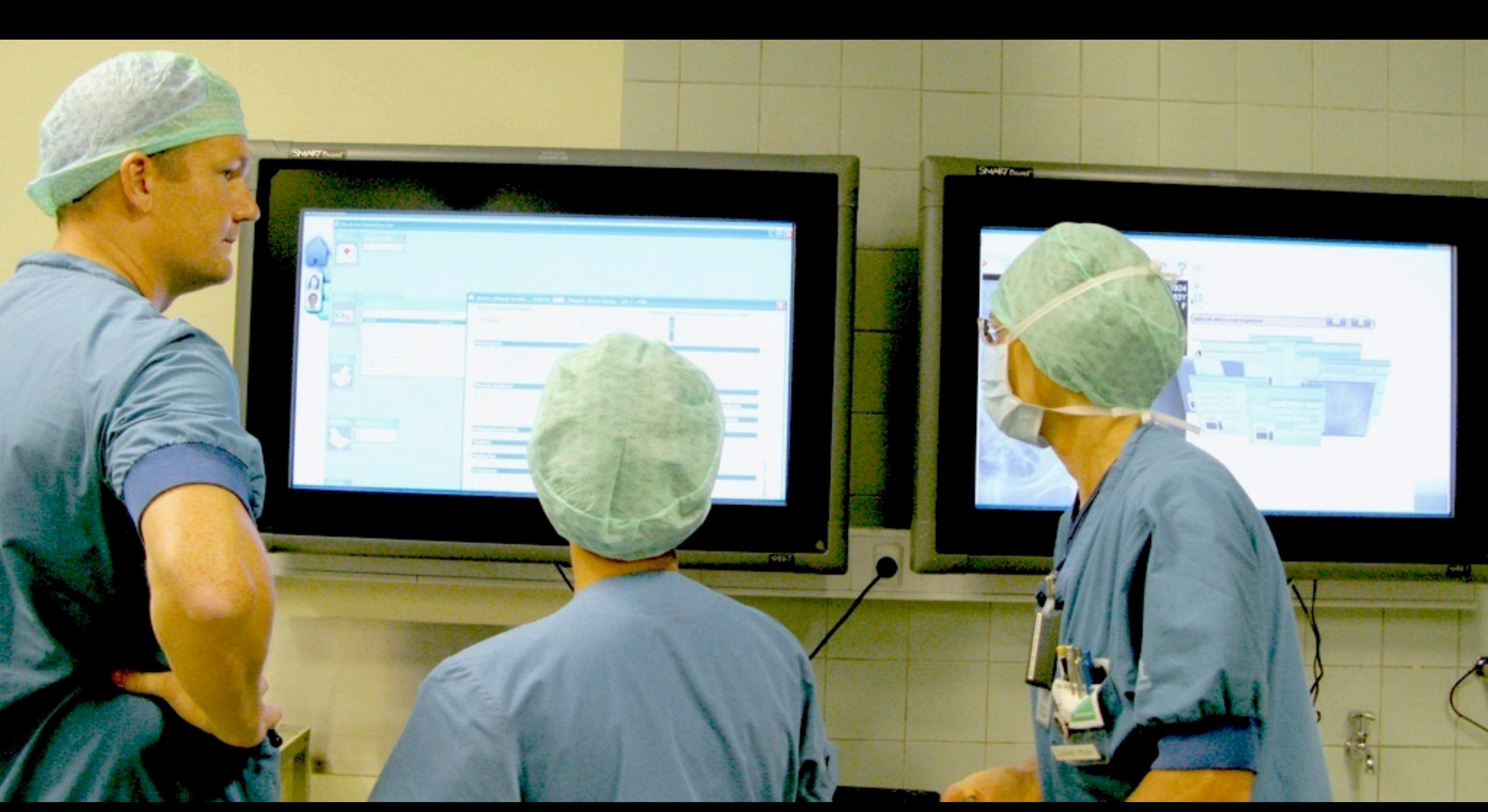
ABC Hardware & Software

"From Personal Computers to Public Computers"

- **Public Displays**
 - wall-based
 - tabletops
 - mobile / tablets
 - embedded (into e.g. hospital bed)
- **Location Tracking**
 - staff
 - patients
 - equipment (incl. public displays)
- **Touch-based, zoomable user interface**
 - "automatic" login
 - context-aware ("know thy patient")
 - cross-device interface



