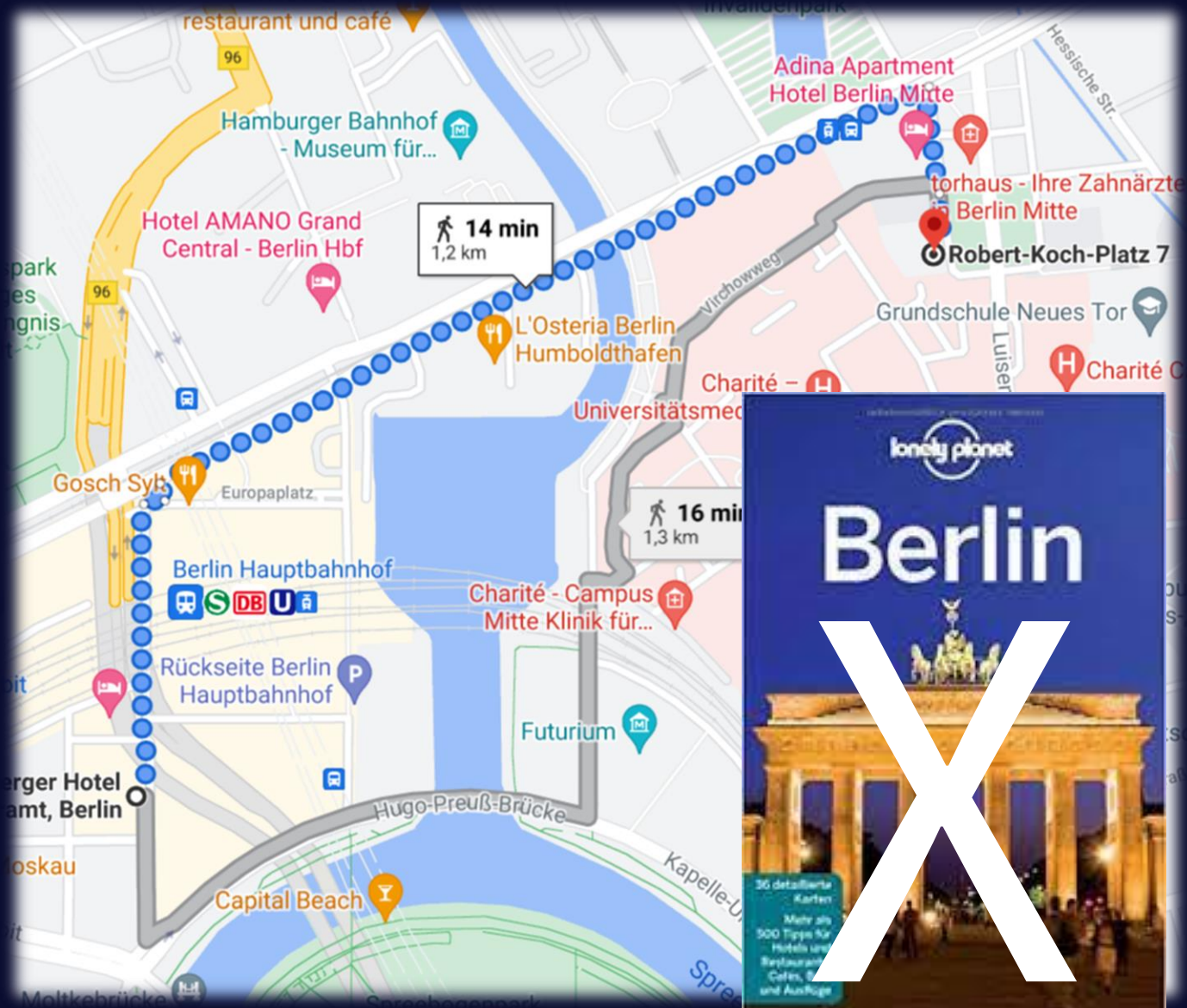
ENABLING EFFICIENT HEALTHCARE

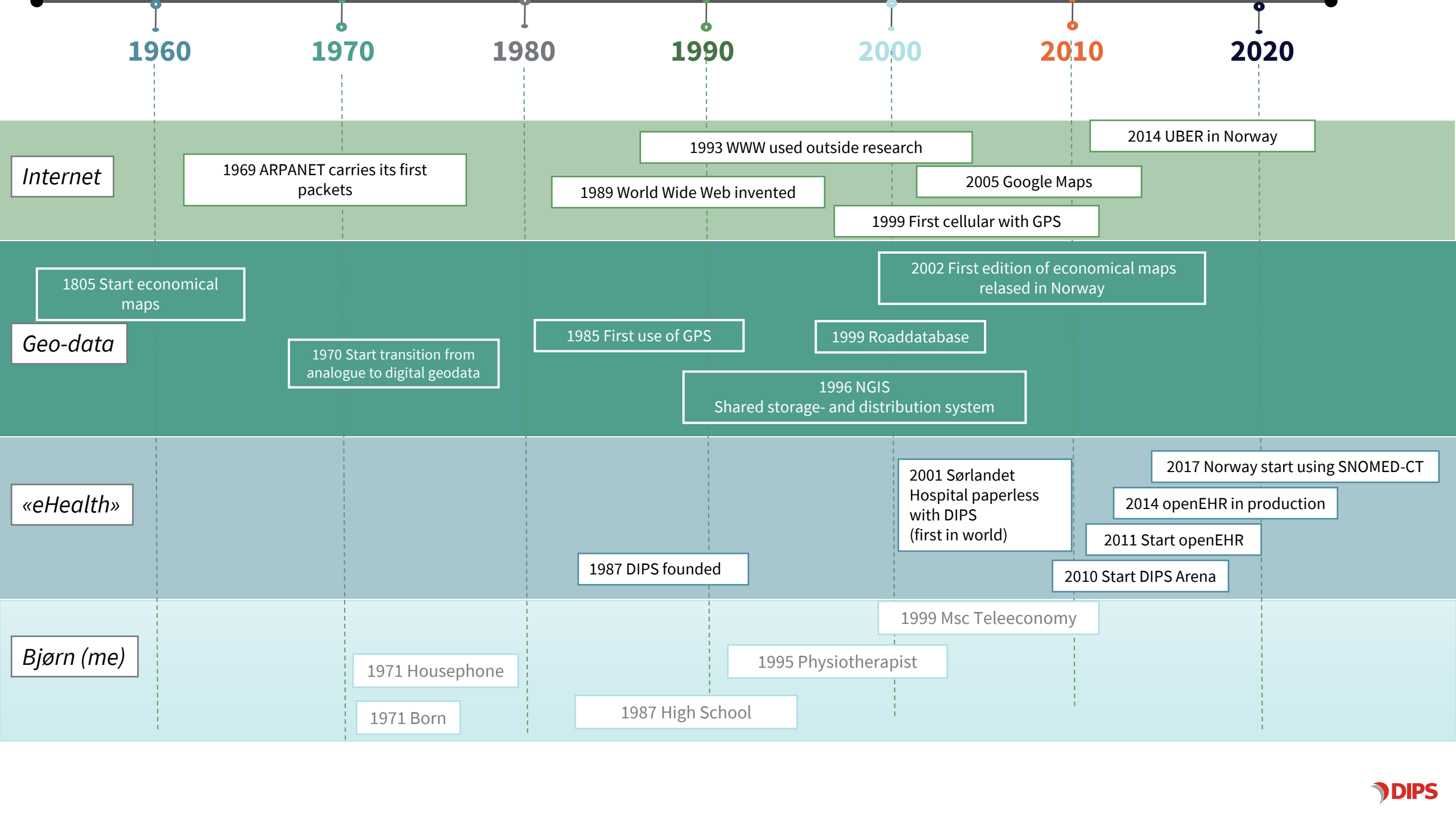
openEHR and FHIR in Norway

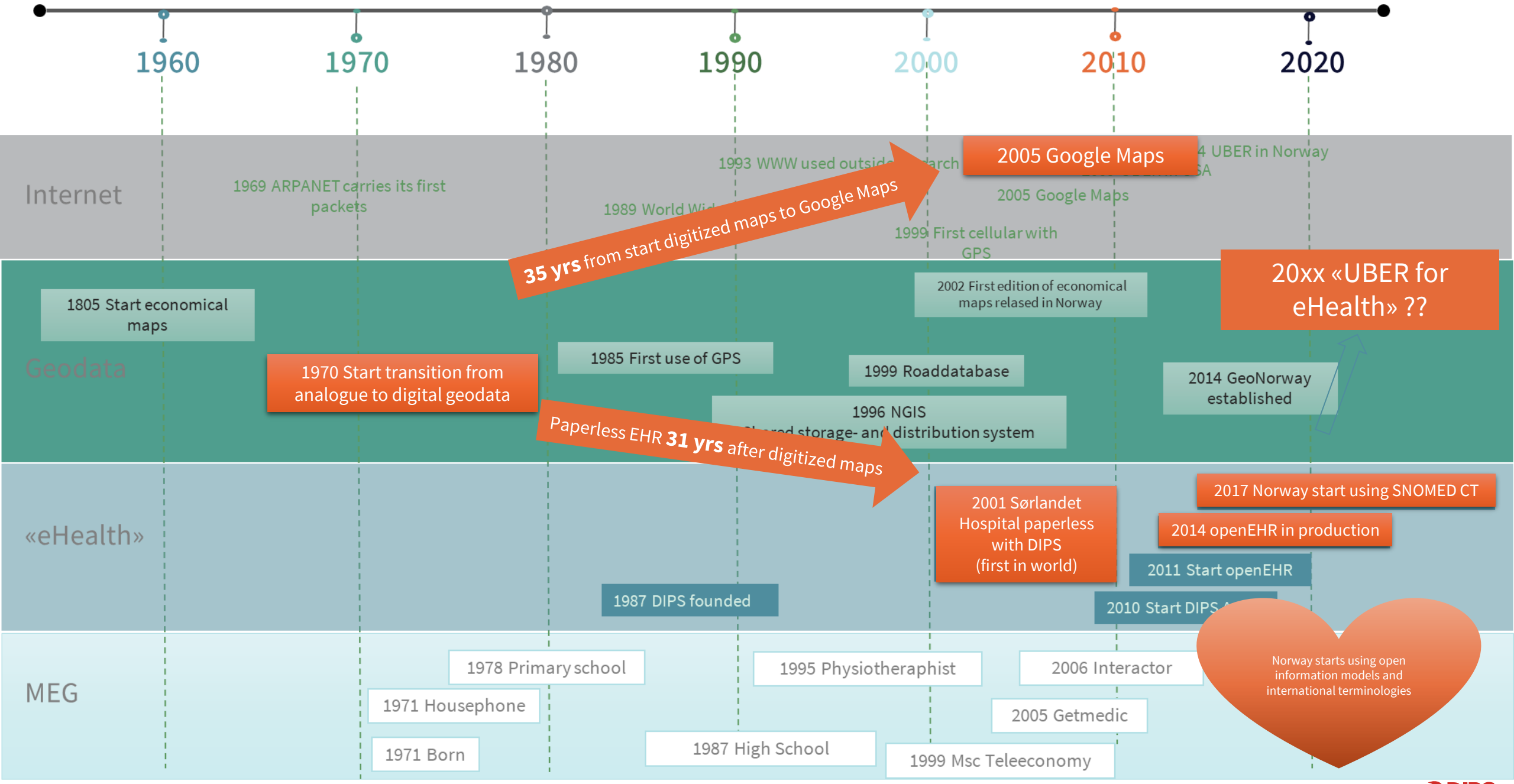
Bjørn Næss, DIPS AS


Hjem
Karlstad
Örebro kommune
Norrköping
Linköping
Kristiansand
Jönköping
182 t
997 km
Älborg
Århus
København
Danmark
Sjælland
Fyn
Kiel
Rostock
Kołobrzeg
Lübeck
Hamburg
Szczecin
Bremen
Hannover
Robert-Koch-Platz 7
Potsdam


restaurant und café
Hamburger Bahnhof - Museum für...
Hotel AMANO Grand Central - Berlin Hbf
14 min
1,2 km
Adina Apartment Hotel Berlin Mitte
Robert-Koch-Platz 7
L'Osteria Berlin Humboldthafen
Virchowweg
Grundschule Neues Tor
Gosch Sylt
Europaplatz
Berlin Hauptbahnhof
16 min
1,3 km
Charité - Campus Mitte Klinik für...
Rückseite Berlin Hauptbahnhof
Futurium
Hugo-Preuß-Brücke
Capital Beach

lonely planet
Berlin


1960
1970
1980
1990
2000
2010
2020
Internet
1969 ARPANET carries its first packets
1989 World Wide Web invented
1993 WWW used outside research
1999 First cellular with GPS
2005 Google Maps
2014 UBER in Norway
Geo-data
1805 Start economical maps
1970 Start transition from analogue to digital geodata
1985 First use of GPS
1996 NGIS
Shared storage- and distribution system
1999 Roaddatabase
2002 First edition of economical maps relased in Norway
«eHealth»
1987 DIPS founded
2001 Sørlandet Hospital paperless with DIPS (first in world)
2010 Start DIPS Arena
2011 Start openEHR
2014 openEHR in production
2017 Norway start using SNOMED-CT
Bjørn (me)
1971 Born
1971 Housephone
1987 High School
1995 Physiotherapist
1999 Msc Teleeconomy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1989 World Wi
1993 WWW used outsid arch
2005 Google Maps
1999 First cellular with GPS
4 UBER in Norway
SA
2005 Google Maps
35 yrs from start digitized maps to Google Maps
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20xx «UBER for eHealth» ??
Paperless EHR 31 yrs after digitized maps
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2005 Getmedic
Norway starts using open information models and international terminologies

Light-footed and sustainable innovation for the health sector must be based on **solid information models** that uses **thoughtful terminologies** to express **clinical concepts** as **precisely as necessary**.

What do I do from day to day?

