



Direktoratet for  
e-helse

# A brief overview of health IT collaboration and interoperability in five countries in 2018



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A brief overview of health IT collaboration and interoperability in five countries in 2018

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# Preface

To understand dominant trends within collaboration, interoperability and health information exchange (HIE), the Norwegian Directorate of eHealth (NDE) conducted a desktop study on five different countries in 2018.



The Nordic countries Norway, Sweden, and Denmark were chosen due to the similarities in political tradition, socioeconomic conditions, organisation of healthcare, and a strong tradition for collaboration, also within eHealth. The study also includes the USA and the UK, as they represent different models for collaboration than the Nordic countries.

**The study is summarized in this report. The report is a snapshot of the situation in 2018. A few changes have been done to reflect 2019, but no full revision of the report has been done. In some cases, the description may therefore not reflect the status in 2019. The report does not provide a complete description of current collaboration models or interoperability solutions but can serve as a starting point for further work on this subject.**

The report is structured as follows:

- A short description of the healthcare system in each country
- A summary of the eHealth collaboration and interoperability situation in each country, and further strategies

In the report, a Norwegian perspective on the different levels of healthcare is used, which is not always consistent with other countries' healthcare systems:

- Primary healthcare: General Practitioners (GPs) and Primary Care (nursing home, community care)
- Specialist (or secondary) healthcare: hospitals, specialist services, outpatient clinics etc.

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## Summary of findings

Although the five countries studied in this report have different healthcare systems, the challenges to Healthcare IT (HIT) collaboration and interoperability are similar: How to improve the exchange of information to support better continuity of care.

Several areas are gaining traction and moving towards firmer ground across the countries:

- Health IT standards for interchange of healthcare information, notably HL7 FHIR, is being adopted by more and more countries and institutions. However, large-scale implementations have still not emerged.
- There is momentum around Application Programming Interface (API) development for Electronic Healthcare Record systems, but the discussion is moving towards control on workflow collaboration and developing continuity of care
- Healthcare Information Exchange (HIE) is considered important in all countries. However, the topics in this discussion is mainly on the infrastructure level, moving towards continuity of care,
- The impression is that the Nordic countries and the UK have a higher willingness to invest in centralised and national initiatives, without (so far) introducing regulation on the initiatives.
- There is a drive from governments and authorities to regulate and incentivise more of the eHealth domain to solve collaboration and interoperability issues. However, there is still no clear common pathway or roadmap in sight in the five countries that have been studied.

# 1 Introduction

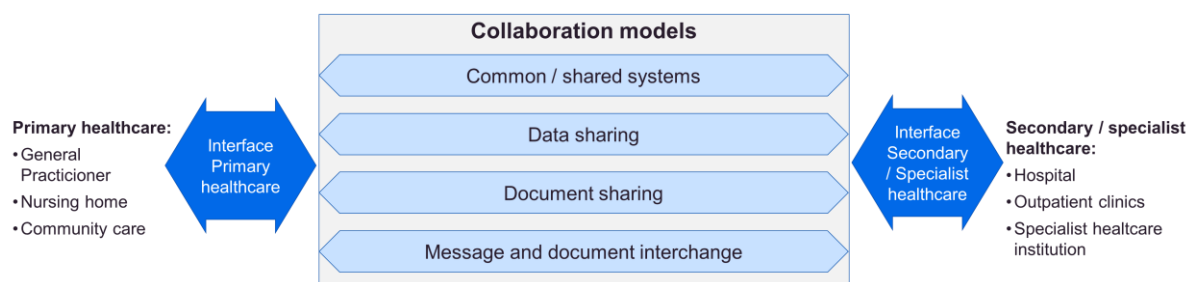
The Norwegian Directorate of eHealth ([NDE](#)) is currently in the planning and execution phase of several large eHealth projects and programs which are all part in the overall mission to support continuity of care at a National level. There is a specific focus on collaboration and interoperability between Electronic Health Record (EHR) solutions, the different care levels, and the different institutions.

The eHealth programs need updated information about how other countries are solving collaboration challenges between EHR and interoperability in Health Information Exchange (HIE) models in general.

In 2018, the Norwegian Directorate of eHealth performed a desktop study of relevant literature, in order to make an overview of collaboration models and descriptions of interoperability in selected countries. The countries studied were the USA, England (UK), Denmark, Sweden, and Norway. The study focused on finding descriptions on how the different countries solve:

- Vertical collaboration (between Primary care and Secondary / specialist care entities)
- Horizontal collaboration (between Primary care entities or between Secondary entities)

Regarding collaboration, the model below outlines four general collaboration possibilities:



*Figure 1 A generic model for collaboration and types of collaboration in the healthcare sector*

These four collaboration models can for example be supported by healthcare providers by using interoperability standards like HL7 v2 and v3, HL7 FHIR, XDS, [DICOM](#) or protocols like X12 or more direct collaboration through TCP/IP, APIs, Web Services etc.

This report describes the collaboration models used in the five countries and, to some extent, which interoperability technologies and standards that are being used.

## 2 Organisation of healthcare

Below is a short description of the general organisation of healthcare of the five countries in the study.

	Norway	Sweden	Denmark	UK	USA
Population (million)	5,2	9,9	5,7	65,6	325,7
GDP (US \$ billion, 2016)	371	514	307	2 700	18 600
Health expenditure as share of GDP (2016 or nearest year in %)	10,5	11	10,4	9,7	17,2
Total health coverage	100	100	100	100	35,6/55,3 <sup>1</sup>
Life Expectancy at birth (2016)	82,5	82,2	80,7	81,6	78,7
Physicians per 1 000 people (2014-2016)	4,4	4,1	3,7	2,8	2,6
Practicing nurses per 1 000 people, 2000 and 2015 (or nearest year)	17,3	11,1	16,7	7,9	11,3
Hospital beds per 1 000 people	3,3	3,6	3,5	3,9	2,9
Long-term care workers per 100 people aged 65 and over, 2015 (or nearest year)*	13	12	8	..	12

Figure 2 Organisation of healthcare per country

\*institution and home

<sup>1</sup> Total public coverage/primary private health coverage

### 2.1 Norway

#### 2.1.1 Demography and background information

Norway has 5.2 million inhabitants spread over nearly 400,000 km<sup>2</sup>, making it one of the most sparsely populated countries in Europe. Norway's population enjoys good health status; life expectancy of 82,5 years is above the EU average of 80,14.

There are about 170,000 FTE's in Primary healthcare (including 4,600 GP's doing 14 million consultations per year) and 105 000 FTE<sup>1</sup>'s in the Specialist healthcare (handling 1,3 million consultations). There are 8,7 million outpatient consultations per year.

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<sup>1</sup> Full-Time-Equivalent



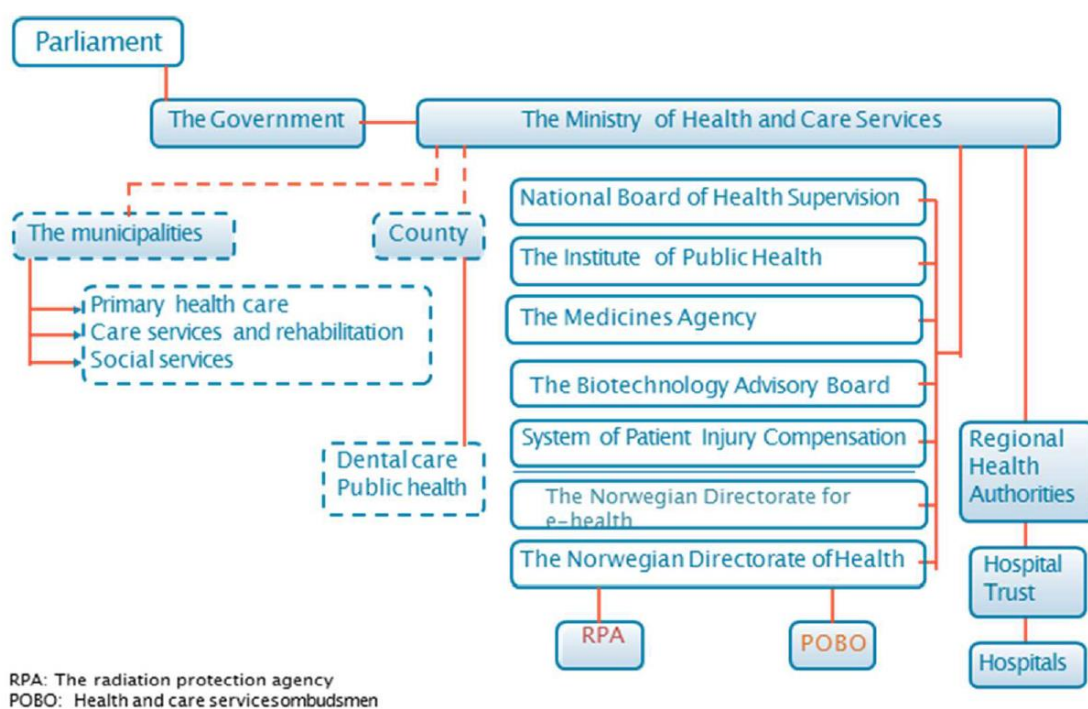
## 2.1.2 Briefly on the organisation and governance

The Norwegian health care system can be characterised as semi-decentralised. The responsibility for specialist care lies with the state since 2002, administered by four Regional Health Authorities (RHAs).