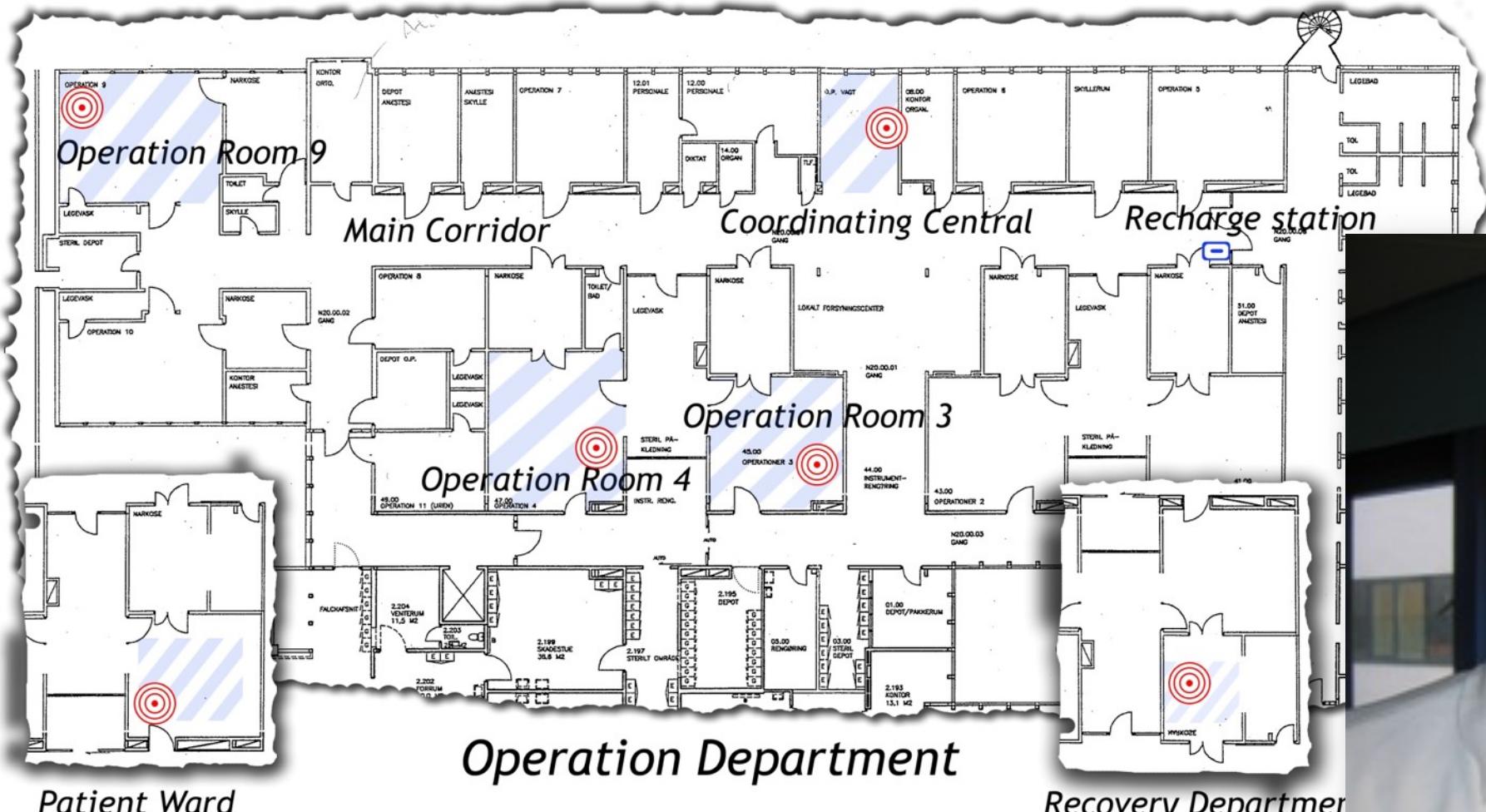












Recovery Department



Nuværende lokation:
OR4

Sygeplejerske
Birgitte Nielsen

Anaestesialæge
Joergen Felthaus

Patient
Liselotte S. Germer

Kirurg
Peder Suder

081138-9637 Uffe E. Jensen
Oesophagospferulon, ve. side

121233-7766 Ingolf Andersen
Intumescens paa abdomen i GA 60 min.

110644-8755 Benny Lautrup
Tenolyse h. blæs, 35 min - CDY skrevet ...

210988-9733 Ole Jensen
Hypokalememi, prø akut 40 min, CDY 1

030666-6633 Iona Olsen
Location: TS
Kortikosterol, 20 min, CDY 17 skrevet

011178-5733 Elisabeth G. Nielsen
Location: TS
Tegnemærkning, CDY 1

270977-3376 Karen Schmidt
Location: Kørforsknings
Home, ingulata højde + moh 4 %
I/pom

211188-9733 Muhammed
Location: TS
AB prø udf 40 min, CDY 1 +
spinalgæring

110972-1234 Liselotte Stilling Germer

120977-3411 Ole Hansen

A**C****B**

2 examples

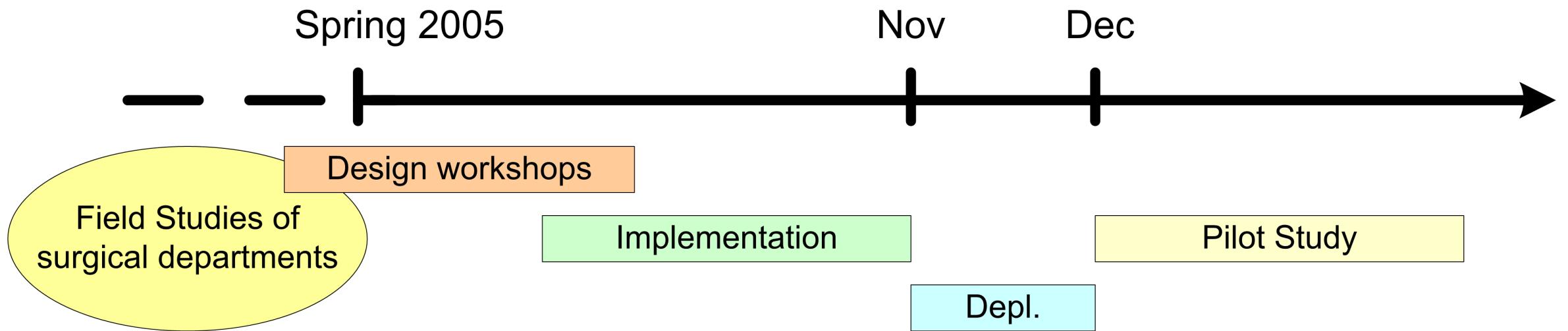


ABC – activity-based computing for electronic medical records [2002-09]



iHospital – ubiquitous computing for clinical logistics [2003-06]

