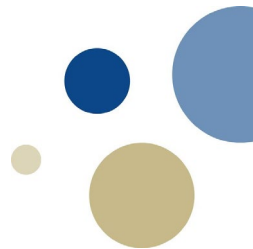




Norwegian University of
Science and Technology



What is there to learn from introducing AI-based functionality in clinical workflows in Norway?

Arild Faxvaag, M.D.

Professor in medicine (Health informatics)

Faculty of medicine and health sciences, NTNU

questions:

- what are some important clinical workflows?
- what motivates the procurement of commercial products?
 - which workflows are targeted?
 - what are some of the results?
- what are the ML&AI R&D opportunities?
 - what is the status of the regulatory work?
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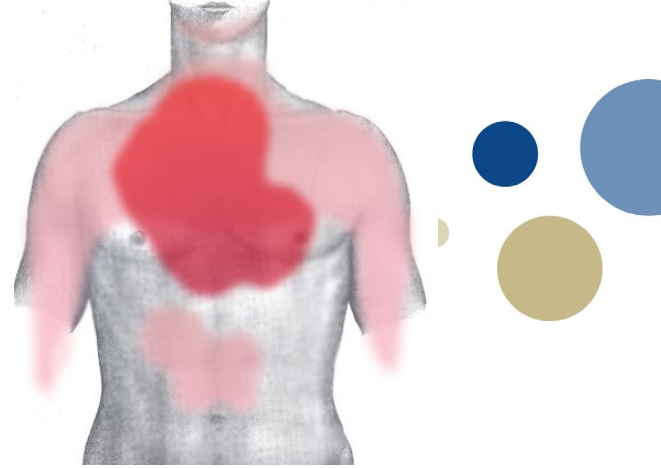


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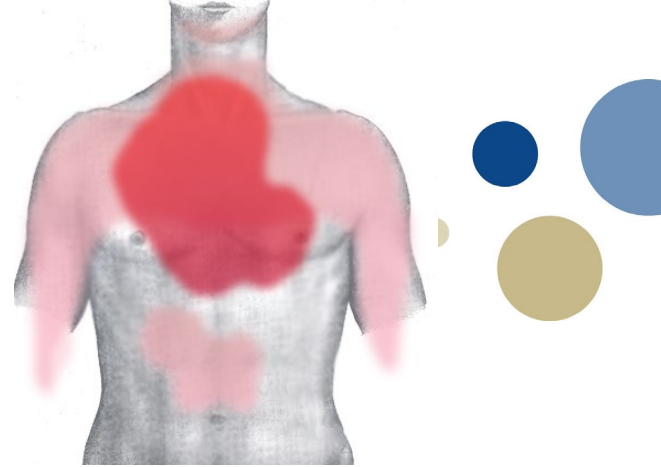
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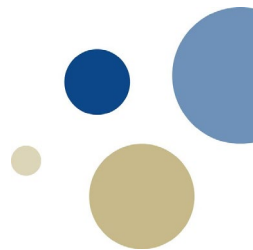
generic clinical workflow:



Step	collect data to underpin decision	search for applicable knowledge	assess the problem	make decision	execute decision	collect data to assess outcome
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Step	collect data to underpin decision	search for applicable knowledge	assess the problem	make decision	execute decision	collect data to assess outcome
Example	Tell me about the pain in your chest	Can this be a heart attack?	You might have a heart attack	You shall have morphine, oxygen, nitroglycerin, and I will have a helicopter coming over	Here you have a nitroglycerine pill. Put it under your tongue.	How is your chest pain doing now?



Diagnostics
(Problem-
knowledge
coupling)

