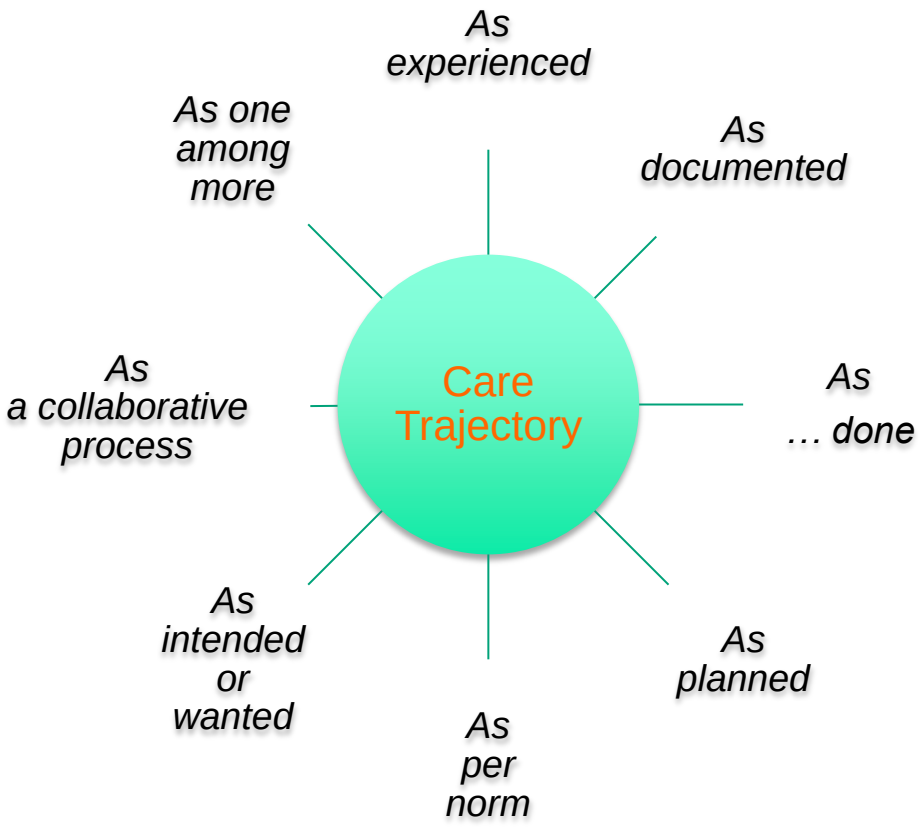
«Keeping patients out of hospital» Capturing care trajectories



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Keeping patients out of hospital

- Every hospitalization is a failure to prevent or treat the patients condition in the community.
- Hospitalization rates vary dramatically across municipalities
- New health delivery models (chronic care model) -> patient centered delivery of evidence based care.
- The electronic medical record: Underused source of information

	hosp.days/1000 inhab/year, avg. 2002-2006			Deathrate/1000 inhab/year avg. 2002-2006	
	Raw	Adjusted (1)		Adjusted (2)	
Nord-reisa	1897	2214	Ref	92	
Nord-Norge	3311	4028	p < 0.0001	88	p=0.7556
Sør-Norge	3033	3500	p < 0.0001	82	p=0.3438

1) Adjusted for age, gender, distance to hospital, mortality, education, low-income groups, home municipality state.
2) Adjusted for age, gender, distance to hospital, education, low-income groups, home municipality state.

Research questions

Methodological – Part A:

- Can we extract information from the EHR which allows a meaningful characterisation and realistic modelling of patient pathways?
- Can patient pathways information predict salient outcomes ?

Health care research – Part B:

- Are patient pathways which adhere to Chronic Care model principles associated with higher quality of care/ lower hospitalization rates?

Objective: Trajectories of care vs. outcome

Tech & method development

- IE from EHR → Events
- Events ⇉ Trajectories
- Trajectory analysis
- Abstraction, clustering and visualization
- Simple variables

Do trajectories matter?