Design Process





Affordances of Whiteboards

- Core roles of whiteboards in hospitals
 - visibility
 - overview
 - status
 - coordination
 - communication
 - handling contingencies
- However...
 - hard to access while roaming around the hospital



iHospital – The Interactive Hospital

- **AwareMedia**
 - The interactive OR whiteboard
- **AwarePhone**
 - The mobile OR schedule
- **Context-awareness**
 - Location tracking
 - Status tracking

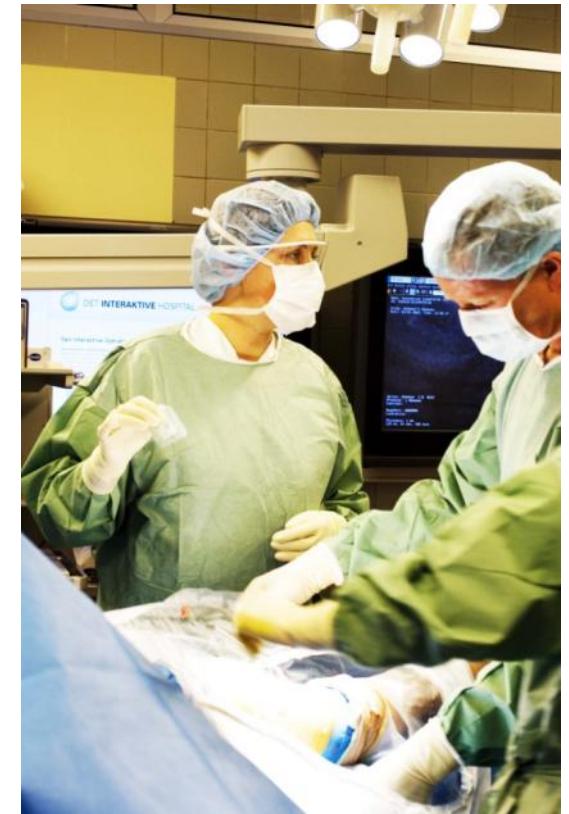


DET **INTERAKTIVE** HOSPITAL

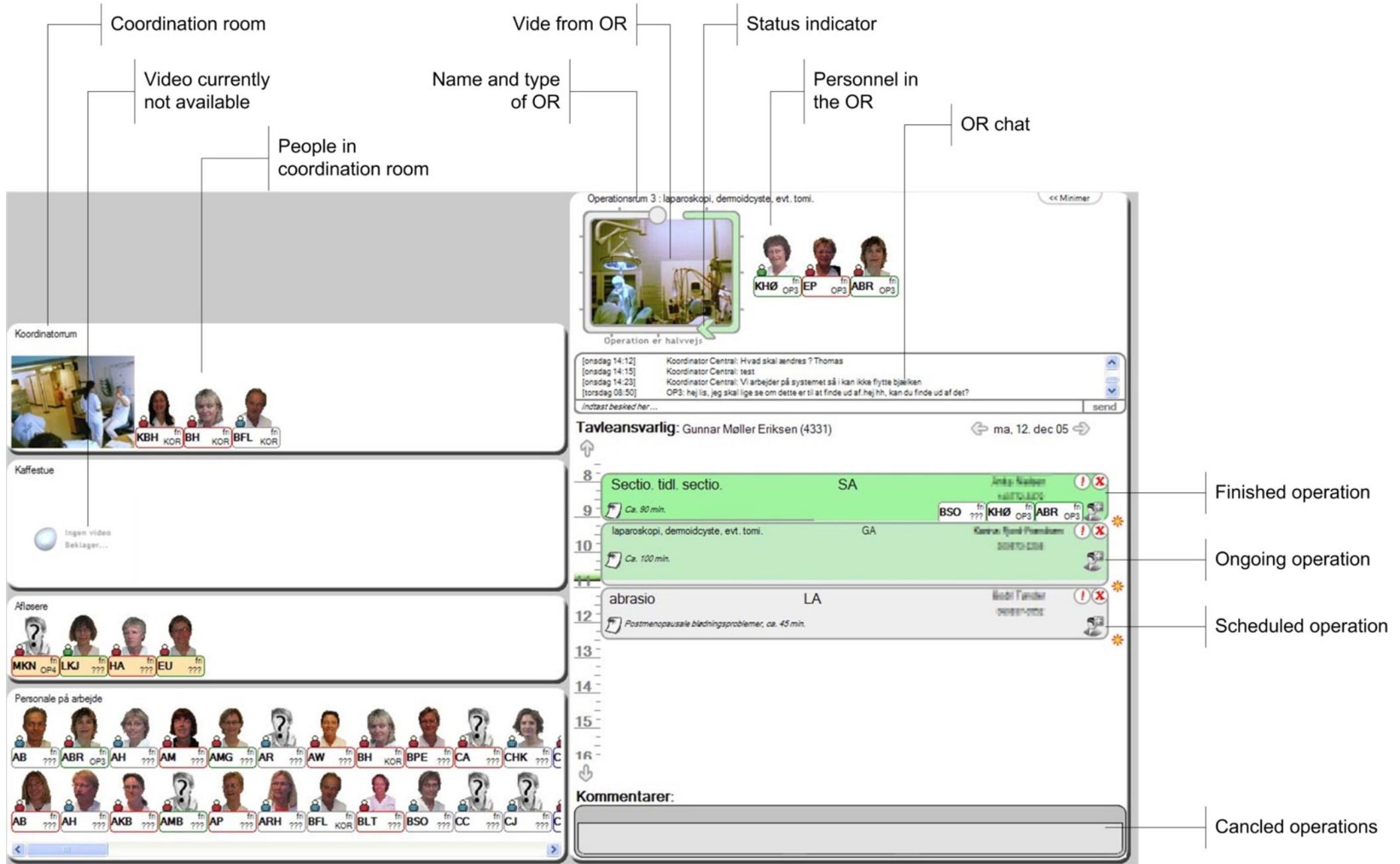
Design Principles

"Putting the OR schedule back on the wall"