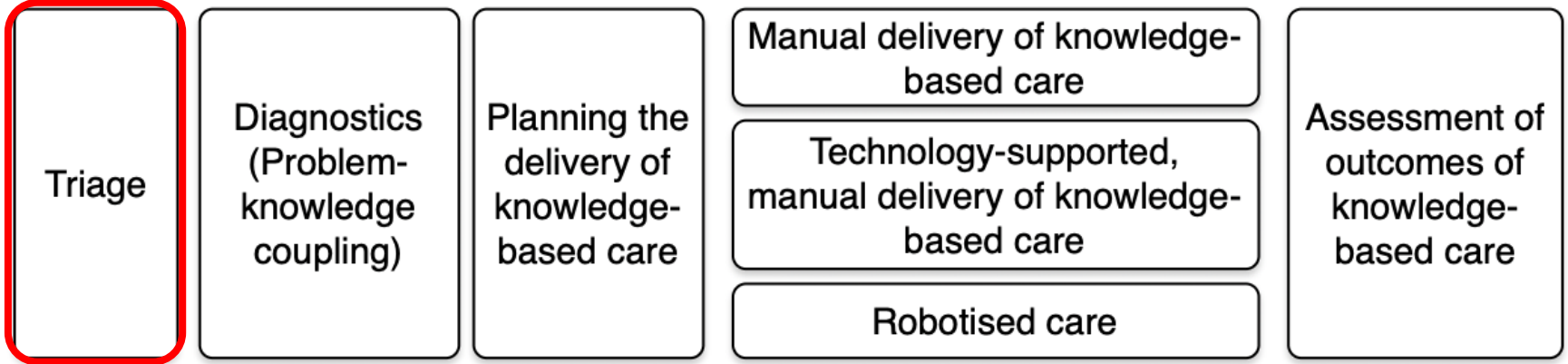
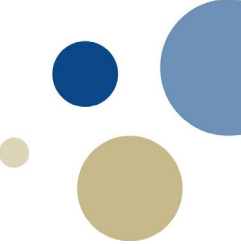
Planning the
delivery of
knowledge-
based care

Manual delivery of knowledge-
based care

Technology-supported,
manual delivery of knowledge-
based care

Robotised care

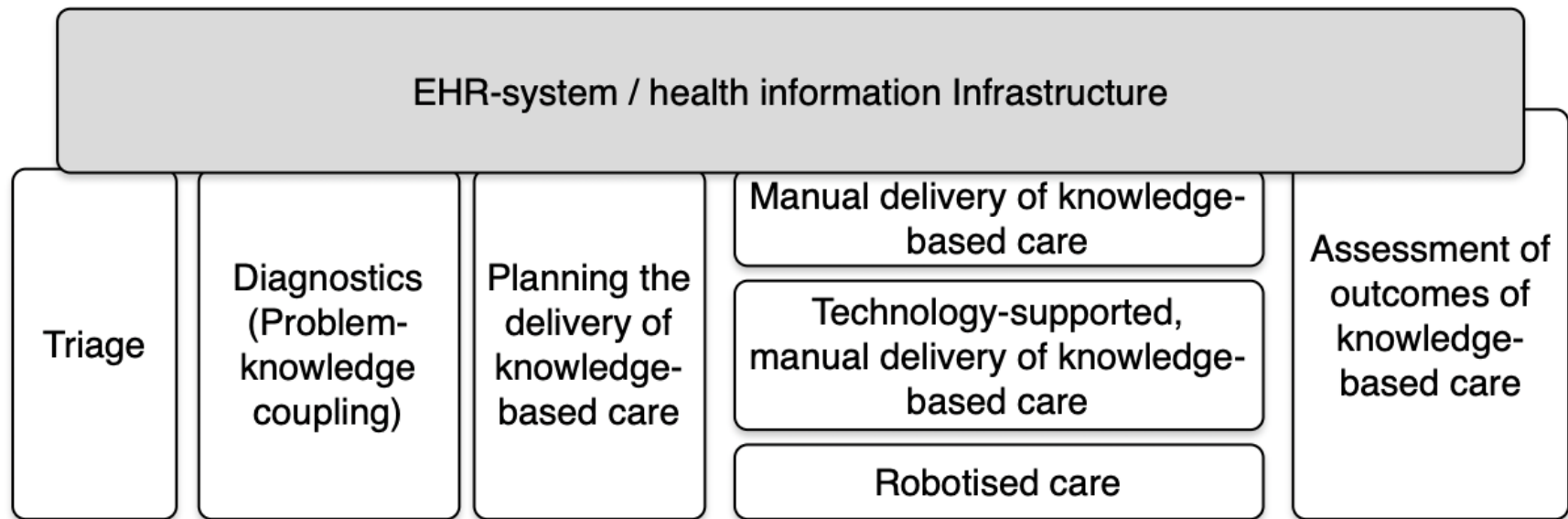
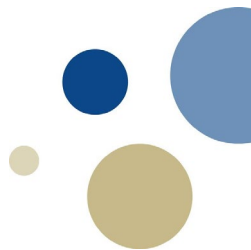
Assessment of
outcomes of
knowledge-
based care



triage -- population health



- triage = assessing health problems to decide on which problem to work on next and which problems that will have to wait
- Population health:
 - monitoring the state of disease in patients with chronic disease:
 - heart failure, COPD, asthma
 - monitoring frailty:
 - fall detection
 - monitoring bodily functions
 - wet diaper detection in nursing homes