- Comparative effectiveness research
- Collaborative care

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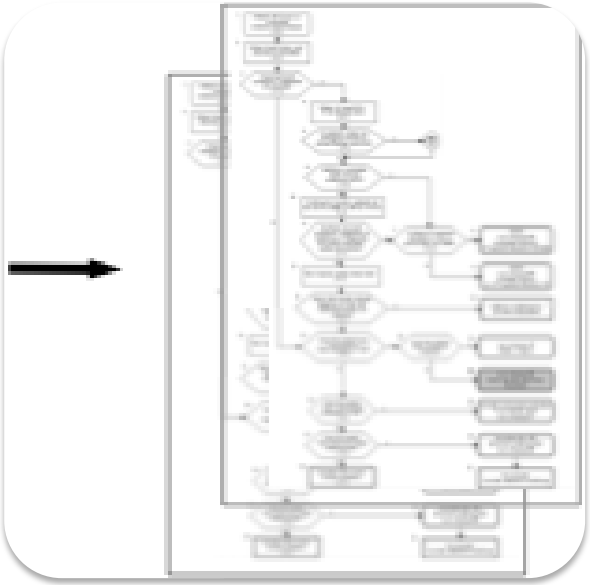
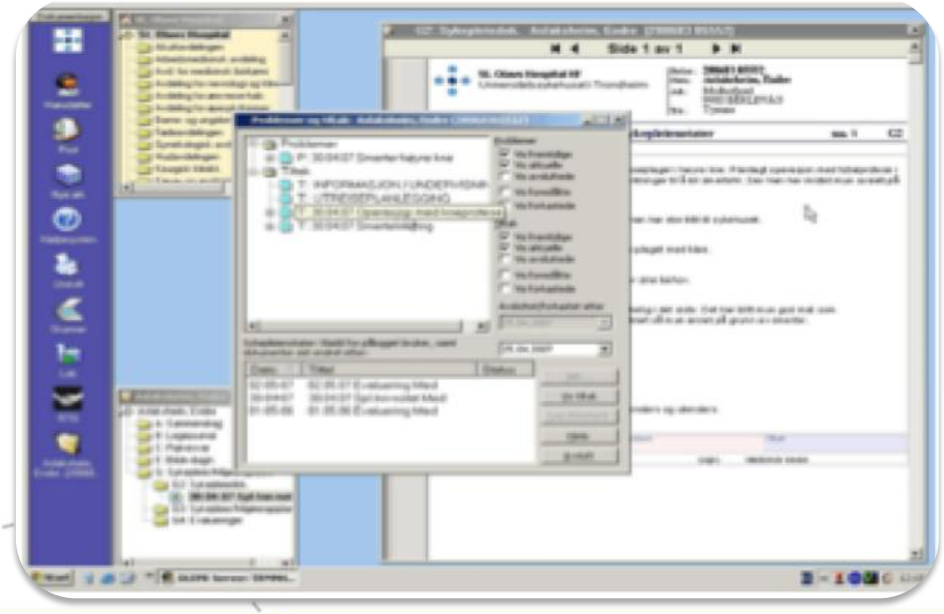
Are we interested in reality, or the documentation of it?

Is there a difference?

Can we make a mapping?





National Patient Reg

Hosp EHR

Chronic patients

Consent

Consenting Chronic patients

Total population

Gen Pract EHR

Information Extraction

Survey

What is a good trajectory?

Primary care

Specialist care

Patient impressio n/opinion

Hospital Care?