Me 2010-2020

Me 2020-present

Acute ward

Covid-19

Cancer registry

Safe EHR

Coloscopy report

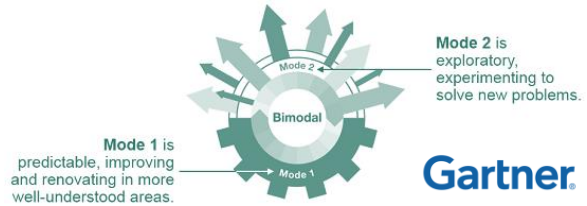
Tools for clinical modelling

openEHR

Patientadministrative services

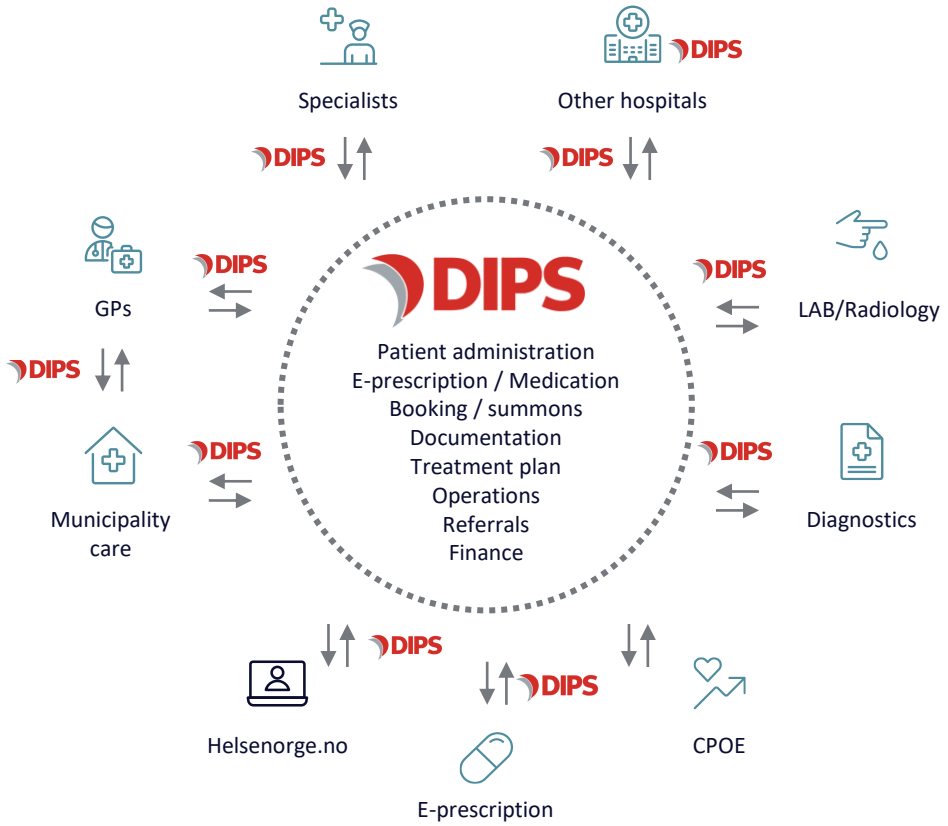
DIPS Arena as a platform

- Work close with healthcare professionals to develop clinical applications using DIPS Arena as a platform.
- Based on open international standards such as openEHR and SNOMED-CT



DIPS is the core system and communication hub in the hospital market in Norway with 86% marketshare

DIPS has 100 000+ daily users and over 1 200 integrations



DIPS is the…

Master of all…

- Clinical personnel data (authorization, access control and logging/tracking)
- Patient waiting lists, planning and logistics
- Planning and handling in operation theatres
- Patient records

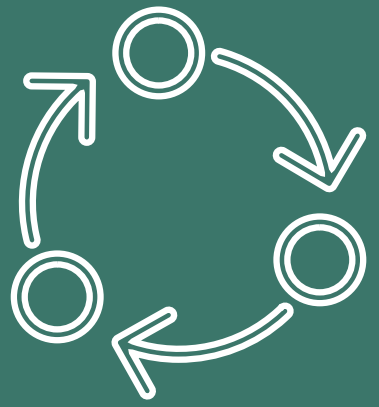
Hub for all…

- Ordering and results from labs and radiology
- Communications with 3rd party systems (PACS, RIS, LAB, etc.) and other healthcare parties

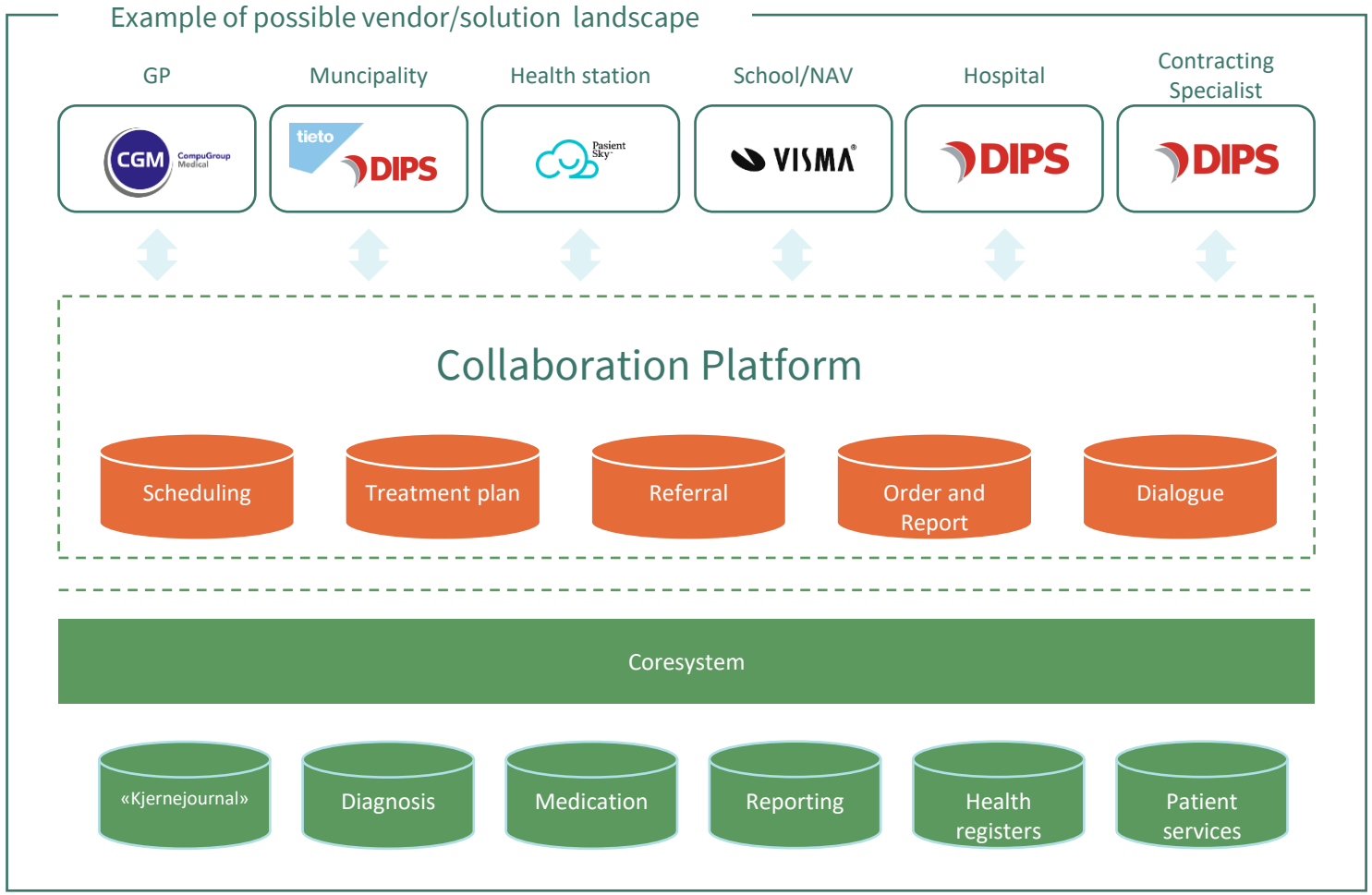
Source for all…

- Documentation and reporting – internally and for the Government and Government bodies