The municipalities are responsible for providing reasonable, high-quality health care and social services to everyone in need of them, regardless of age or diagnosis. The state is responsible for ensuring equal framework conditions through legislation, financial frameworks and national guidelines (evidence-based medicine etc.). In addition, the state carries the responsibility of exercising supervision and control.

The [Ministry of Health and Care Services](#) is in charge of regulation and supervision of the system, but many of the tasks are delegated to various subordinate agencies, such as the [Norwegian Directorate of Health](#) and the [Norwegian Medicines Agency](#) (NoMA). Various types of health data are collected in around 200 medical registries, and overall supervision and monitoring of health services is provided by the [National Board of Health Supervision](#).

Inter-sectoral cooperation and strengthening the role of patients and next-of-kin has been a policy priority for several years<sup>2</sup>.



Source: A. K. Lindahl, Norwegian Knowledge Centre for Health Services, 2015.

Figure 3 The [Norwegian Health System](#)<sup>3</sup>

### Primary healthcare providers

The municipal health services include GPs, pregnancy and antenatal care, health clinics for mother and child, school clinics, mental health care, nursing homes, rehabilitation, physiotherapy, health promotion and several other areas. Each municipality has a municipal

<sup>2</sup> [Norway: Health system review](#), 2013

<sup>3</sup> FHI, Helsetjenesteforskningkonferansen 2018, "Norwegian Health Services in a Comparative Perspective"

medical officer appointed to advise the local council on health issues. Some municipalities have jointly established common health services.

Primary health services are financed through grants from the national government, local tax revenues, reimbursements from the National Social Security Scheme and out-of-pocket payments. Services like health stations, youth clinics, school clinics, pregnancy and antenatal care and consultations for children below 16 years are free of charge.

### **Health and care services for the elderly and disabled**

The most important services are:

- Institutional care (nursing homes) and community care housing
- Home care services: home-help and community nursing, meals on wheels
- Respite services for care-giving persons and families
- Day care and activity centers

On the community level, there has been a shift away from institutional to homebased care. These services are intended for the whole population, irrespective of age, gender, socioeconomic status and other differences. In this respect telemedicine/welfare technology becomes even more important.

### **Specialist healthcare**

Specialised healthcare services include all hospital services, ambulance services, emergency call systems, laboratories, x-ray, in-house pharmacies, some medical rehabilitation facilities etc.

The most recent reform in the specialised health care services was The Regional Health Authorities Act of 2002 where four regional health enterprises were set up to manage specialised healthcare services. These enterprises are state-owned.

### **Overall on eHealth**

The Norwegian Directorate of eHealth was established in 2016. The Norwegian Directorate of eHealth implements the national policy on eHealth, establishes the requisite standards, and governs the use of eHealth methodology nation-wide.

The Directorate's primary responsibilities are a) national steering and coordination of eHealth through close cooperation with regional health authorities, local authorities, technical organisations and other interested parties and b) development and administration of digital solutions that will improve and simplify the Norwegian health and care sector.

## **2.2 Sweden**

### **2.2.1 Demography and background information**

Sweden is the third largest country in the EU by area with 450 295 km<sup>2</sup>. The country has a population of approximately 10.1 million with the highest concentration in the southern half of the country. Approximately 85% of the population lives in urban areas. Sweden is divided into 21 county councils and 290 municipalities. County councils and municipalities have different roles and separate responsibilities relating to local government.

## 2.2.2 Briefly on the organisation and governance

The Swedish health care system is decentralised and have a strong regional structure. [The Ministry of Health and Social Affairs](#) has the overall responsibility for policy and regulations. Health care is managed by county councils and is mainly funded by taxes levied by county councils and municipalities.

Sweden's health care system is organised and managed on three levels: national, regional and local.

- At the national level, the Ministry of Health and Social Affairs establishes principles and guidelines for care and sets the political agenda for health and medical care.
- At a regional level, the 21 county councils have the primary responsibility for primary care and hospitals in their counties. The specialist health service consists of 70 local hospitals, including seven regional university hospitals.
- At a local level, the 290 municipalities are responsible for social services, care of the elderly and the disabled, childcare and the school health services.

Sweden's regions, country councils and municipalities cooperate within the member and employer organisation [Swedish Association of Local Authorities and Regions](#) (SALAR) which represents and advocates for local government in Sweden. Together with the national IT service provider [Inera AB](#) and others, SALAR supports the development of eHealth and welfare technology in regions, country councils and municipalities.

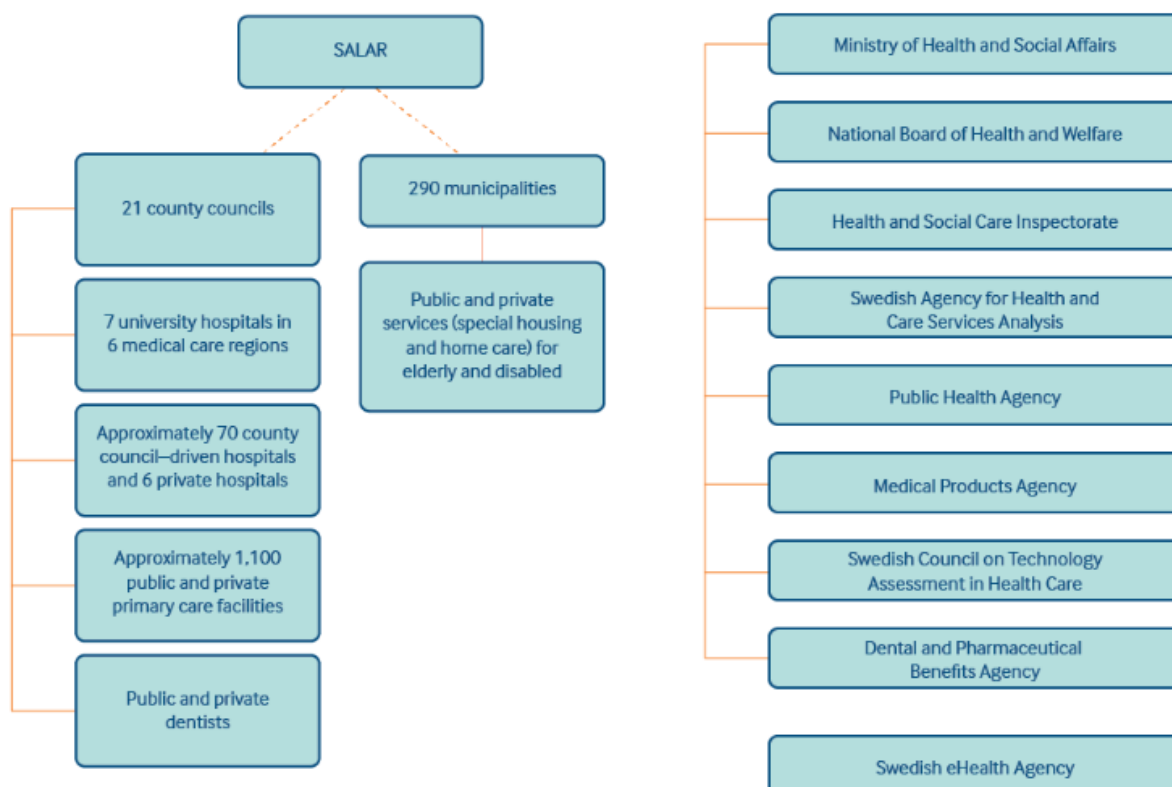


Figure 4: Organisational chart of the Swedish healthcare system<sup>4</sup>

<sup>4</sup> <http://international.commonwealthfund.org/countries/sweden/>

In Sweden, counties, regions and municipalities collaborate on the development of a national architecture. All use of common national infrastructure and national services is voluntary. The state develops and recommend different standards that will contribute to increased interoperability. The county councils and regions are autonomous in the selection of EHR-systems and are not required to comply with the state-recommended standards. The development of interoperable systems has proven to be slow and the national standards have only been implemented in EHR-systems on a moderate level. There are two reasons behind this. First, inadequate anchoring of the state's work within the EHR-suppliers and regions. Second, the regions must finance all the implementation costs themselves<sup>5</sup>.

### **Overall on eHealth**

The Swedish eHealth Agency ([eHälsomyndigheten](#)) manages, coordinates and develops the government's eHealth initiatives and holds the responsibility for IT functions and registries. This include full responsibility of e-prescription and drug statistics. The agency has limited power because they do not possess strong financial instruments due to the funding principle, or strong legal and governance mechanisms due to the regional structure in which country councils and municipalities are autonomous in terms of investment, operation and management of ICT.

[Inera AB](#) develops and manages digital eHealth services for the general population and health care personnel on behalf of county councils and municipalities and is owned by SALAR and municipalities through shares. In 2019 almost all municipalities had shares (*Inera's services available [here](#)*).

Inera evaluates both international and national standards and provides instructions on how to apply these to create interoperability. Inera is responsible for providing a framework for interoperability, managing detailed specifications for information exchange and provide support in the implementation processes. Inera creates the conditions for interoperability by developing a common framework of standards in cooperation with SALAR, regions, county councils, municipalities, national authorities and the industry.