Methods development

Evaluation

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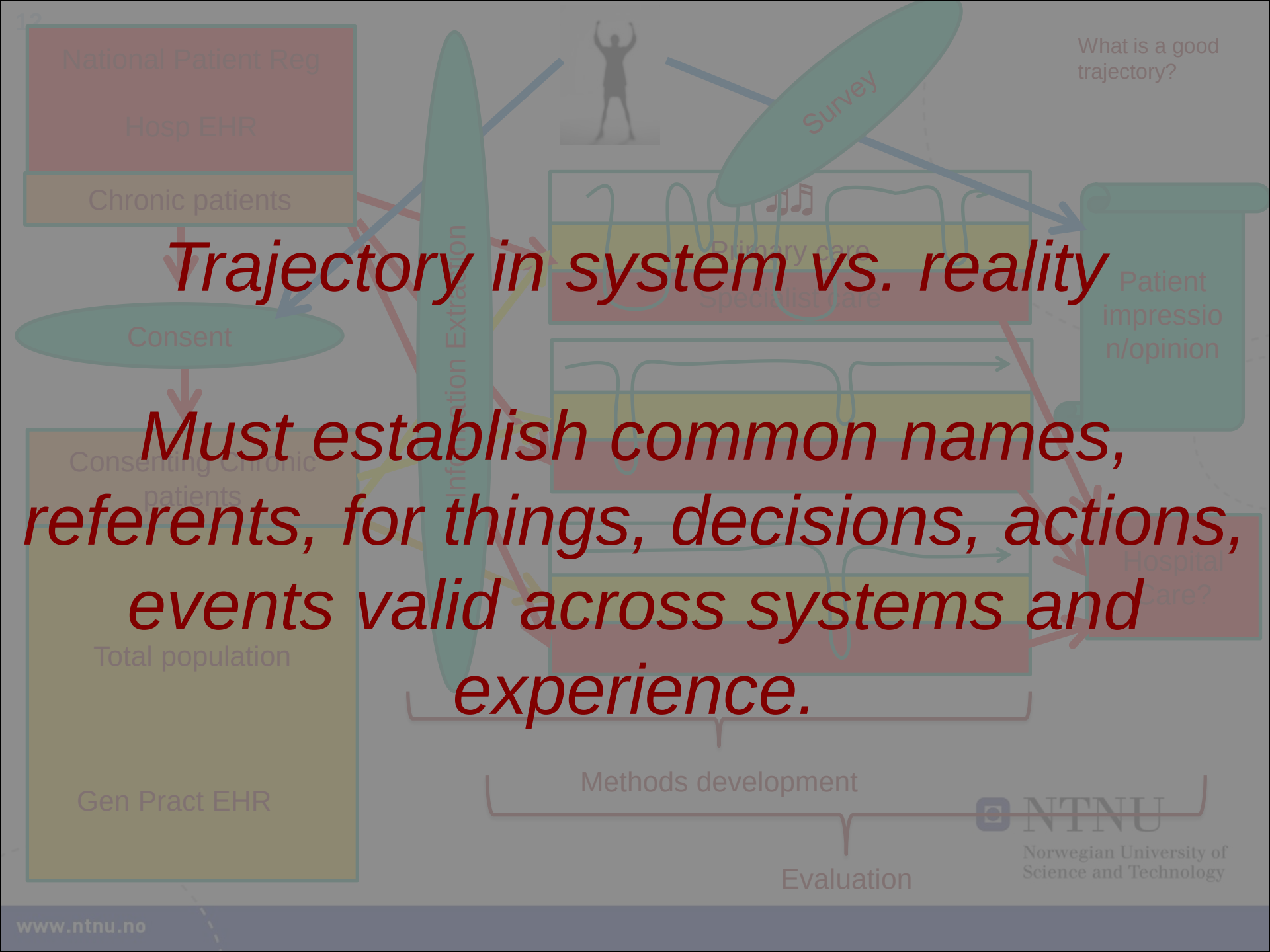

Trajectory in system vs. reality

Must establish common names, referents, for things, decisions, actions, events valid across systems and experience.

Trajectory technology

Capture & reasoning

- NLP
- Data quality and referent tracking.
- NER & events
- Anonymization
- Temporality, persistence and event reasoning

Alignment:

- Clustering & search
- Process models

Analysis:

- Query & visualization
- «Carelets»
- Care mapping for individual og group.

Evaluation – Properties of the good trajectory:

- User-understandable process features
- Composability
- Borders
- Simple criteria

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Does trajectories exist?

- From a healthcare point of view?
  - No
- In one HIS?
  - Hardly, even with nice, global identifiers. Lots of noise and errors
- Across HIS?
  - Do not know
- Health data has … low quality and validity, because noone uses them…

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Keeping patients out of hospital
Patient Trajectories (Pastas)