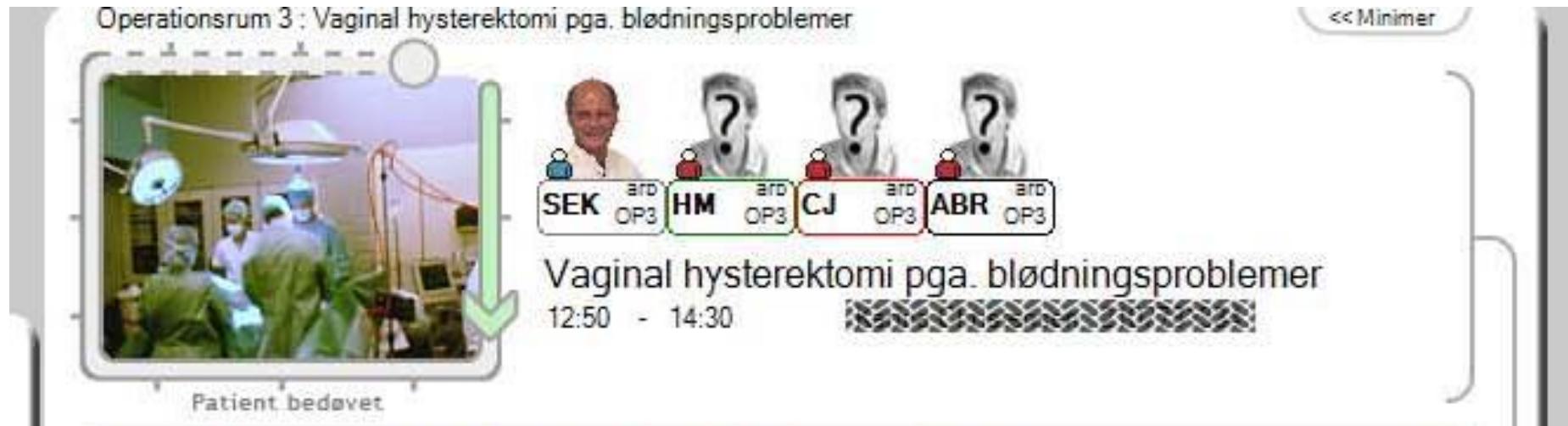
- Social awareness – shared and public
- Temporal awareness – continuous changing schedules
- Spatial awareness – where are people and things?
- Communication – easy and context-aware
- Mobile access – roaming the entire hospital



Source: J.E. Bardram, T.R. Hansen and M. Soegaard. AwareMedia: a shared interactive display supporting social, temporal, and spatial awareness in surgery. In *Proceedings of ACM CSCW '06*, p. 109-118, ACM Press, 2006.