DIPS is one of many players in a broad supplier landscape, with APIs for a common collaboration platform



An interaction platform that realizes seamless patient pathways and information sharing across all levels and actors will be the hub, with open interfaces to system suppliers



From humble beginnings to market leading EHR supplier in Norway…

1987 Founded at Nordland Hospital

1997 DIPS AS incorporated

2000 2nd generation EHR

2003 Contract Helse Nord

2007 Tender win Helse Vest

2008 Tender win Helse Sør-Øst

NOK >1.3 billion invested in DIPS Arena from 2013

2013 Kick-off DIPS Arena development

2014 OUS implements DIPS

2018 AWC new owners

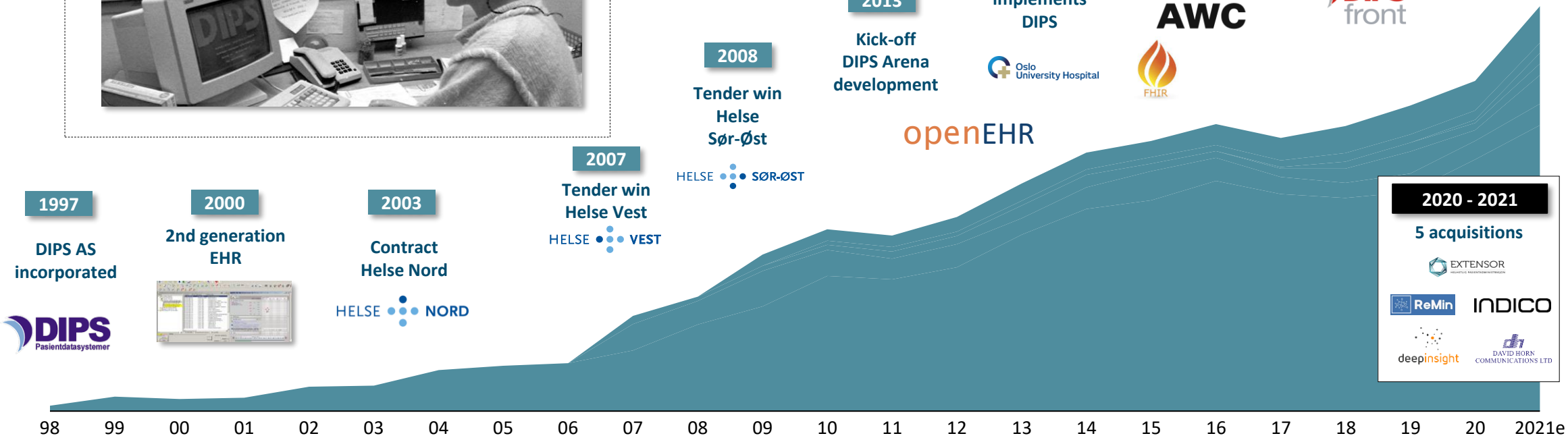
DIPS Arena implementation initiated

2019 DIPS Front acquired

2021 Reorganization to Kernel

openEHR

2020 - 2021 5 acquisitions



Kernel is a growth platform for connected best-of-breed solutions in healthcare

What we believe in

- Connected best-of-breed solutions are the future of enterprise IT
- The best companies are run by dedicated people with a simple goal
- We maintain speed and agility by actively avoiding bureaucracy and corporate red tape
- Security comes first

How we operate

- Overhead-light with CEO, CFO and experienced professionals
- Developing group strategy and attracting new partners
- Spawning new companies and projects
- Coordinating and reaping synergies

Kernel

Kernel operating companies

DIPS	DIPS front	EXTENSOR HELHETLIG PASIENTADMINISTRASJON	ReMin	deepinsight	INDICO	Acquisitions
420 MNOK	47 MNOK	15 MNOK	8 MNOK	13 MNOK	53 MNOK*	LTM Mar'21 Revenue

Note: * includes David Horn Communications

Norwegian public hospital system

eHealth in Norway

- Four Regional Health Authorities (RHAs)
  - 24 Hospital trusts
  - 100% EHR adoption
- Two main EHR vendors
  - DIPS Arena 3 of 4 regions
  - EPIC implemented in the mid region
- Directorate of eHealth
  - A sub-ordinate institution of the Norwegian Ministry of Health and Care Services.
  - Responsible for steering and coordination of eHealth through close cooperation with regional health authorities, local authorities, technical organisations, and other interested parties

International standards:
Assessment of frameworks for common information models

FHIR

- should be used when preparing common information models where the primary area of use is **information exchange**. Other standards for information modeling can be used if a standard other than FHIR is to be used in the exchange

openEHR

- should be used when preparing common information models where the primary area of use is **storage in clinical systems** based on openEHR, but can also be used for systems that are not based on openEHR.

UML

- should be used in the consolidation of common information models and in the preparation of other common information models than those that fall under points 1 and 2.

DCM

- The processes and requirements described in the DCM specification should be considered as part of the basis when preparing routines for quality and management of common information models.

openEHR and FHIR – in some clinical use-cases
Vital Signs and Colonoscopy Report

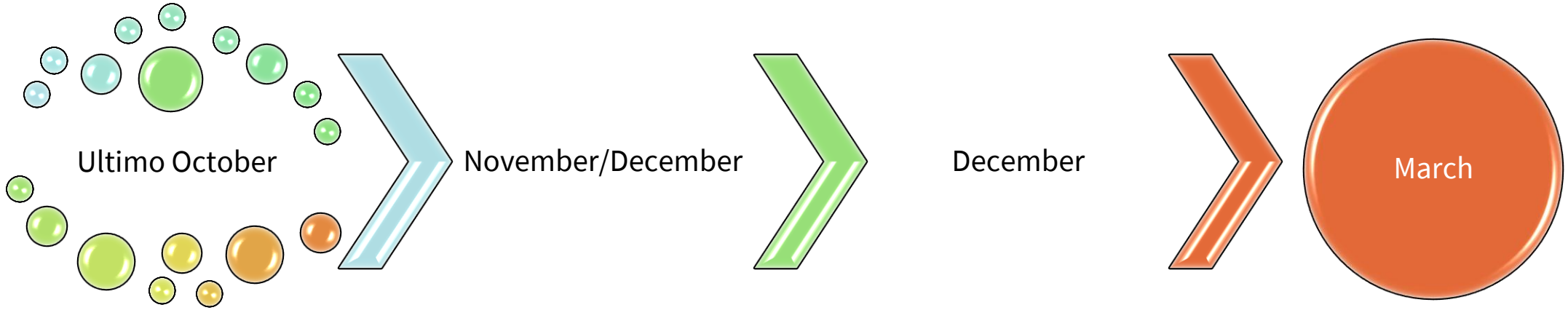
Vital Signs – integration example

DIPS HL7 FHIR iMDsoft openEHR

- The need to synchronize vital signs data between the DIPS Arena EHR and Metavision ICU
- Should be
  - Use openEHR archetypes as “abstract information model”
  - Based on FHIR
  - Use SNOMED-CT as terminology
- Started June 2019
- Status October 2021
  - FHIR profile in v 0.8
  - Missing a way to distinguish “pulse” and “heartbeat”
  - AFAIK the problem is defining the right SNOMED-CT code