## **2.3 Denmark**

### **2.3.1 Demography and background information**

Denmark covers an area of 43 560 km<sup>2</sup>. The country has a population of approximately 5,7 million. Denmark is organised into five regions and has 98 municipalities.

Danish citizens are entitled to free and equal access to public healthcare services with universal coverage. Traditionally, the Danish healthcare system has been characterised by a high degree of local autonomy in the shaping of specific solutions and benefit realisation. Following more than a decade of structural reforms, major changes have been implemented to introduce more central control of planning and coordination. Starting with patients' free choice of hospital (1993) and the introduction of a waiting time guarantee (1997), extending patient's free choice of provider to include private and foreign hospitals (2002), and, finally culminating in the Municipal reform of 2007, in which 13 counties were reorganised into five regions, and 272 municipalities reduced to 98.

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<sup>5</sup> [https://ehealthresearch.no/files/documents/Prosjektrapporter/NSE-rapport\\_2016-05\\_Internasjonale\\_referansecase\\_for\\_bruk\\_av\\_helsedata.pdf](https://ehealthresearch.no/files/documents/Prosjektrapporter/NSE-rapport_2016-05_Internasjonale_referansecase_for_bruk_av_helsedata.pdf)

Healthcare in Denmark is largely financed through a national earmarked health tax (8 % of income) and redistributed in terms of block grants to regions and municipalities. 80 % of all regional healthcare activities are financed through these block grants in addition to some activity-based (DRG) payments (5 %). The remaining funding comes from a combination of per capita and activity-based payment contributions by municipalities. With the structural reform, co-financing was introduced as an incentive for municipalities to invest in health prevention and health promotion.

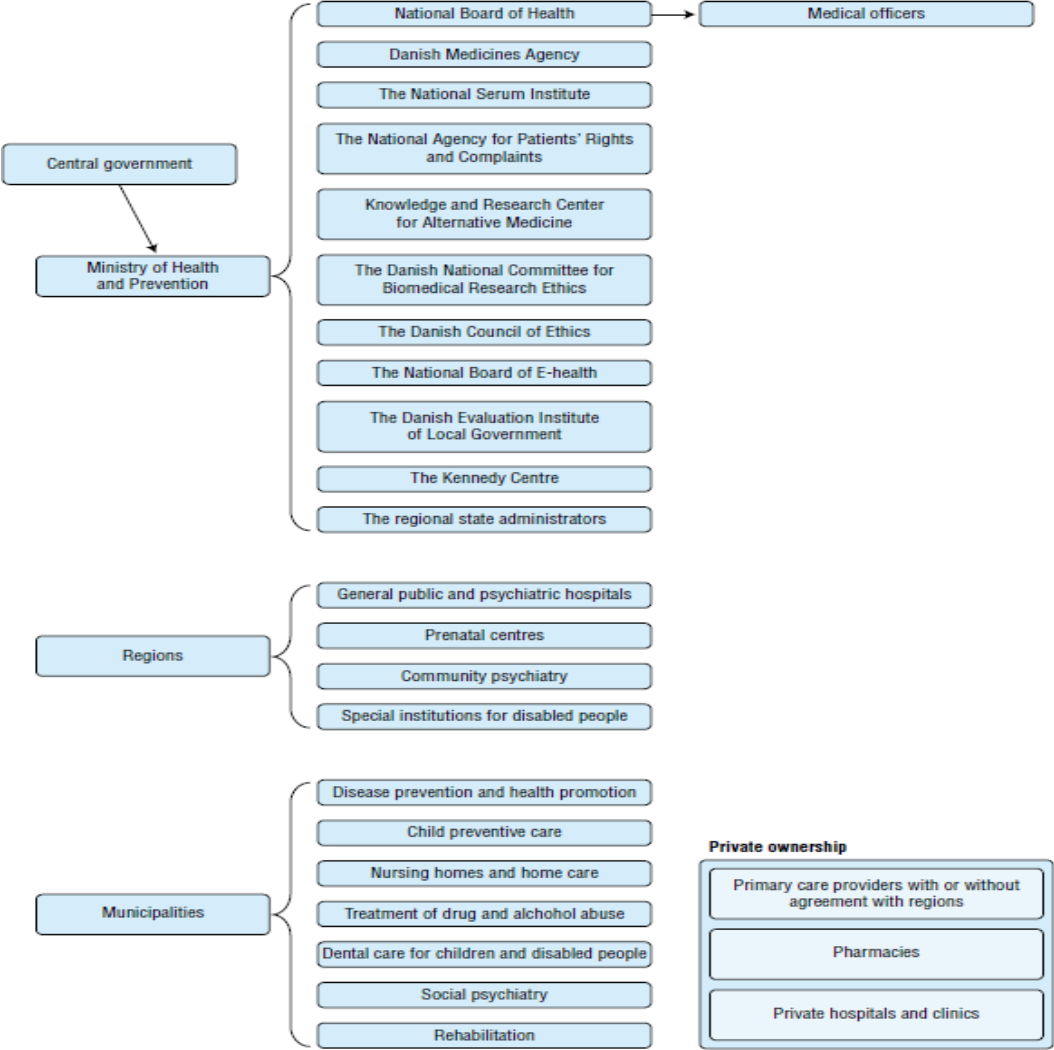


Figure 5: Overview of the Danish health system<sup>6</sup>

**2.3.2 Briefly on the organisation and governance**

Denmark’s five regions are responsible for both the specialist health services, psychiatric services, and the general practitioners in their region. This might change due to the reform of the Danish healthcare system in 2019. The general practitioners are employed by the regions and, like the Norwegian general practitioners, they have a gate keeper function

<sup>6</sup> [http://www.euro.who.int/\\_data/assets/pdf\\_file/0004/160519/e96442.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0004/160519/e96442.pdf?ua=1)

towards the specialist health service. The municipalities are responsible for home services and nursing homes.<sup>7</sup>

The Danish health service is characterised by high levels of digitisation and decentralisation. The Government has overall responsibility for health policy and regulations through the [Ministry of Health](#). The [National Board of Health](#), subject to the Ministry of Health, is the supreme health authority in Denmark and is advising regions and municipalities with recommendations, guidelines and action plans. The ministry develops broad guidelines for general planning in the healthcare sector and operations in the healthcare services.

### **Primary healthcare**

The 98 municipalities are governed by councils. They are responsible for providing services such as nursing homes, home nurses, health visitors, school health care, dental care for some groups, municipal dentists, prevention and health promotion, and institutions for people with special needs (i.e. people with disabilities, treatment for drug- and alcohol-related problems, and school health services). These activities are financed by taxes, with funds distributed through global budgets and carried out by health professionals. Salaries and working conditions are negotiated by Local Government Denmark and the different professional organisations. Local Government Denmark is the interest organisation of the municipalities in Denmark. The distribution of seats in the political committees is based on the elections to the local town councils.

### **Private sector**

Private sector includes the pharmacies and the GPs; other health professionals who work on a self-employed basis are specialist doctors, physiotherapists, psychologists, chiropractors and others.

### **Specialist healthcare**

In the field of health care, the Ministry is in charge of the administrative functions that are related to the organisation of hospitals, community psychiatry and self-employed health professionals with agreements with the region, as well as the market authorisation of pharmaceuticals and supervision of the pharmacy sector. Prevention and health promotion are also part of the Ministry's remit. The regions own and run hospitals and partly or fully finance private practitioners such as GPs, specialists, chiropractors and physiotherapists, based on transfers from the state and municipalities. They also provide reimbursement for pharmaceutical care.

### **Overall on eHealth**

Denmark is considered one of the most developed and innovative countries in the world in the field of e-health and as a pioneering country in the international context<sup>8</sup>. Their e-health portal [health.dk](#) is the largest electronic patient portal in Europe.

In January 2018, Denmark received a new joint public e-health strategy "Strategy for digital health 2018-2022" with the title "*One secure and coherent health network for all*"<sup>9</sup>. The new e-health strategy was published as a result of the financing agreement between the government, the Danish regions and KL(organisation for municipalities).The strategy sets the direction for the upcoming e-health work and focuses on collaboration between hospitals,

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<sup>7</sup> [https://ehealthresearch.no/files/documents/Prosjektrapporter/NSE-rapport\\_2016-05\\_Internasjonale\\_referansecase\\_for\\_bruk\\_av\\_helsedata.pdf](https://ehealthresearch.no/files/documents/Prosjektrapporter/NSE-rapport_2016-05_Internasjonale_referansecase_for_bruk_av_helsedata.pdf)

<sup>8</sup> [Utviklingstrekk 2018](#), Direktoratet for e-helse

<sup>9</sup> <https://www.sum.dk/Aktuelt/Publikationer/Strategi-for-digital-sundhed-2018-2022-januar-2018.aspx>

municipal health services, and other public and private players supported by a digital network.

The overarching goal is better coherence, quality and geographical equality in the health care system.

## 2.4 England

This report restricts itself to a study of England (NHS England) as part of Great Britain and the United Kingdom (UK).

### 2.4.1 Demography and background information

The UK has around 66 million inhabitants, it's the 22<sup>nd</sup> most populated country in the world, covering 243,610 km<sup>2</sup>. Life expectancy is 81,6 years. Almost one-third of the population lives in England's southeast, which is predominantly urban and suburban, with about 9 million in the capital city of London. England is divided into 9 government office regions (Scotland and Wales not counted here).