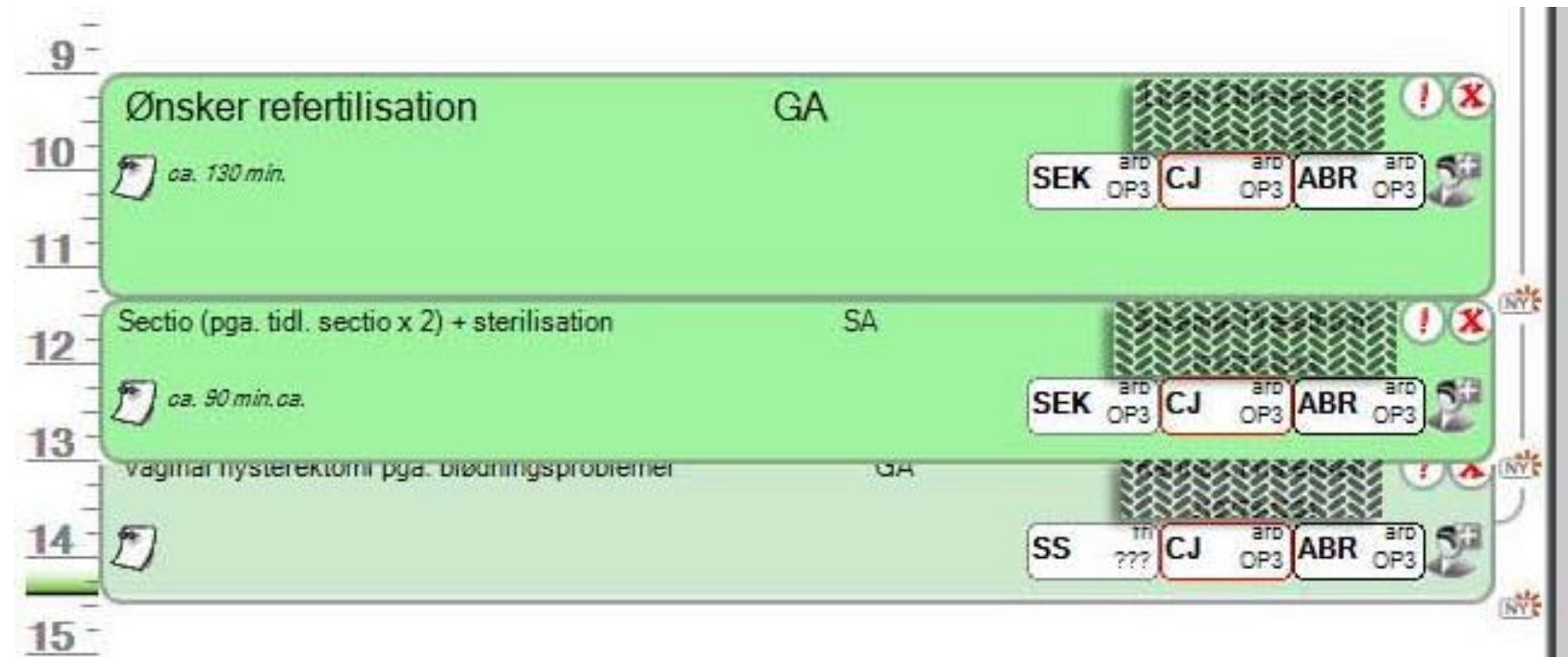
UI – Spatial Awareness



OR Space

- Video
- Status
- People in the OR
- Patient
- Type of surgery & expected end time