Workshop, Stockholm 21 June 2012

Rune Sætre

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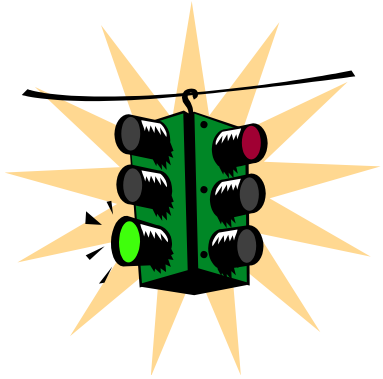
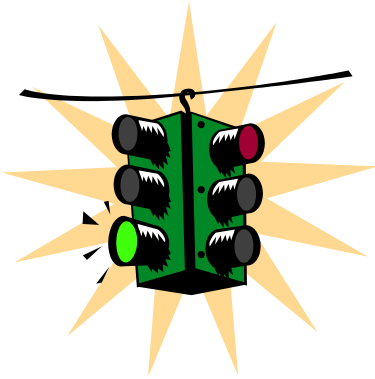


Outline

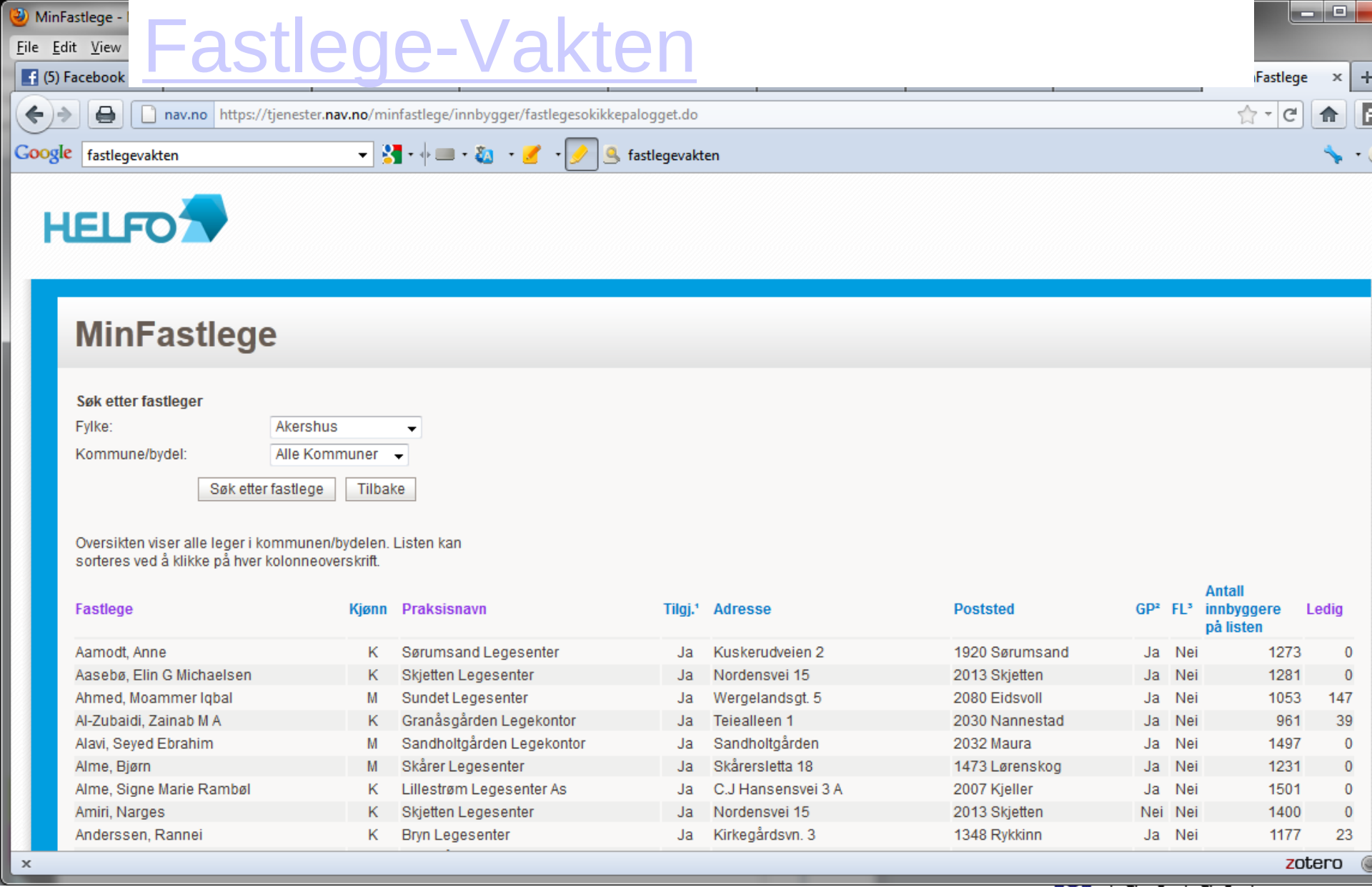
- My Background
- My Pet Program
  - FastlegeVakten
- Demo
  - Patient Explorer
  - Brat / Stay
- Summary