The **National Health Service (NHS)** is the name used for each of the public health services in the United Kingdom – the [NHS in England](#), [NHS Scotland](#), [NHS Wales](#), and [Health and Social Care in Northern Ireland](#). Each of the UK's health service systems operates independently and is politically accountable to the relevant government (Scottish, Welsh, Northern Ireland and the UK Government).

### 2.4.2 Briefly on the organisation and governance

Health services in England are largely free at the point of use. The National Health Service (NHS) provides preventive medicine, primary care and hospital services to all those "ordinarily resident"<sup>10</sup>. The NHS is the largest semi-integrated health system in the world, but it remains fragmented in how it organises the delivery of care<sup>11</sup>.

The NHS in England is the biggest part of the system by far, catering to a population of 53 million and employing more than 1.35 million people. The NHS in Scotland, Wales and Northern Ireland employs 153,427; 84,817 and 78,000 people respectively.

The NHS employs more than 1.5 million people (2019 figures)<sup>12</sup>. The NHS cares for one million patients every 36 hours, delivers 700 000 babies annually and handles 22 million accident & emergency visits<sup>13</sup>.

The UK has a two-tier healthcare system with most of the population in the UK using the NHS. Some people also have private health care/medical insurance. Interestingly, private healthcare in the UK is dominated by the NHS (the NHS has the largest number of private beds in its private patient units).

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<sup>10</sup> [Health Systems in Transition](#), United Kingdom (England), Health system review (2011)

<sup>11</sup> How is health information technology changing the way we deliver NHS hospital care? [Sood & McNeil](#) (June, 2017)

<sup>12</sup> <https://www.nuffieldtrust.org.uk/resource/the-nhs-workforce-in-numbers>

<sup>13</sup> Making IT Work ([The Wachter Review](#))

## Primary healthcare

NHS-funded primary care is provided in various ways. The first point of contact for general medical needs is usually self-employed GPs and their practices, typically entering into contractual engagements with [Clinical Commissioning Groups](#) (CCGs). GPs may also be employed directly by alternative providers (e.g. commercial sector). GPs in England conduct +300 million consultations per year, write one billion prescriptions and perform most of the nation's healthcare interactions. GPs in England have a gatekeeper function as in Norway.

Community health services, NHS Direct, NHS walk-in centres, dentists, opticians and pharmacists are part of NHS primary care services. The primary care system also plays a gatekeeping role in determining access to more specialised, often hospital-based, acute health care services.

## Specialist healthcare

NHS-funded secondary care is provided by salaried specialist doctors (consultants), nurses, and other health care professionals (e.g. physiotherapists and radiologists) working in government-owned hospitals (NHS trusts). A small private sector exists alongside the NHS, funded through private insurance, direct payments from patients, or other.

In addition to secondary care, a range of more specialised tertiary services are also provided by NHS trusts and deal with more complex or rare conditions. These trusts are usually also linked to medical schools or teaching hospitals, as well as being centers of research in their fields.

## Overall on eHealth

[NHS Digital](#) supports the NHS and social care services, see chapter 3.4 for details.

# 2.5 USA

## 2.5.1 Demography and background information

The United States of America (USA, U.S.) is a federal republic comprising 50 states. At 9.8 million km<sup>2</sup> and with over 325 million people, the United States is the world's third- or fourth-largest country by total area and the third-most populous country.

## 2.5.2 Briefly on the organisation and governance

Due to historical reasons, most healthcare establishments are managed by not-for profit associations, funds, unions, pension funds etc., a minority by commercial businesses (especially insurers)<sup>14</sup>. In addition there is [Medicaid](#), a federal and state program that helps with medical costs for some people with limited income and resources, and [Medicare](#), which provides health insurance for Americans aged 65 and older, as well as younger people with some disability status and people with selected diagnoses.

Important establishments are University Hospitals, in close relation with Universities and Research laboratories. Most are managed as businesses but often have charity activities. An

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<sup>14</sup> [EU/JAseHN INFORMATION PAPER](#) on Main eHealth activities outside of the EU Annex 11: Main USA eHealth policies and activities (2018-05-18)



example is the [Mayo Clinic](#)<sup>15</sup> and [Veterans Health Administration](#), whose services and partnerships are deployed globally. The rest of US hospitals consist of public hospitals. With non-profit rural hospitals, public hospitals constitute the health care safety net for uninsured populations. They receive a great part of their financial resources from local authorities, state or federal government.

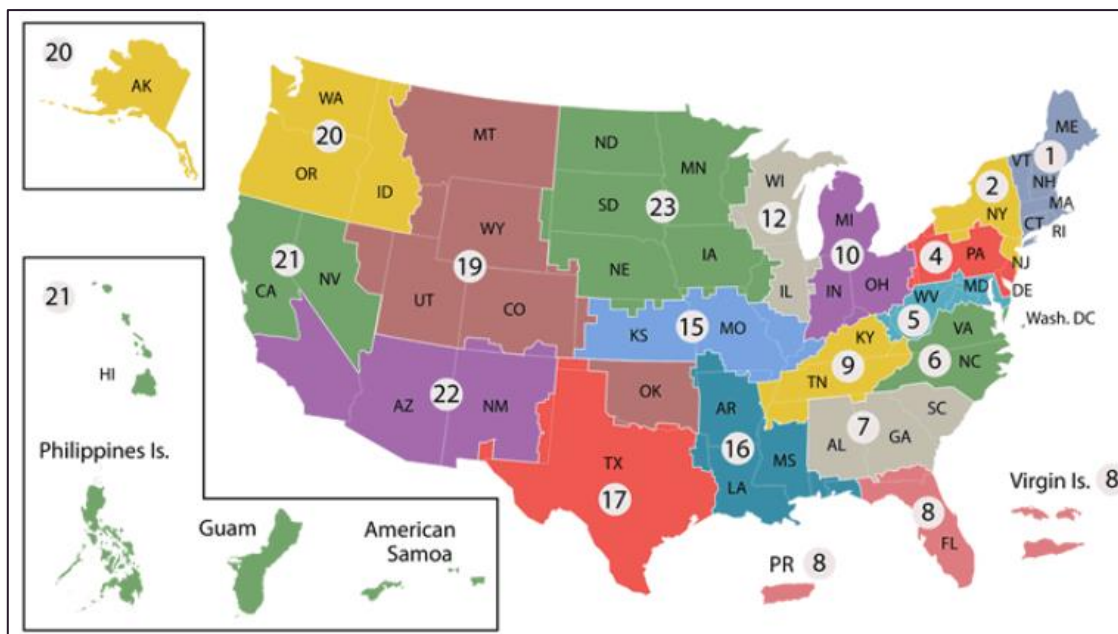


Figure 6: Map (and number) of U.S. Veterans Health Administration facilities globally.

## Overall on eHealth

The national management of the eHealth field in the United States is limited. The state has no direct role in developing common infrastructure or solutions. National governance is mainly through legislation and incentive schemes<sup>16</sup>.

The United States has developed a federal strategy for Health IT for the period 2015-2020<sup>17</sup>. Among the goals in the strategy plan is the development of a national infrastructure for eHealth and to provide researchers with high-quality health data across organisations and EPR systems.

The federal authority, the [National Coordinator for Health Information Technology](#) (ONC), a department of Health and Human Services, was established in 2004, and was responsible for coordinating work on national certified EHR solutions. This initiative was based on voluntary participation from providers of health services, and progress was slow. In order to speed up the prevalence of EPR systems, federal authorities passed the [HITECH](#) Act in 2009. The HITECH Act is a law with accompanying financial incentives.

<sup>15</sup> Mayo clinic: Non-profit healthcare and research Federation with 60 sites, 21 hospitals, 6 nursing homes, staff 60,000, physicians and scientists 1,095 and 15,318 allied.

<sup>16</sup> NSE: [Internasjonale referansecase](#) for bruk av helsedata

<sup>17</sup> [Federal Health IT Strategic Plan 2015-2020](#). U.S. Dept. of Health and Human Services; 2014

The U.S. does not have a single national health network, though there are networks for certain vendors and service providers that reach beyond single states. Instead, economic incentives, administered by ONC, are used to motivate healthcare services to collaborate on the development of a secure communications infrastructure, but adoption has been slow<sup>18</sup>.

A challenge in the United States is that the level of technological maturity varies considerably between different actors. While some businesses are at the top international level, such as Kaiser Permanente, others use paper records. Entities like the Kaiser Permanente (KP) establishes strong central management inside their domain, making it easier to introduce a common EHR solution ([HealthConnect](#) (Epic)), with all service providers in the system.

More on this in chapter 3.5.

## 2.6 EU

Each EU country has their own National EHR strategies, but several interoperability initiatives are currently supported:

### [Patient Summary](#)

The EU funded project 'International Patient Summary' aims to support:

1. The European participation in this global standardisation activity and
2. The development of a European standard on Patient Summaries, based on the global standardisation work.

The standard takes the European Guidelines on cross-border care, as adopted by the European eHealth Network, as a starting point.

### [EHR Exchange format](#)

The European Commission continue to drive the process for standardised cross border exchange. The Norwegian Directorate of eHealth has participated in the recommendation on a European Electronic Health Record exchange format. The Recommendation supports the digital transformation of health and care in the EU by seeking to unlock the flow of health data across borders.