UI – Temporal Awareness



OR Schedule

- Operations
- OR Teams
- Timing
- Delays
- Cancellations

UI – Social Awareness

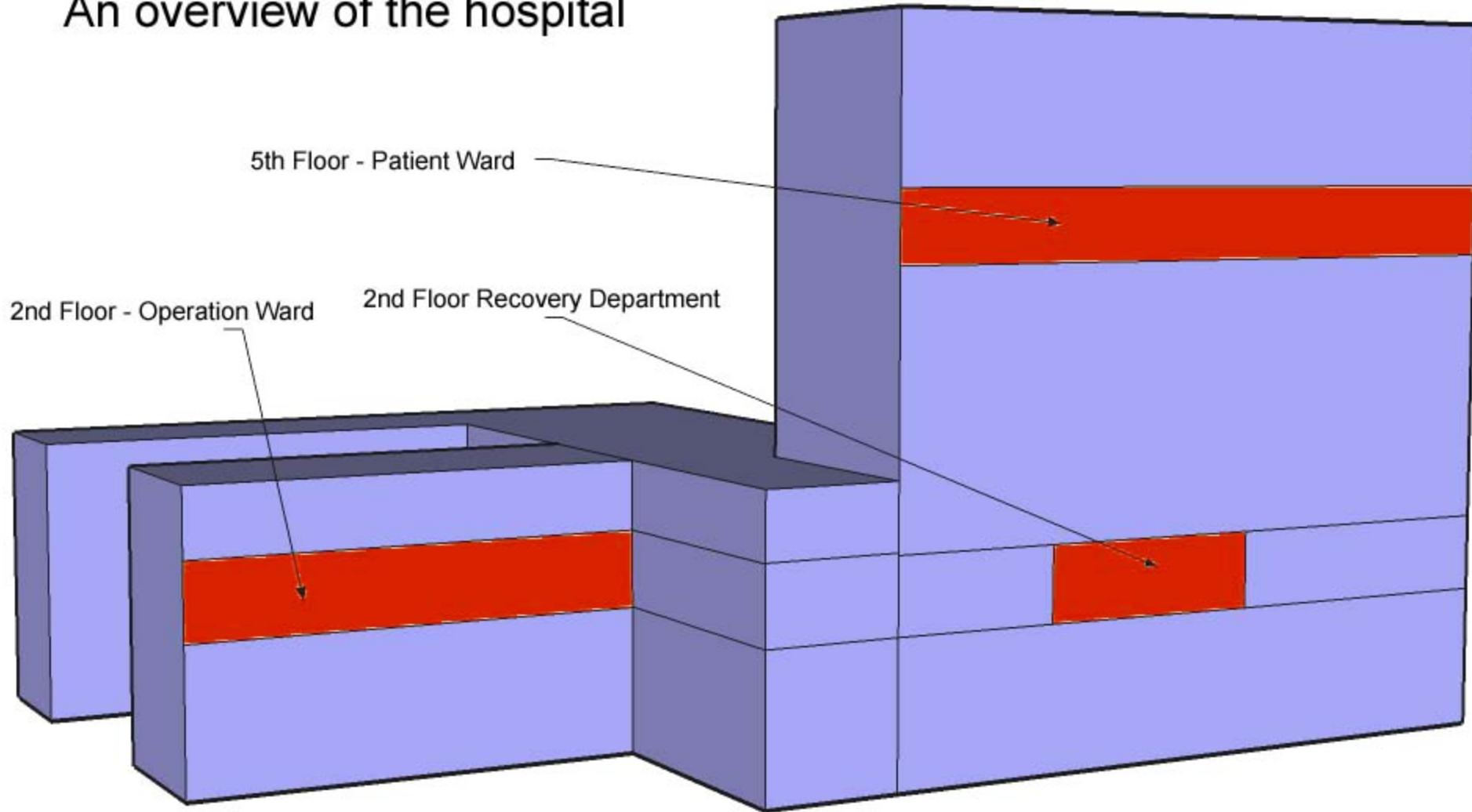


Context

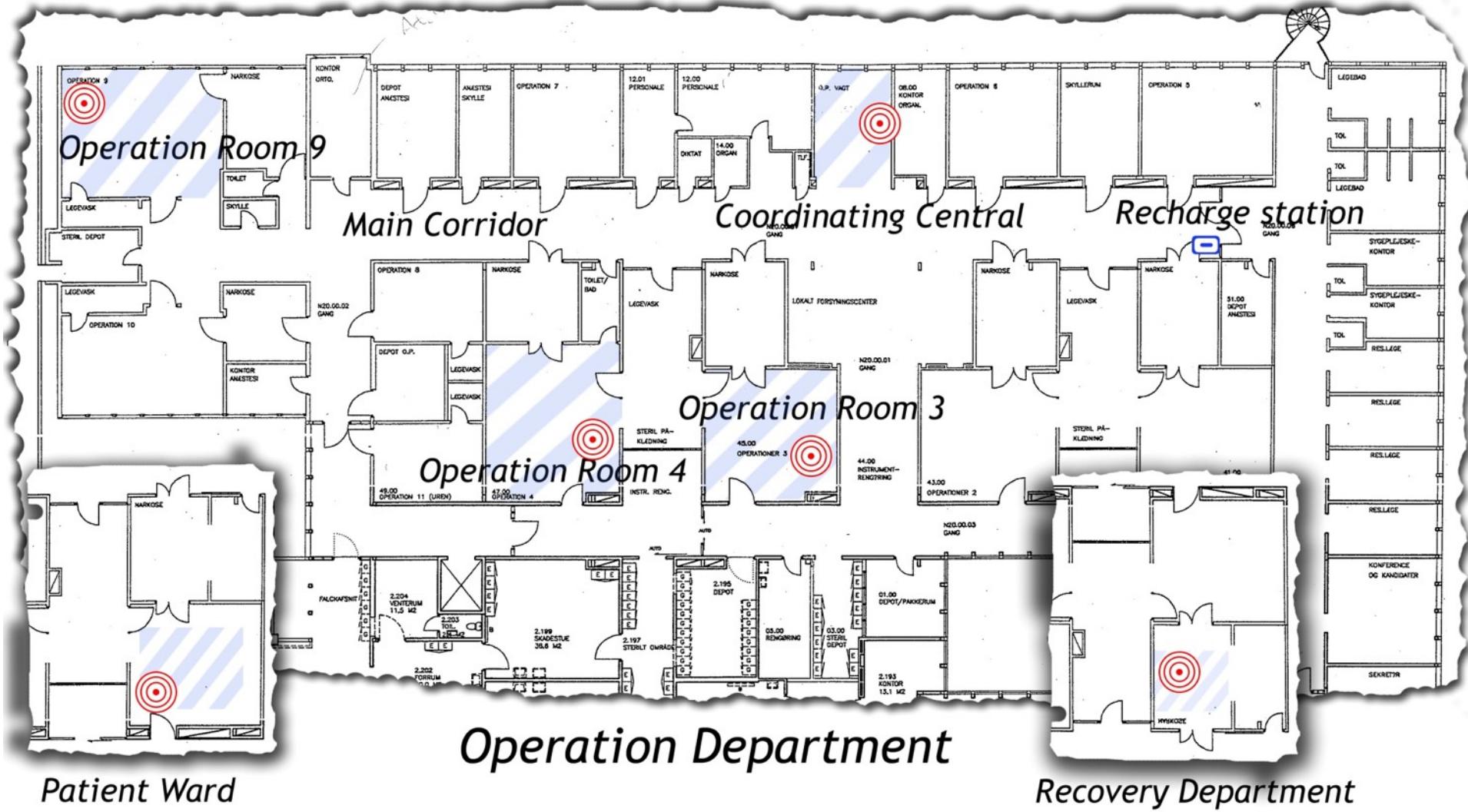
- Picture, Name & Initials
- Location
- Activity (e.g. surgery)
- Tracking device
- Role (e.g. replacement, coordinator, surgeon)