How we developed a complete colonoscopy report within a few weeks with

Diakonhjemmet Sykehus



Request from customer/doctor

Weekly sprints with doctor

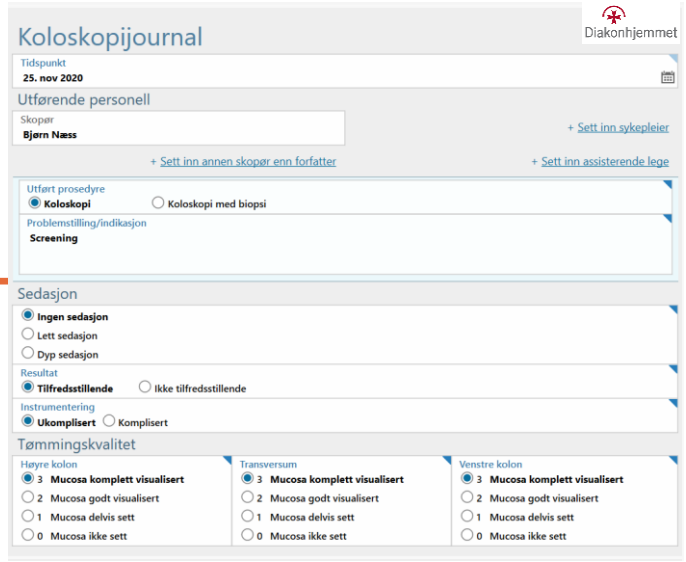
- Form in production for initial usage
- More sprints with adjustments

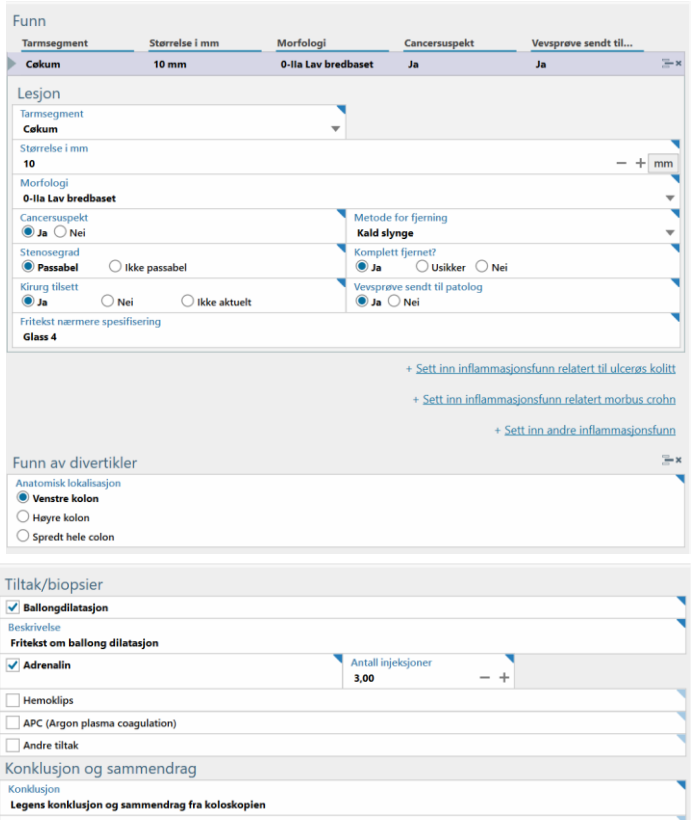
- Arena upgraded with support for discharge summary
- Roll out to more doctors

Boston Bowel Preparation Scale
[**SNOMED-CT**::722818007 | Boston bowel preparation scale (assessment scale)]

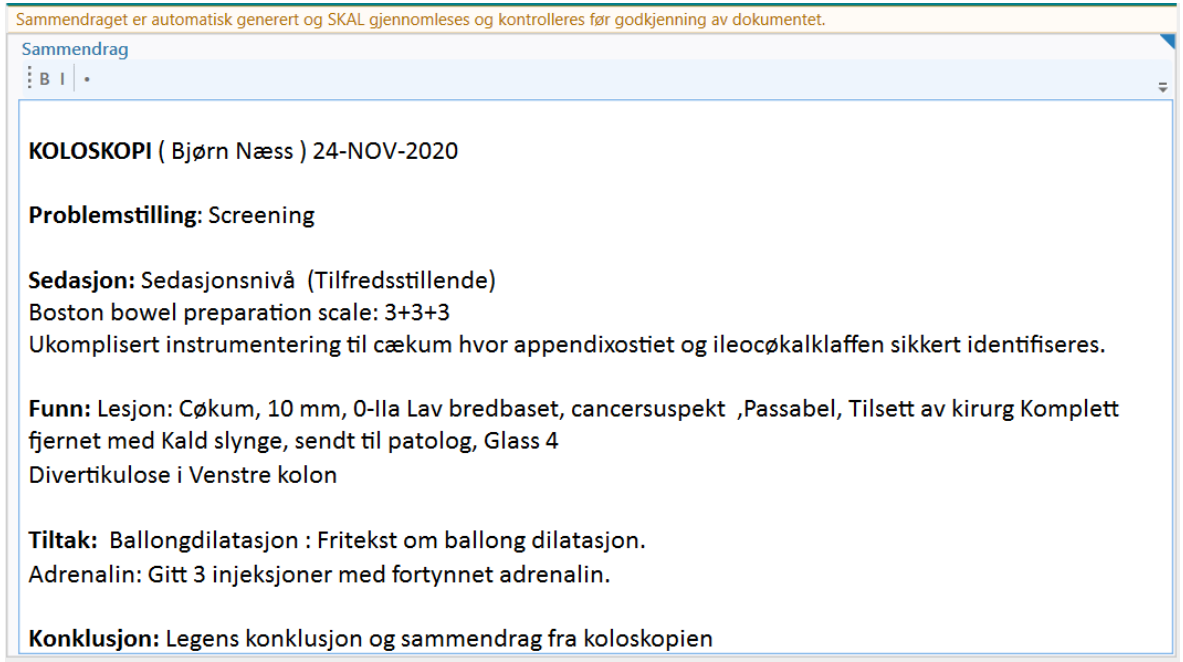
Original Author/Publisher	Author name: Bjørn Næss Organisation: DIPS AS Email: bna@dips.no Date originally authored: 2020-10-26