EU's [Joint Action](#) to support the eHealth Network was established 2011 and is a voluntary network with representatives from all national health authorities in the EU which also functions as a preparatory body for documents going through the EU process<sup>19</sup>.

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<sup>18</sup> [The Feasibility of the Nationwide Health Information Network](#), 2016

<sup>19</sup> [https://ec.europa.eu/health/sites/health/files/ehealth/docs/ev\\_20161121\\_co31\\_en.pdf](https://ec.europa.eu/health/sites/health/files/ehealth/docs/ev_20161121_co31_en.pdf)

## 3 Healthcare collaboration and Health Information Exchange solutions

This chapter focuses on the specifics for each country. Two areas are addressed:

1. Electronic Health Record in use in primary and secondary / specialist healthcare
2. Collaboration methods used in primary and secondary / specialist healthcare
  - o Collaboration inside primary and secondary / specialist healthcare
  - o Collaboration between primary and secondary / specialist healthcare

The report also seeks to describe each country's challenges, experiences, and future plans.

### 3.1 Norway

Below is a summary table of EHR solutions, Collaboration approach and other National initiatives in three levels (Social welfare, Primary and Specialist healthcare services), compiled in 2018. The EHR solution landscape is dynamic and the list of vendors is expected to change.

Country	Context	EHR/EMR		Collaboration		National initiatives		
		Vendors	Examples	Vertical	Horizontal	Infostructure	Standards	Other
Norway	Social welfare	Small, national	Gerica (Tieto) Profil (Visma) CosDoc (ACOS)	Messaging (ebXML)	Limited: Paper / CD	National Health Network	ebXML, HIS/CEN	National Patient Summary
	Primary	Small, national	System X (Hove) Plenario (Infodoc) CGM Journal (Compugroup)	Messaging (ebXML)	Limited: Paper / CD		ebXML, HIS/CEN	
	Specialist	National	DIPS, DocuLive (Cerner)	Messaging (ebXML)	In 2019, 3:4 regions offers direct access to EHR (over 80% of the population)		ebXML, HIS/CEN, HL7/FHIR	

*(Table explanation: Vertical collaboration = between Primary and Specialist, Horizontal collaboration = between the GPs or between the hospitals)*

The main collaboration approach (more than 99%) in Norway is document-based messaging (using ebXML/ebMS 2.0), but there are initiatives within other collaboration areas as well. The next main approach is related to shared services like use of the National Summary Care Record (Kjernejournal).

The figure below shows how collaboration is done between Primary and Specialist healthcare in Norway, also indicating standards in use:

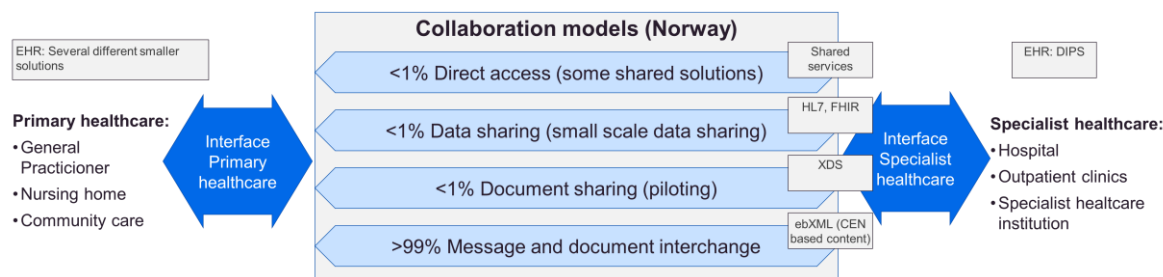


Figure 7: A generic model for collaboration in Norway, with standards in use and % usage

The simplified model above show collaboration as primarily between primary and specialist healthcare, but collaboration is also between the entities in Primary and between the entities in Specialist healthcare.

It is worth noting that Norway has no shared information model across entities.

The Directorate of eHealth contribute and support work with:

- [Collaboration standards, messaging templates, ebXML profile and lately, service-based messaging](#)
  - Example: 50 national standards for clinical content (lab, summary, prescriptions)
  - Coding schemes based on ICD-10, ICPC-2, NCSP, ICF, DRG
- Code of Conduct for information security in the healthcare and care services ([Normen](#))
- National Summary Care Record ([Kjernejournal](#))
- National Healthcare Portal ([Helsenorge.no](#)) with information and services

There is a [National Health Network](#) (NHN) available in Norway:

- Nearly all health actors in the health and care services are connected to NHN
- In many areas, electronic messaging has replaced paper
  - For example, electronic referrals, discharge reports/epicrisis, laboratory responses and automatic refund cards are widely used

### 3.1.1 Electronic Health Record systems

EHR solutions in Norway is present in three levels:

- Primary healthcare (GP's) and nursing homes/community care
- Specialist (hospitals and more)
- National Summary Care Record

#### National approach to EHR

Norway's approach and current strategy is based on the "One citizen - One health record" program<sup>20</sup>.

<sup>20</sup> <https://ehelse.no/strategi/n-innbygger-n-journal>

The EHR solutions in use in Norway are several (see chapters below), but an overview of the situation in 2019 is as follows:

- The EHR solutions in Primary healthcare (GPs) are not integrated to but can collaborate through messaging to the Specialist healthcare (hospitals) and vice versa
- EHR data are semi-structured
- Status of EHR solutions in Specialist healthcare:
  - 3 of the 4 regional health enterprises (specialist care) use the Norwegian solution DIPS, and will continue to do so for some years<sup>21</sup>
  - The Central Region is replacing its EHR solution to Epic<sup>22</sup>.
    - Although a regional procurement initiative, this EHR replacement is also considered a national pilot for next-generation EHR in Norway
- The EHR solutions in Primary healthcare (GPs) are not integrated to Specialist healthcare (Hospitals), but can collaborate through messaging (ebXML/ebMS 2.0)
  - The Directorate is currently studying how to cover the [EHR challenges at Primary healthcare \(GPs\) level](#), and will deliver a plan for review early 2020.
- National [Summary Care Record](#)
- National [e-prescription solution](#) (video link)

### EHR used in primary healthcare

The main EHR solutions in use in Norway have no or limited footprint outside Norway, although several of the vendors are international. Some of the vendors are listed here:

- GPs in Norway use EHRs from vendors like:
  - [System X](#) (Hove Medical System)
  - [Plenario](#) (Infodoc)
  - [CGM Journal](#) (CompuGroup Medical)
- Nursing home/community care EHR solutions are<sup>23</sup>:
  - [Gerica](#) (Tieto), has 50 % of the market
  - [Profil](#) (Visma)
  - [CosDoc](#) (ACOS)

### EHR used in Specialist healthcare

The main EHR solutions in Norwegian hospitals are:

- [DIPS](#) (DIPS ASA) – Norwegian EHR solution used by 3 of 4 regions
- [Doculive EPJ](#) (Cerner) used by 1 of 4 regions, to be phased out in 2020-2022

## 3.1.2 Collaboration within Primary and Specialist healthcare

In Norway, all parties in the healthcare sector use the same collaboration architecture, with a few exceptions:

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<sup>21</sup> Report: [FELLES PLAN, Neste generasjon PAS/EPJ](#) – Helse Nord RHF, Helse Sør-Øst RHF og Helse Vest RHF, Version 0.95

<sup>22</sup> <https://helse-midt.no/vart-oppdrag/prosjekter/ehelse/helseplattformen/tidslinje-innforing>

<sup>23</sup> Directorate of Health, 2014, EHR in the nursing home/community

- The National Care Summary Record and e-prescription is not fully implemented across Nursing homes and Community care entities
- E-prescription is not fully implemented across all specialist healthcare entities

### **Collaboration methods used inside Primary healthcare**

The main collaboration form inside primary care is based on the National Collaboration Platform, i.e. document-based messaging using ebXML, and some national component, such as National Summary Care Record.

Please note that this collaboration overview is limited to EHR and does not include LAB, RIS/PACS etc.

### **Collaboration methods used inside Specialist healthcare**

3 out of 4 Regions in Norway use the EHR solution DIPS (Regions North, West and South East):

- Region North and Region West have consolidated on one regional database each, so EHR collaboration is done directly in the DIPS EHR solution.
- Region South East has not consolidated into one database but will integrate with XDS and execute other actions to increase collaboration and integration.
- Region Central's current Doculive solution covers the region.
  - The planned Epic EHR solution will cover region + primary healthcare.

The main collaboration form between hospitals across regions and between hospitals and private specialist clinics is using the National Collaboration Platform (document-based messaging) and some national components, such as National Summary Care Record and eResept (e-prescriptions).

To improve sharing of EMR information between regions the Directorate of eHealth [recommends HL7 FHIR for data sharing](#). A national solution for document sharing is [established](#), based on the IHE-XDS framework. Communication with other document sharing solutions can enable searches across the whole health sector of Norway. Requests are token-based so it's known who is behind the query and what rights they have. The solution supports patient's view into their EMRs.

### **3.1.3 Collaboration between Primary and Specialist healthcare**

Collaboration between Primary and Specialist healthcare is done through:

- National [Summary Care Record](#) (Kjernejournal) will be integrated using FHIR API.
- Between GPs and specialist (hospitals): Collaboration is done using ebXML.
- Between Nursing home/community care and specialist (hospitals): Collaboration is done using messaging (ebXML).
  - Some messaging statistics for Norway is found [here](#).