Deployment

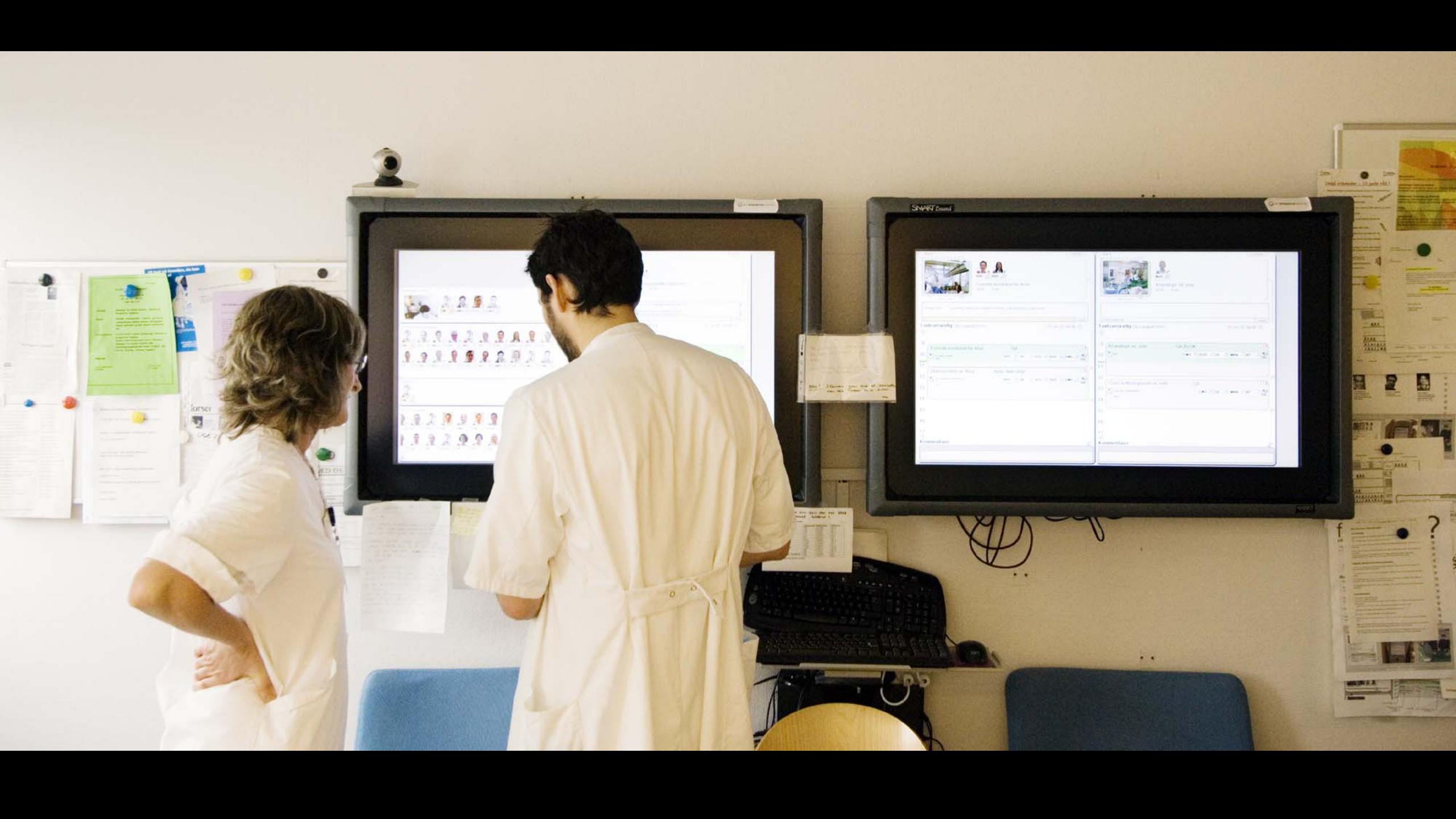
An overview of the hospital



Deployment







Patienteninfo

Kontaktdaten

Patienteninfo

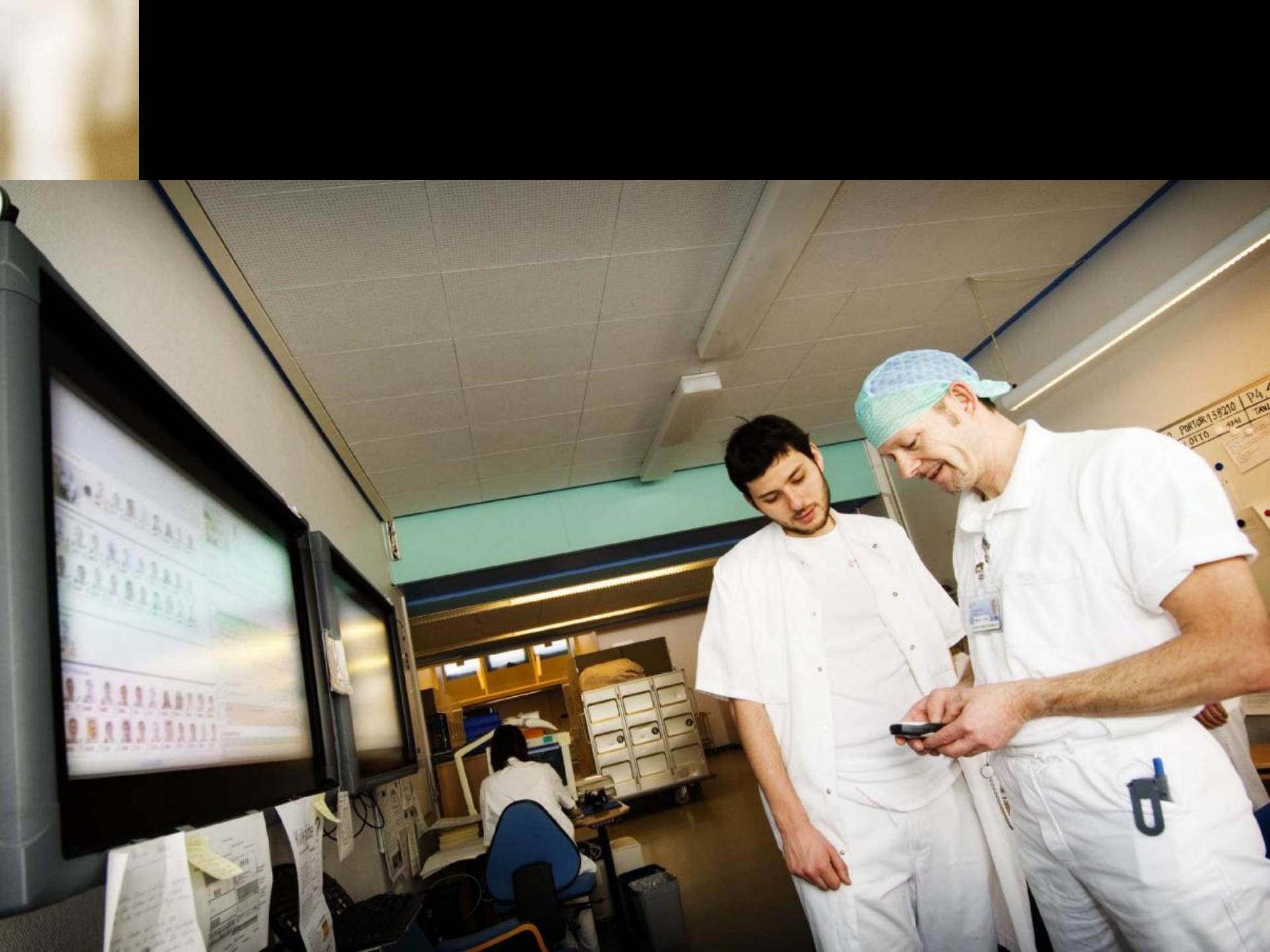
Kontaktdaten

Patienteninfo

Kontaktdaten







Cetrea

clinical logistics



2 examples



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Outline of Talk

What are the problems with "Sundhedsplatformen"?