DIPS

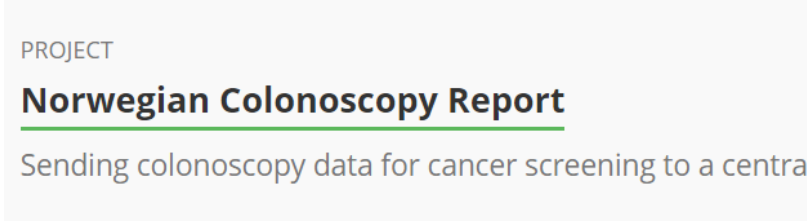




Discharge summary and note generation



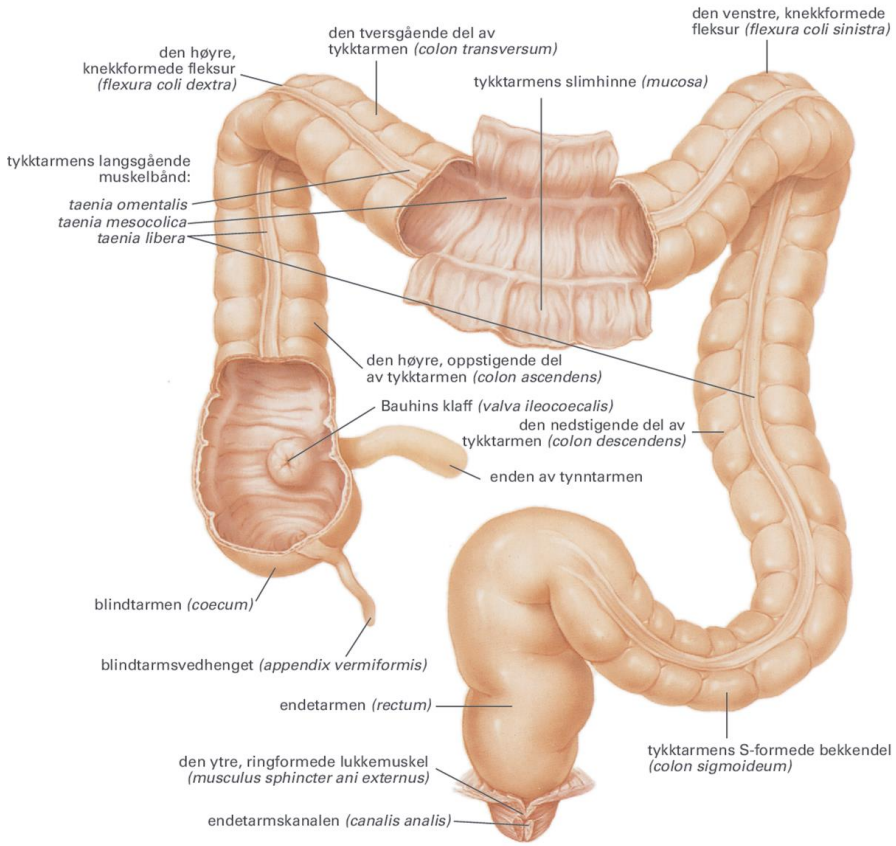
Automatic report to national registry



Tarmscreeningprogrammet

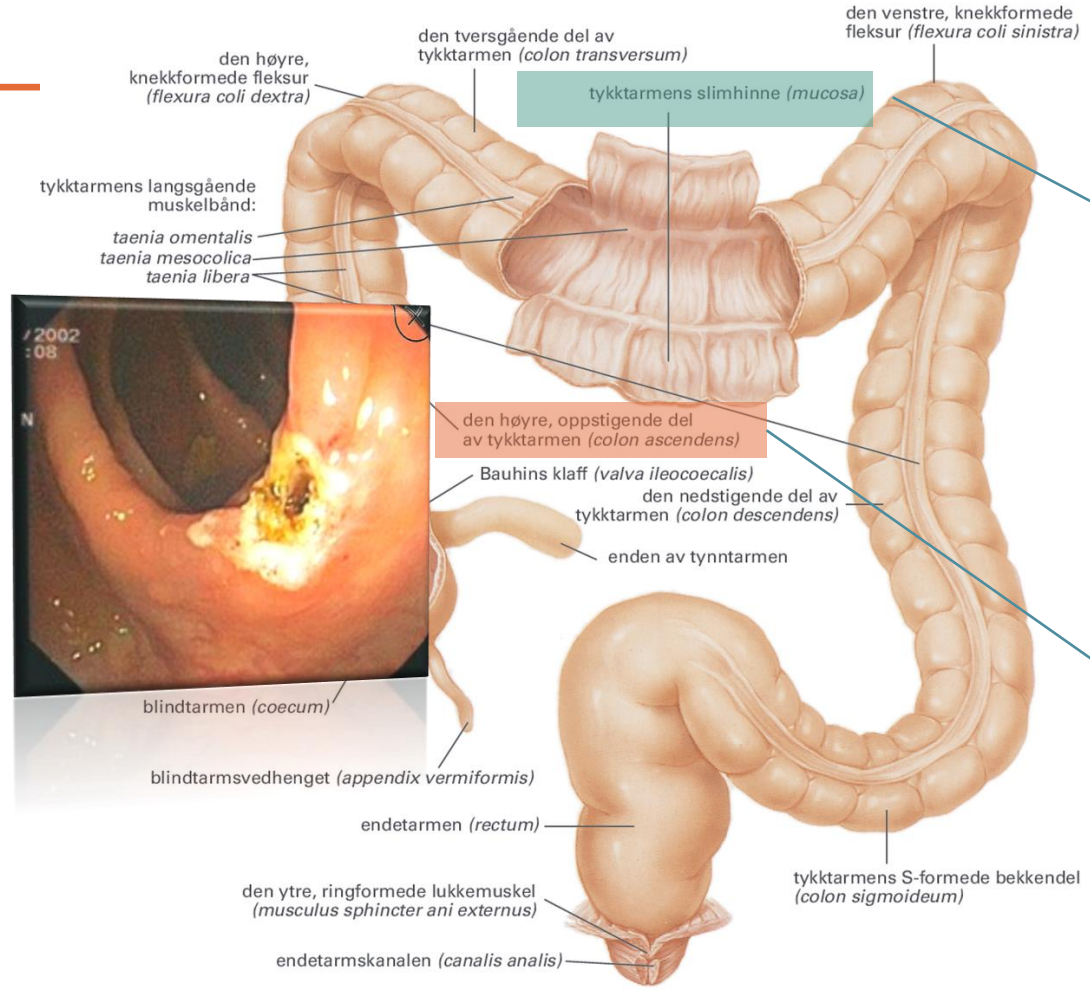
DIPS

SNOMED-CT defines the anatomy in the colon



at0038	Term ileum	term:SNOMED-CT::85774003
at0039	Cøkum	term:SNOMED-CT::32713005
at0040	Ascendens	term:SNOMED-CT::9040008
at0041	Høyre fleksur	term:SNOMED-CT::48338005
at0042	Transversum	term:SNOMED-CT::485005
at0043	Venstre fleksur	term:SNOMED-CT::72592005
at0044	Descendens	term:SNOMED-CT::32622004
at0045	Sigmoid	term:SNOMED-CT::60184004
at0046	Rectosigmoid overgang	term:SNOMED-CT::81922002
at0047	Rektum	term:SNOMED-CT::34402009