### **3.1.4 Note on: Telecare approach in Norway**

Telecare is here defined as remote care of elderly and physically less able people, providing care remotely while the patients are at home. All municipalities support some level of telecare services and solutions (for example, Oslo has 30.000 safety alarms installed in homes, but many of these are old, analogue solutions with limited service range).

## General (National) approach to Telecare

There is currently a National Welfare Technology Programme ([WTP](#)).

- The programme is testing a National Gateway that will support data from different WTP services into the EHR
- The market is not transparent, many actors / initiatives in many municipalities

### 3.1.5 Collaboration challenges, experience, and future plans

#### Collaboration challenges

Current collaboration solution (ebXML) between the different levels of healthcare services is considered non-scalable and difficult to develop and maintain.

#### Future plans

The Directorate of Health in 2019 recommended to the Ministry of Health and Care Services that one shared, national solution for the health and care service should be the end state target and developmental direction for the realisation of the aims surrounding «[One citizen – One health record](#)<sup>24</sup>».

The Ministry chose to follow the recommendation and have commissioned a planning project for the Primary / Municipal healthcare services, where the goal is to create a common National electronic health record for primary care services and a National health sector information exchange. The project planning report will be an important basis for the government's and municipalities' investment decision process, tentatively in 2020.

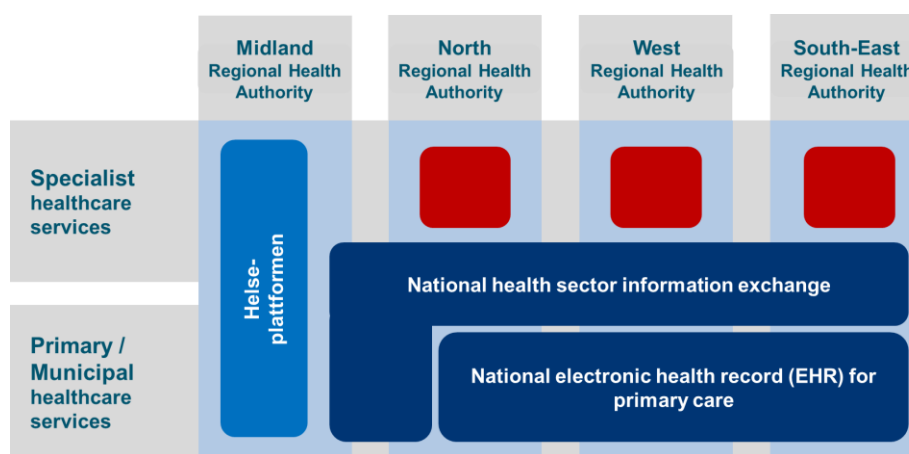


Figure 8 Target plan for National EHR and HIE in Norway (2019)

In addition, the Midland Regional Health Authority is currently detailing its "[Helseplattformen](#)" project which is a full replacement of the EHR landscape for the whole region into one solution ([EPIC](#)).

The regions North, West and South-East will continue to use the Norwegian solution [DIPS](#) in the Specialist healthcare services.

<sup>24</sup> Melding til Stortinget 9 (2012-2013), Én innbygger – én journal

## 3.2 Sweden

Below is a summary table of EHR solutions, Collaboration approach and other National initiatives in three levels (Social welfare, Primary and Specialist healthcare services). The information on Sweden is limited to what was found during the desktop study in 2018:

Country	Context	EHR/EMR		Collaboration		National initiatives		
		Vendors	Examples	Vertical	Horizontal	Infostructure	Standards	Other
Sweden	Primary	Cambio CompuGroup Evry with The county council of Norrbotten	Cosmic Take Care, PMO and Assynja NCS Cross VAS	Direct access, messaging, NPÖ	Direct access IT-support with message management			NPÖ
	Secondary	Cambio CompuGroup Cerner with Evry	Cosmic Take Care Melinor NCS Cross	Direct access through the different EHR-systems. NPÖ	Direct access through the different EHR-systems. NPÖ IT-support with message management			Journalen National Service Platform

(Table: Vertical collaboration = between Primary and Specialist, Horizontal collaboration = between the GPs or between the hospitals)

### 3.2.1 Electronic Health Record systems

The 21 county councils are responsible for primary and specialist healthcare within their councils. Municipalities are responsible for social services. Most councils and regions have standardised their medical records with one journal system and one supplier for all healthcare documentation for hospitals, psychiatry and primary healthcare within their county or region. Many also have coherent records with private healthcare providers. Through this consolidation, the EHR-market in Sweden is characterised by a few dominant suppliers (see figure below).



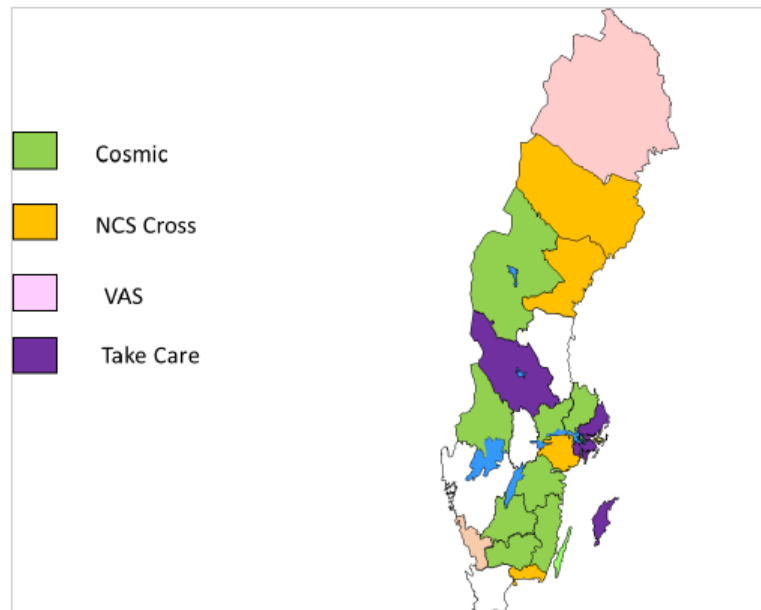


Figure 9: County councils with same system for healthcare documentation (hospital, primary care and psychiatry)<sup>25</sup>

### EHR systems in Specialist healthcare

Within specialist healthcare (hospitals and psychiatry), four suppliers with their four systems, have 91.2% of the EHR-market.

- Cambio with Cosmic
- CompuGroup with Take Care
- Cerner with Melinor
- Evry with NCS Cross

### EHR systems in Primary healthcare

With their eight systems, five suppliers; Cerner (Melinor), Cambio (Cosmic), CompuGroup (Take Care), Evry (NCS Cross) and the county council of Norrbotten (VAS) have 97% of all users in Sweden (see figure below):

<sup>25</sup> [eHälsa och IT i landstingen](#), 2018

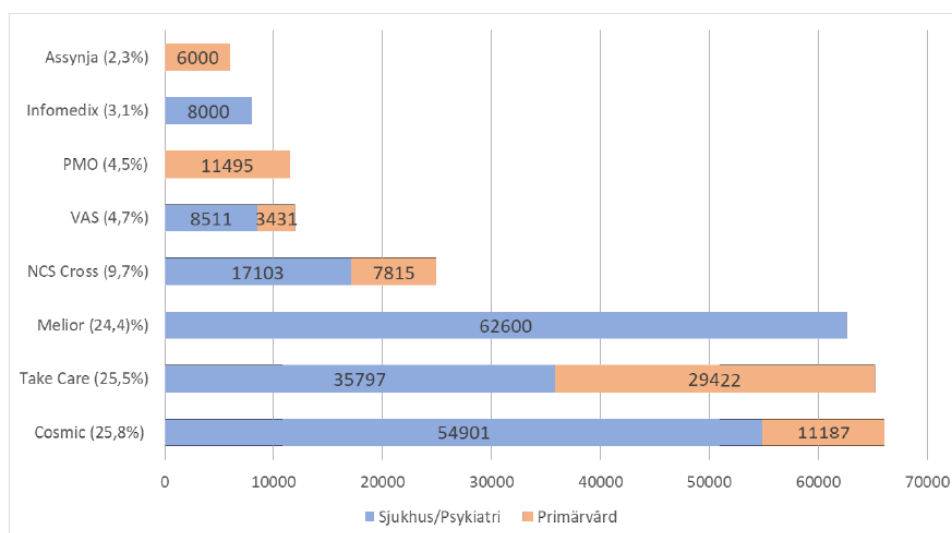


Figure 10: Market shares 2018 – EHR-systems in specialist and primary healthcare illustrated in total number of users

In addition to the overall EHR-systems, specific healthcare documentation systems for certain types of healthcare (for example dental care, childbirth) are also available. As illustrated in the above figure, 73% of all EHR-users are within hospitals and psychiatry and 27% of users are within primary healthcare.

### EHR-developments on a regional level

The regions have gone through major EHR procurement processes the last years. Skåne, as the first region in Sweden, has [signed a contract with Cerner Sverige AB](#) on a new EHR-system which will be one cohesive IT system for the entire healthcare sector in the region. Västra Götaland have also chosen Cerner and Stockholm will decide on system [end of 2019](#). The cooperation group, Sussa, (Blekinge, Sörmland, Örebro, Västerbotten, Västernorrland) chose [Cambio Healthcare in late 2018](#).