- usability!

What is Human-Computer Interaction (HCI)?

- definition
- science(s)
- methods
- technology
- applications

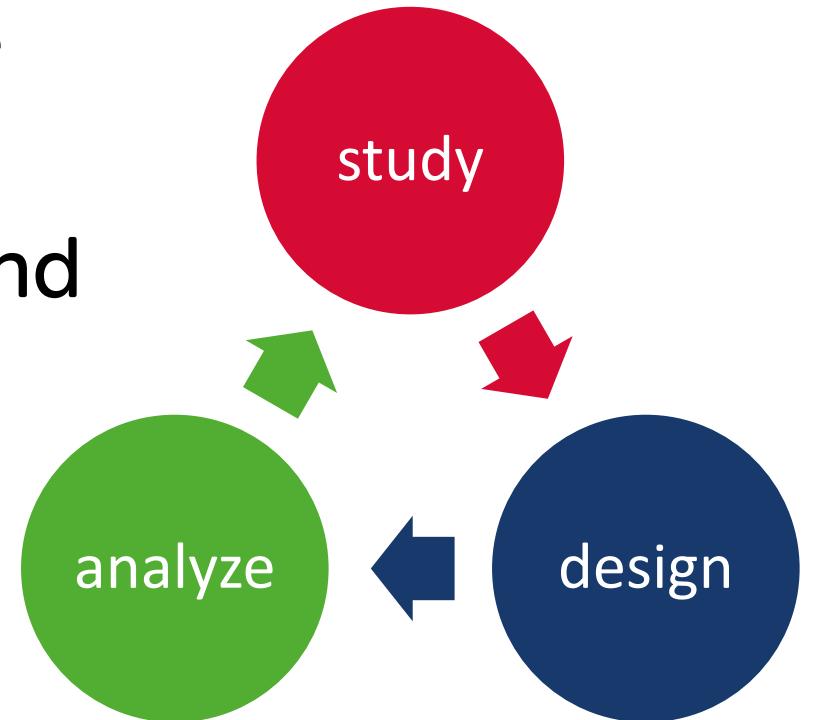
(Personal) Examples from designing Health Technology

- electronic medical records
- clinical logistics



The practice of HCI

- **study**, observe, learn how people use computers (or other things)
- **design** user interfaces, technology, and the user experience (UX)
- **analyze**, evaluate, assess human-computer interaction





Sundhedsplatformen er en gennemgribende forandring af hospitalernes IT og organisation



Arkivfoto: Jens Dresling/POLFOTO

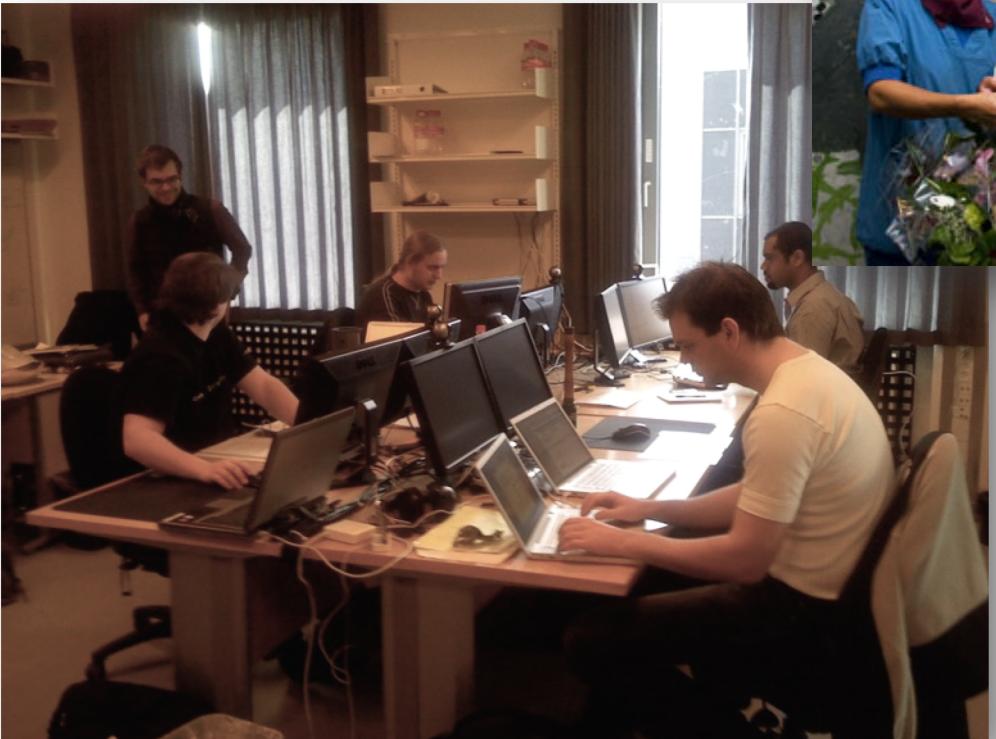
Acknowledgements



DET **INTERAKTIVE** HOSPITAL



Regionshospitalet
Horsens



Forsknings- og
Innovationsstyrelsen
Ministeriet for Videnskab
Teknologi og Udvikling



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