Colonoscopy – the need for new archetypes



Koloskopi

Tidspunkt
11. mar 2021 kl 23:37

Omsorgsnivå
○ Inneliggende ◉ **Poliklinil**

Utførende personell

Skopør
Bjørn Næss

Problemstilling/indikasjon
Screening

Sedasjon
◉ **Ingen sedasjon**
○ Lett sedasjon
○ Dyp sedasjon

Sedasjonskvalitet
◉ **Tilfredsstillende** ○ Ikke tilfredsstillende

Instrumentering
◉ **Ukomplisert til cøkum** ○ Ukomplisert til term ileum ○ Ukomplisert til anastomose ○ Komplisert

Tømmingskvalitet

Høyre kolon	Transversum	Venstre kolon
◉ 3 **Mucosa komplett visualisert**	◉ 3 **Mucosa komplett visualisert**	◉ 3 **Mucosa komplett visualisert**
○ 2 Mucosa godt visualisert	○ 2 Mucosa godt visualisert	○ 2 Mucosa godt visualisert
○ 1 Mucosa delvis sett	○ 1 Mucosa delvis sett	○ 1 Mucosa delvis sett
○ 0 Mucosa ikke sett	○ 0 Mucosa ikke sett	○ 0 Mucosa ikke sett

Funn

Cancer suspekt lesjon	Størrelse i mm	Morfologi	Vevsprøve sendt til patolog
Nei	**12,00 mm**	**0-Ip stilket**	**Ja**
Nei	**10,00 mm**	**0-Is høy bredbaset**	**Ja**