### 3.2.2 Collaboration within Primary and Specialist healthcare

As mentioned, most councils and regions have one journal system and one supplier for all healthcare documentation for hospitals, psychiatry and primary healthcare within their county or region. Many also have coherent records with private healthcare providers. As a result, the EHR-market is characterised by a few dominant suppliers for primary and specialist healthcare. Sweden does not have a national collaboration system within the primary or specialist healthcare sector, nor between these. In addition to the EHR-systems, HIE is done through two different services offered by Inera: NPÖ and Journalen. These two collaboration methods allow for healthcare professionals and citizens to access EHR-information across different healthcare actors and are described below.

#### National Patient Overview - NPÖ

The National Patient Overview ([Nationell patientöversikt - NPÖ](#)) allow authorised healthcare professionals direct access to obtain parts of patients EHR-information registered by other healthcare providers across EHR-systems in other county councils, regions, municipalities

and the private sector<sup>26</sup>. NPÖ is an opt-out system which means that patient approval is necessary to allow access for healthcare professionals.

NPÖ is only an overview over requested information and does not store any data. NPÖ provides the same patient information, in the same way, to different healthcare personnel across the Swedish healthcare sector. With NPÖ, all journal information from other healthcare providers is available through direct access. This is however, only available for healthcare providers which have implemented NPÖ. For this reason, the overall benefit of the service is increased as more actors implement the service and more information becomes available. All county councils and regions, and around 245 municipalities, have implemented NPÖ.

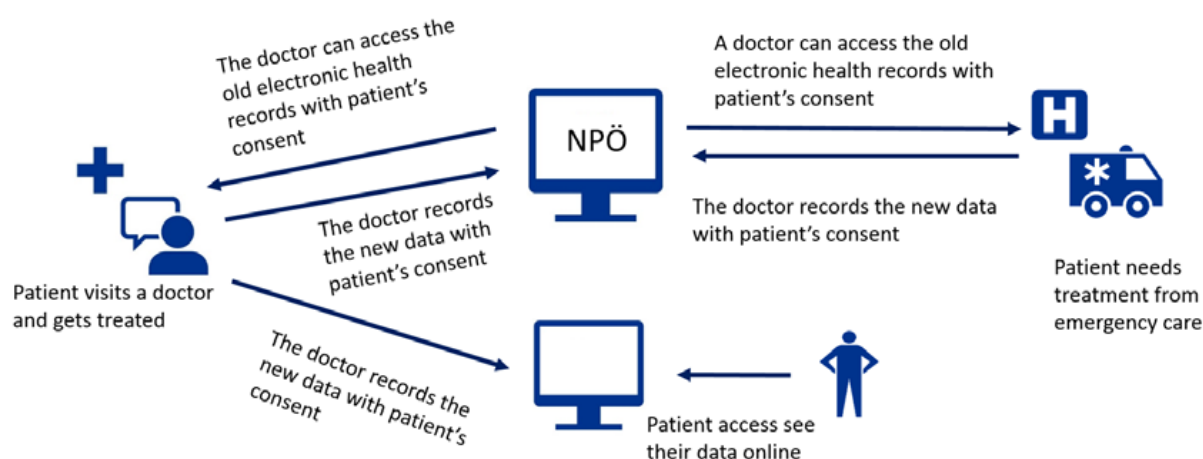


Figure 11: The [flow of electronic health data](#) from patient's viewpoint.

The use of NPÖ requires several underlying services:

- Catalog Services ([Katalogtjänst HSA](#)) - an electronic catalog that contains quality-reviewed data about people and activities in Swedish care and care.
- Identification Service SITHS ([Identifieringstjänst SITHS](#)) - a security solution that allows users to identify themselves with a strong authentication.
- [Sjunet](#) - a national quality-assured network for all electronic communication in the healthcare sector. The network is not connected to the internet.
- [Security Services](#) - consist of a number of services that together allow an organisation to regulate and monitor access to patient information.
- Available Patient ([Tillgänglig patient – TGP](#)) - a service that allows to restrict access to patient information in coherent records through NPÖ.

NPÖ has created the prerequisites for, as well as contributed to, information being made available over local and regional borders. NPÖ's greatest benefit is the exchange of information between municipalities and county council and regions. However, NPÖ is also an important service for access to information internally in many councils and regions.

<sup>26</sup> For a full overview over approved connections/information amounts accessible in NPÖ from the different counties and regional HER-systems, please [see attached link](#).

## Journalen

[Journalen](#) is an online service that allows residents to access their EHR-information. The service is available through [1177 Vårdguiden's e-services](#) which enables secure communication between healthcare providers and residents. The services by 1177 Vårdguiden is offered by Inera and can be accessed by phone or online. These services provide residents with general information, allows for electronic communication with healthcare providers, booking appointments online, renewing prescriptions, and access to their own medical records.

All 21 county councils and regions have implemented the Journalen. All residents from the age of 16 can access their EHRs from the healthcare providers that have implemented it through 1177 Vårdguiden's services.

The implementation of Journalen is an important part of Sweden's vision of become the best in the world in 2025 in using eHealth and digitalisation. Journalen currently has more than 1.8 million users, but the amount of information that can be accessed varies across the country. The county councils and regions have made different assessments of how and when residents can access their medical information through Journalen. Some county councils and regions only allow residents to see information that have been signed and approved by the responsible healthcare staff. Others may have a delay (about two weeks) before allowing information from another county or region.

## The National Service Platform

Many of Inera's services, including NPÖ and Journalen, is based on its common IT architecture and are connected through the [National Service Platform](#), a technical platform that simplifies, secures and streamlines the exchange of information between different IT systems within healthcare.

It enables service-based integration between different systems in county councils, regions, municipalities and private providers of healthcare services. The platform is the hub between systems and e-services that need to communicate with each other and allows the exchange of information to be done in a safe and cost-effective manner. The purpose of the National Service Platform is to create a loose link (virtual service) between e-services and systems that both produce and consume information so that individual systems can be added and removed without affecting others. The aim is also to achieve interoperability, which means that different types of systems can interact and communicate with each other regardless of supplier and technology.

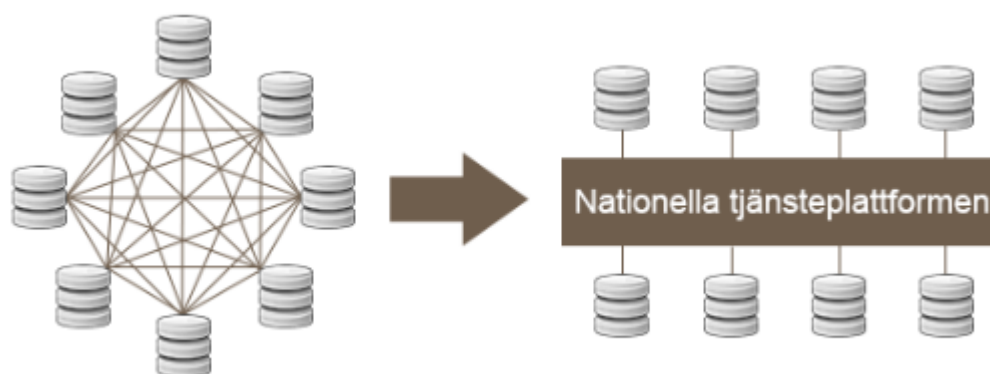


Figure 12: The National Service Platform Architecture (Source: Inera AB)

### 3.2.3 Collaboration between Primary and Specialist healthcare

The implementation of NPÖ, with its underlying service infrastructure, has significantly improved and created new opportunity for information exchange and access to information between county councils, municipalities, private healthcare providers and patients, across different EHR-systems. In all county councils, municipalities have access to information from the county council, including 17 via NPÖ. In several county councils there are also other solutions for municipalities access to information from the county council. Three county councils use other solutions than NPÖ. Nine county councils have access to information from municipal healthcare, including five via NPÖ. There are also other solutions for the exchange of information, illustrated in the figure below.

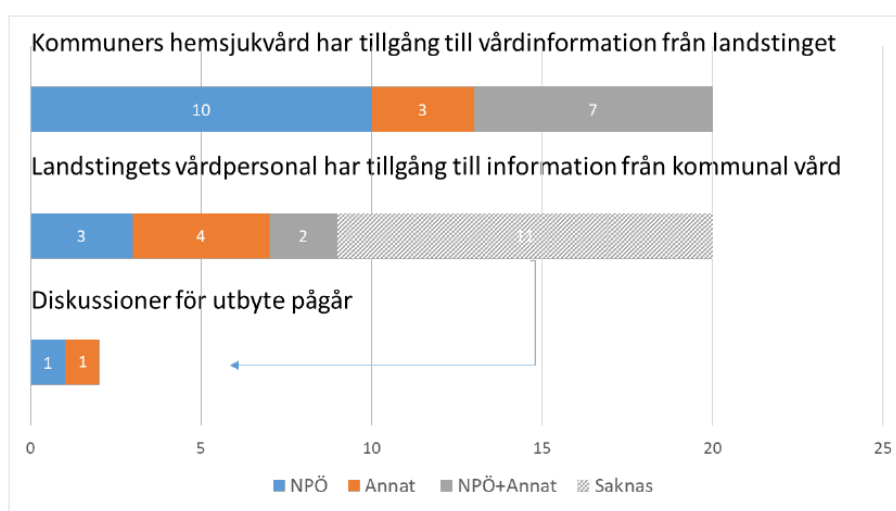


Figure 13: Access to mutual information between municipalities and county councils.