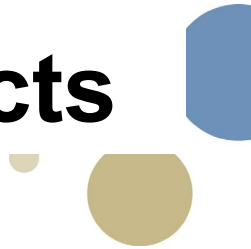


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procurement of commercial products

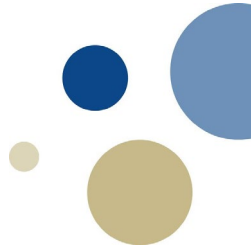


- Software bundled with imaging information systems
 - Radiology: BoneView*
 - Pathology: Digital pathology products
- Software products based on Large Language models (LLMs)
 - speech-to-text services bundled with EHR system or speech recognition products
 - to support documentation practice

* <https://www.gleamer.ai/>

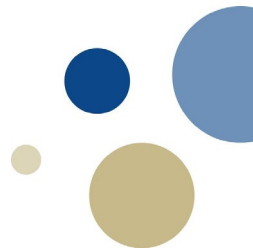
motivation:

- **Laboratory services:**
 - Lack of qualified personnel to take care of an ever-increasing number of tests
- **EHR documentation practice:**
 - relieving the documentation burden

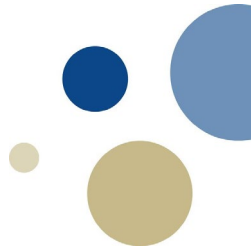


Radiology:

- BoneView:
 - **workflows targeted:** Detection of fractures after trauma
 - **results:**
 - **Patients:** Patients cleared of fractures by BoneView don't have to wait until the pictures has been read by a radiologist
 - **The radiologist:** Better in-basket triage, but still have to work through all the pictures



Digital pathology:



- **workflows targeted:**

- Tumor screening
- Detection of dysplastic cells in PAP Smears (cervical cancer screening program)

- **results:**

- Services often implemented as part of implementing a **digital pathology system** (no more samples under an analogue microscope)
- **An AI-assisted pathologist does better than a pathologist without AI**

LLM-based speech-to-text services



- now in widespread use in primary care
- on its way in hospitals

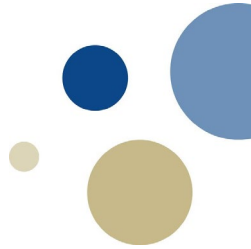
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the ML&AI R&D agenda:

- Norwegian Research Council: **Huge research programmes**
- Collaborations in the nordics: **Nordic AI**
- Collaborations across EU



ML&AI Regulatory work:

- the health authorities are dedicated to make this work in all sectors
 - oil and gas industry
 - defence
 - maritime sector
 - education
 - healthcare
- implementing the EHDS regulations
 - the AI act



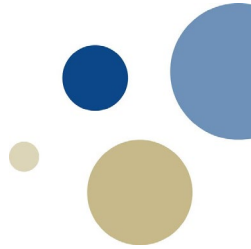
infrastructures for machine learning:



- the health registries infrastructure
- EHR corpora
- dawning:
 - health data spaces that can be used across national borders
 - rare diseases
 - disease-specific research registries

funding mechanisms:

- Norwegian research council
 - support for R&D
- Innovasjon Norge
 - support for product development



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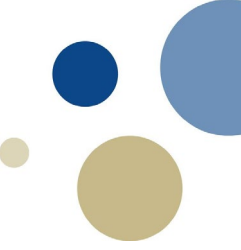
Image / Signal analysis in diagnostics	Ultrasound-based assessment of the heart MRI in - cognitive decline - Early detection of stroke Digital pathology - Breast cancer (screening programs) - pap smears - Other cancers Other imaging modalities - skin, - retina Other sound modalities - audible lung sounds
Image analysis in therapy planning	Therapy planning in - Neuro-oncology - radiation therapy - In vitro fertilisation

Analyses of a large number of discrete data for decision support	Continuous monitoring and assessment of the state of the patient - in-hospital - in nursing homes - while at home (population health) Prediction of outcomes - after surgery - in diabetes care Nursing home admission risk
Building large language models with corpora in Norwegian	NorwAI
Application of large language models	Building an emergency call simulator Sepsis: Assessing the outcome of written therapy advice Extracting outcome data from the patients EHR Applications within Personalised medicine Decision support in virtualised care

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end of presentation