CV

- →2003: MSc Computers: BusTUC @ atb.no
- →2006: PhD Computer Science NTNU
  - Natural Language Understanding (NLU): GeneTUC
- →2010: Postdoc University of Tokyo, TsujiiLab
  - Natural Language Processing (NLP): MedIE
- →2012: Postdoc NTNU: UbiCompForAll
  - End User Service Composition
- →2015: Postdoc NTNU
  - Keeping Patients Out of the Hospital

Fastlege-Vakten



Fastlege	Kjønn	Praksisnavn	Tilgj.[1]	Adresse	Poststed	GP[2]	FL[3]	Antall innbyggere på listen	Ledig
Aamodt, Anne	K	Sørumsand Legesenter	Ja	Kuskerudveien 2	1920 Sørumsand	Ja	Nei	1273	0
Aasebø, Elin G Michaelsen	K	Skjetten Legesenter	Ja	Nordensvei 15	2013 Skjetten	Ja	Nei	1281	0
Ahmed, Moammer Iqbal	M	Sundet Legesenter	Ja	Wergelandsgt. 5	2080 Eidsvoll	Ja	Nei	1053	147
Al-Zubaidi, Zainab M A	K	Granåsgården Legekontor	Ja	Teiealleen 1	2030 Nannestad	Ja	Nei	961	39
Alavi, Seyed Ebrahim	M	Sandholtgården Legekontor	Ja	Sandholtgården	2032 Maura	Ja	Nei	1497	0
Alme, Bjørn	M	Skårer Legesenter	Ja	Skårersletta 18	1473 Lørenskog	Ja	Nei	1231	0
Alme, Signe Marie Rambøl	K	Lillestrøm Legesenter As	Ja	C.J Hansensvei 3 A	2007 Kjeller	Ja	Nei	1501	0
Amiri, Narges	K	Skjetten Legesenter	Ja	Nordensvei 15	2013 Skjetten	Nei	Nei	1400	0
Anderssen, Rannei	K	Bryn Legesenter	Ja	Kirkegårdsvn. 3	1348 Rykkinn	Ja	Nei	1177	23