Tarmsegment hvor lesjonen er påvist
Ascendens

Cancer suspekt lesjon
○ Ja ◉ **Nei**

Størrelse i mm
12,00 − + mm

Metode for fjerning
Endoskopisk mucosal reseksjon

Morfologi
0-Ip stilket

Komplett fjernet?
◉ **Ja** ○ Usikker ○ Nei

Vevsprøve sendt til patolog
◉ **Ja** ○ Nei

Fritekst nærmere spesifisering
Glass 1

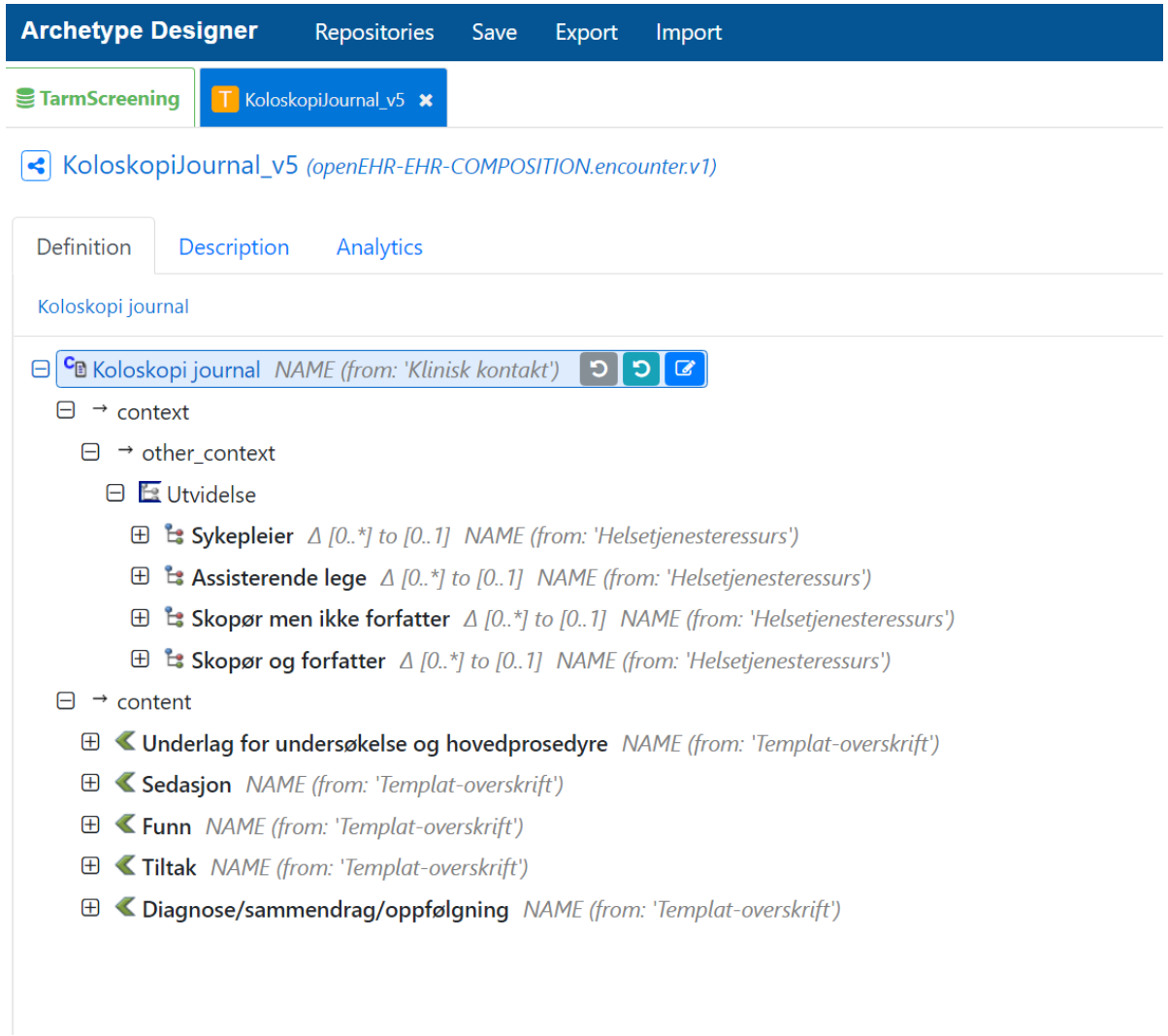
+ Sett inn polypp

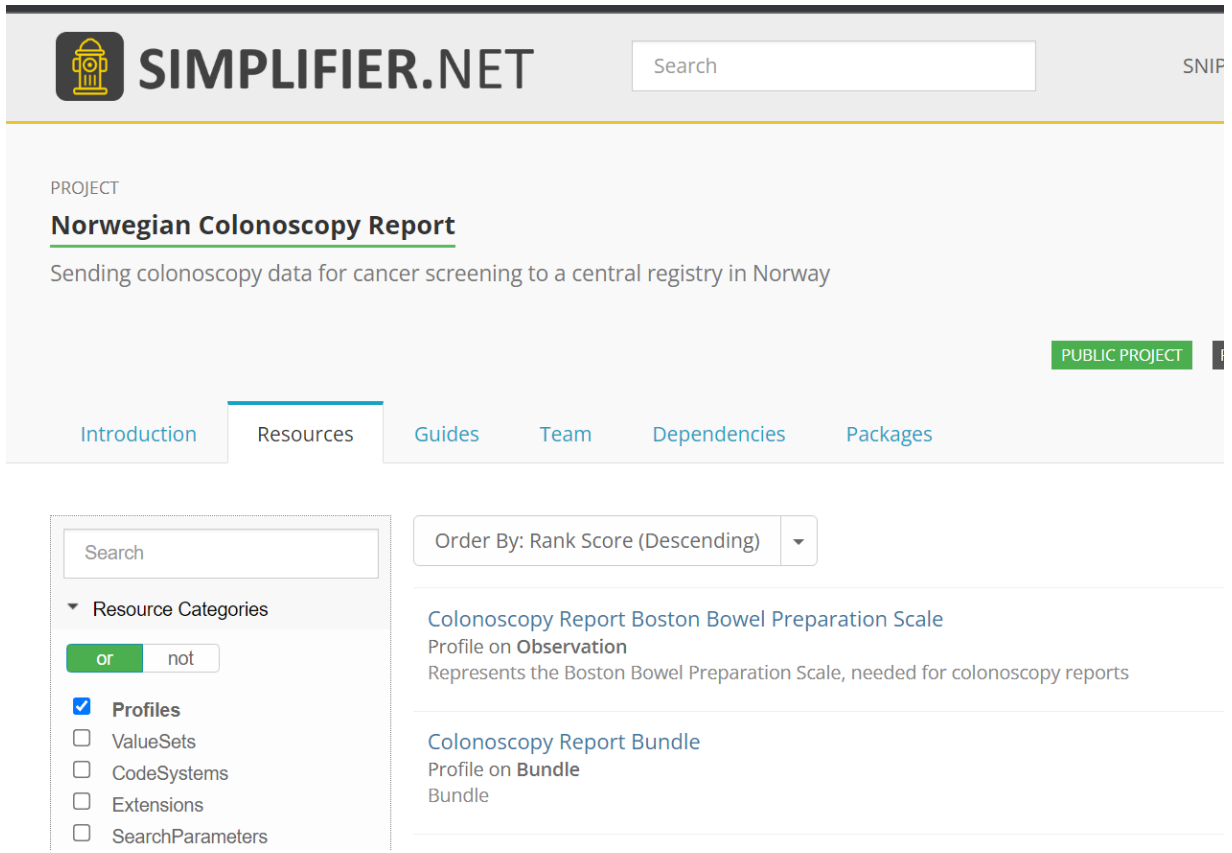
Boston Bowel Preparation Scale
[**SNOMED-CT**::722818007 | Boston bowel preparation scale (assessment scale)]

Boston Bowel Preparation Scale – 3 months from initial need and testing into a national and global reviewed archetype.

openEHR has a governance model that works and scales !

Colonoscopy screening in the tooling





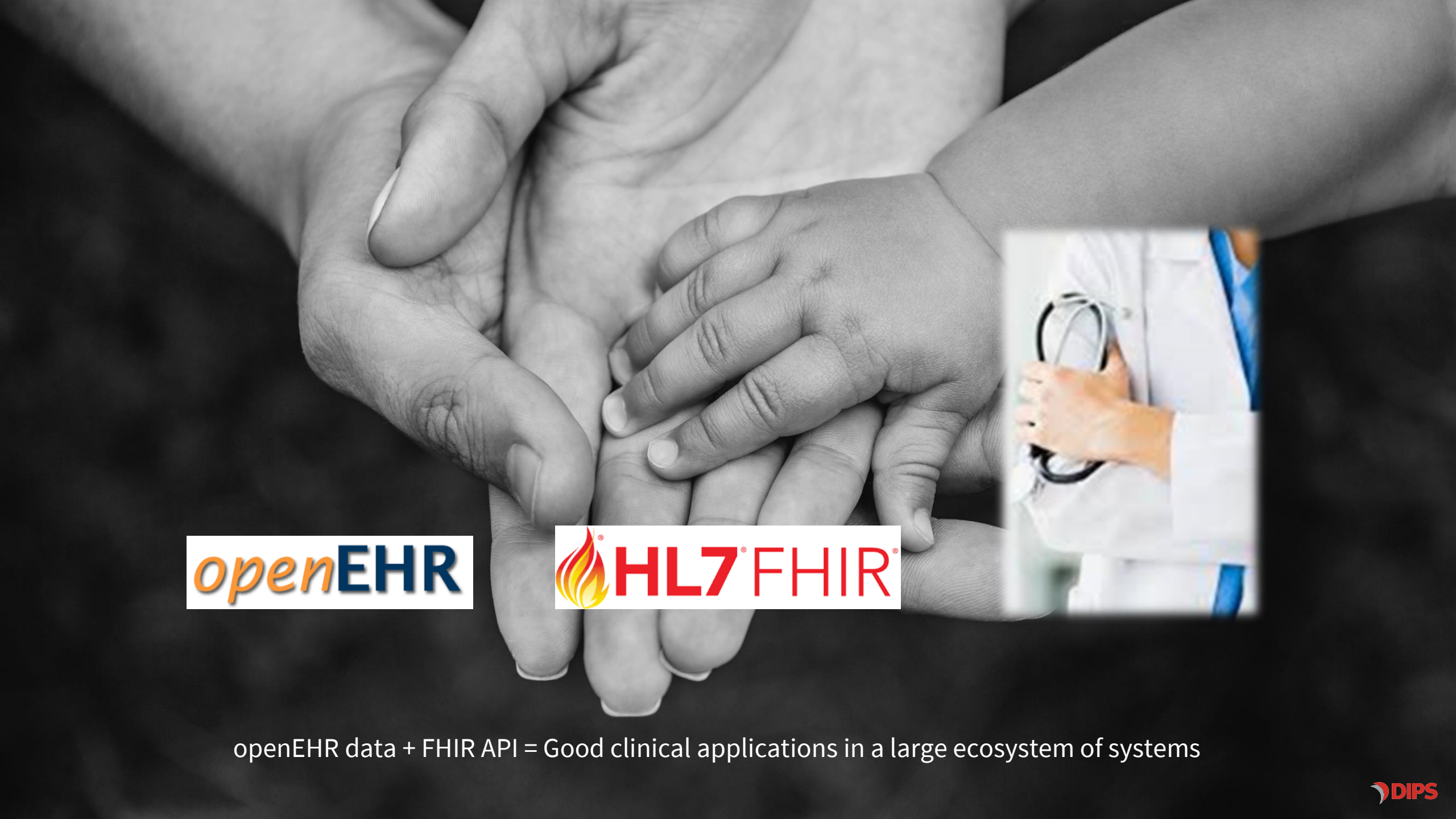
openEHR and FHIR – two levels of friendship operations

- FHIR is based on 80% rules for clinical content which means they cover a minor set of clinical data but often with high volume . openEHR have models for clinical content and covers a wide range of clinical domains
  - FHIR look at openEHR CKM when they build new FHIR profiles.
- FHIR and openEHR share the same value set needs.
  - Need to cooperate on the development and maintenance of those.

Functional

- Automatically create FHIR profiles based on reviewed openEHR templates.
- HL7 governance groups do technical, functional review and describe the enterprise architectural design patterns for the use-cases.
- **Let's create tools that automatically transform clinical reviewed openEHR templates in to good FHIR profiles.**
  - **This will lower cost, improve quality and ease the governance of national eHealth systems**

Technical



openEHR data + FHIR API = Good clinical applications in a large ecosystem of systems

DIPS