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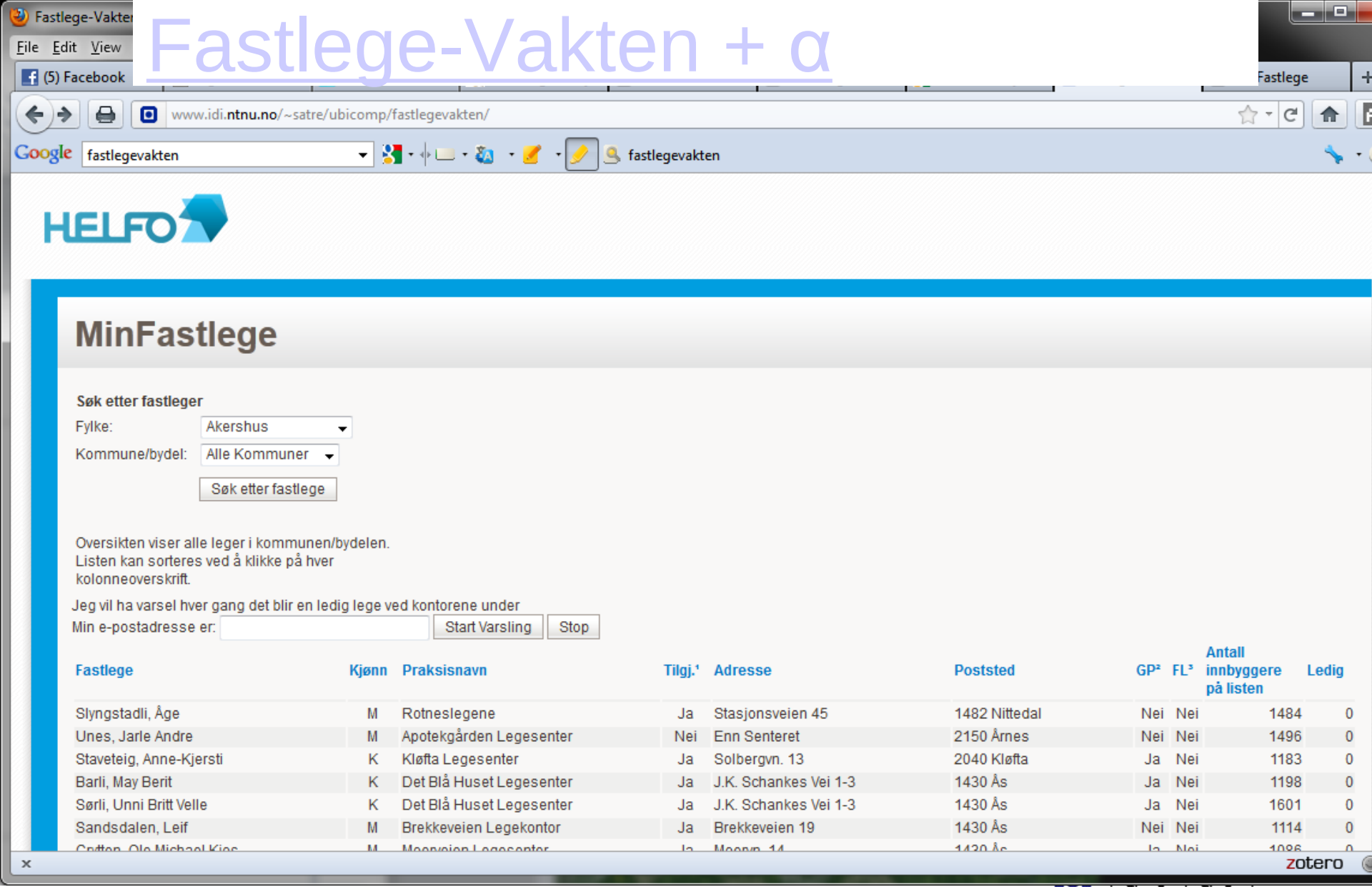
Japan + α

Fastlege-Vakten + α



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Slyngstadli, Åge	M	Rotneslegene	Ja	Stasjonsveien 45	1482 Nittedal	Nei	Nei	1484	0
Unes, Jarle Andre	M	Apotekgården Legesenter	Nei	Enn Senteret	2150 Årnes	Nei	Nei	1496	0
Staveteig, Anne-Kjersti	K	Kløfta Legesenter	Ja	Solbergvn. 13	2040 Kløfta	Ja	Nei	1183	0
Barli, May Berit	K	Det Blå Huset Legesenter	Ja	J.K. Schankes Vei 1-3	1430 Ås	Ja	Nei	1198	0
Sørli, Unni Britt Velle	K	Det Blå Huset Legesenter	Ja	J.K. Schankes Vei 1-3	1430 Ås	Ja	Nei	1601	0
Sandsdalen, Leif	M	Brekkeveien Legekontor	Ja	Brekkeveien 19	1430 Ås	Nei	Nei	1114	0

Knowledge representation:

- BRAT:
  - A1 format
  - Encoded Frames
  - Base: the subject (entity), or the predicate (events)
  - Arguments: object (entity or predicate)
  - identified by URIs
  - Example : *New York has a postal abbreviation which is NY*

<rdf:Description rdf:about="urn:states:New_York">
<"http://purl.org/dc/terms/" :alternative>NY</rdf:Description>

- Universal Resource Identifier
  - Ensure that concepts are tied to a unique definition that everyone can find on the Web

Demo

- Patient Explorer
- Brat
  - http://brat.nlplab.org/

Summary

- Keeping Patients out of Hospital
  - Patient Trajectories (Pastas)
- Analyze electronic patient records
  - Connect
    - written knowledge
    - structured knowledge
  - Find
    - Dates
    - Substances
    - Anatomy terms
    - Etc.