To support the implementation of coordinated care planning between municipalities and county councils, IT-support with message management is used in all county councils. There are 9 different systems in use and the most common is Meddix (6 county councils) and Prator (5 county councils).

### 3.2.4 Collaboration challenges, experience, and future plans

#### Collaboration challenges

The main challenge with NPÖ and Journalen is the amount of healthcare providers which have implemented the services. Both the services need to be bought by public and private actors from Inera. The higher number of healthcare providers connected, the more information available through NPÖ and Journalen for healthcare personnel and citizens.

#### Future plans

As mentioned, many of the county councils are in the process of changing their EHR-systems for their region. This will probably change the collaboration methods in these county councils and municipalities towards a more direct access-approach.

In 2016, Sweden launched its eHealth strategy, [Vision for eHealth 2025](#) – common starting points for digitalisation of social services and healthcare. It states that "in 2025, Sweden will be best in the world at using the opportunities offered by digitisation and eHealth". The strategy has three focus areas: regulatory framework, terms and standards. The strategy's

[action plan](#) for the period 2017-2019 present the planned initiatives for these focus area within the current period.

### 3.3 Denmark

Below is a summary table of EHR solutions, Collaboration approach and other National initiatives in three levels (Social welfare, Primary and Specialist healthcare services). The information on Denmark is limited to what was found during the desktop study in 2018:

Country	Context	EHR/EMR		Collaboration		National initiatives		
		Vendors	Examples	Vertical	Horizontal	Infostructure	Standards	Other
Denmark	Primary (mainly Social care)	Global	Sundhedsplatformen (Epic) Columna (Systematic)	Direct	Messaging	Danish National Health Data Network (SDN) operated by Medcom	XML EDIFACT	
	Specialist (incl GPs)	Global	Sundhedsplatformen (Epic) Columna (Systematic)	Direct, messaging	Messaging		XML EDIFACT ICD10 ICPC SNOMED CT	

(Table: Vertical collaboration = between Primary and Specialist, Horizontal collaboration = between the GPs or between the hospitals)

#### 3.3.1 Electronic Health Record Systems

##### National approach to EHR

Established in 2003, [Sundhed.dk](http://Sundhed.dk) is the official portal for the public Danish Healthcare Services and enables patients and healthcare professionals to find information and communicate. It is also the portal for patients to access information from their own EMRs and to access general health and treatment options, view their medical records, medication history, laboratory results, hospitals visits, book appointments with their general practitioner and renew prescriptions, and access their medication data<sup>27</sup>.

Sundhedsplatformen serving 2.5 million citizens in [Region Hovedstaden](#) and Region Sjælland is an EHR-solution from Epic. All the information from Sundhedsplatformen will be transferred to the eHealth portal's Sundhedsjournal. The EHR rollout has received, and still receives, low satisfaction scores from users<sup>28</sup>.

Denmark also has another major EHR-system from the software and systems developer Systematic who delivers IT-solutions to the Danish health sector, delivering the eHealth platform Columna. Columna consists of a clinical EHR-system, a clinical logistics system, a services logistics system and a telemedicine system. Columna is implemented and used in Region Midtjylland with more than 1.3 million citizens.

<sup>27</sup> [eHealth in Denmark: A Case Study](#), 2013

<sup>28</sup> [Stor utilfredshed med Sundhedsplatformen](#) (April, 2018), [Eksperter er bekymrede](#) (July, 2019)

### 3.3.2 Collaboration within Primary and Specialist healthcare

Collaboration methods used within and between The Danish eHealth infrastructure consists of a set of different solutions described in this chapter.

#### The National Service Platform

The National Service Platform is the central communications platform that enables access to national health services, registries and registration solution. All national ICT systems in Denmark must adhere to the NSP national standards in order to reduce integration problems between the different systems.

Denmark adopted the EDIFACT standard for electronic communication between healthcare professionals as early as 1994. Over the past 20 years, several IT systems were integrated to facilitate the secure exchange of clinical information using messaging. Examples of message types exchanged include discharge letters, referrals, laboratory request and results. The XML standard has been adopted for the public exchange of information.

The primary interoperability standards adopted in Denmark include:

- EDIFACT is the main messaging standard
- classifications and terminologies such as ICD10, ICPC and SNOMED CT
- standards for laboratory data and imaging using the DICOM standard
- MedCom's standards for communication of messages are based on CEN standards and are in widespread use in Denmark

#### The Danish National Health Network

The Danish National Health Data Network (SDN) was established by [MedCom](#) to facilitate Electronic Data Interchange (EDI) and XML communication standards for the messages most commonly used between GPs, hospitals, pharmacies, homecare providers and specialists. Sundhed.dk uses the health net as connection channel to the local systems in the healthcare sector.

#### Sundhed.dk

Sundhed.dk being a public, internet-based portal that collects and distributes health care information among citizens and health care professionals, is unique in bringing the entire Danish health care sector together on the Internet. It is providing an accessible setting for citizens and health care professionals to meet and efficiently exchange information as it also serves the purpose of facilitating the electronic communication between other care practitioners and patients.

#### The national prescription server ([Receptserveren](#))

The national prescription server (Receptserveren) enables patients and healthcare professionals to electronically retrieve their prescriptions at any pharmacy through the sundhed.dk portal. GPs are automatically notified when a patient retrieves their prescription from the pharmacy<sup>29</sup>. Close to 100% of the general practitioners transfer prescriptions to the pharmacies through this solution. The national prescription server enables patients and healthcare professionals to electronically retrieve their prescriptions at any pharmacy through the sundhed.dk portal.

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<sup>29</sup> [eHealth in Denmark: A Case Study](#), 2013

## The Shared Medication Record

The Shared Medication Record (FMK) is a central database designed to provide healthcare practitioners with an electronic overview of the patient's current prescriptions and the patient's medication history from the past two years. The FMK was created because GPs and hospitals use different systems to administer e-prescribing and most hospital physicians faced struggles because their systems lacked the functionality to electronically prescribe medications. The data can be accessed by the patients using sundhed.dk and by the physicians and pharmacies that have been authorised by the patient<sup>30</sup>.

## E-Journal

[E-Journal](#) is a system built by the Danish Regions and is designed to extract information from hospital EMR systems from all regions, which will provide healthcare practitioners with an overview of a patient's medical record in relation to a hospital visit. The E-Journal is directly accessible to hospital clinicians through the hospital's EMR system. GPs and citizens must use the sundhed.dk portal to access the data. Information which cannot be accessed includes the patients' medication record, diagnostic imaging (x-rays) and test results.

### 3.3.3 Collaboration between Primary and Specialist healthcare

The Danish Health Data Network (Medcom) acts as a data integrator to ensure interoperability. It facilitates effective data transfer between several actors of the health service and allows fast information flow in form of reliable data exchange among the respective software systems of the participating healthcare providers<sup>31</sup>. This consists of text-based clinical messages such as referrals to hospitals; prescriptions; requests for diagnostic tests; test reports; discharge letters; notifications of discharges to community and home care services and reimbursements. MedCom is supporting implementation of Denmark's new method for documenting and exchanging health care data, Fælles Sprog III ([FSIII](#)), which will contribute to better coherence and more data usage in the primary IT-systems through the implementation of common notions, classifications and adapted workflows.

In 2017 MedCom successfully implemented the results of the EU-funded interoperability project Antilope into daily practice and into MedCom's cooperation with the IT vendors in the Danish healthcare system<sup>32</sup>. MedCom is the first European Competence Center to follow the ISO9001:2015 standard in the process for testing and certification of Health Care IT-systems, resulting in high quality and uniform test and approval of systems.

### 3.3.4 Collaboration challenges, experience, and future plans

Denmark launched a [Digital health strategy 2018-2022](#)<sup>33</sup> in January 2018 named "A Coherent and Trustworthy Health Network for All". The strategy sets the direction for the eHealth work that focuses on digitisation and use of health data in the context of prevention, care and direct treatment. The high-level goal is to have better coherence, quality and geographical similarities in the health care system. The strategy has five main focus areas described below from the strategy document:

1. The patient as an active partner

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<sup>30</sup> [eHealth in Denmark: A Case Study](#), 2013

<sup>31</sup> [A comparison of National Health Data Interoperability Approaches in Taiwan, Denmark and Canada](#)

<sup>32</sup> [Denmark has successfully implemented EU interoperability project results](#)

<sup>33</sup> <http://healthcaredenmark.dk/media/1611539/The-Danish-Digitalisation-strategy-2018-2022.pdf>



2. Knowledge on time – support collaboration and a holistic patient care
3. Prevention – for example through treatment at home
4. Trustworthy and secure data
5. Progress and common building blocks

The digital health strategy describes collaboration, health information exchange and coordination of patient pathways in focus area 2, *Knowledge on time – support collaboration and a holistic patient care*, where the direction described in this area is to replace many of the IT systems in the regions and municipalities, which is expected to lead to a greater volume of structured data and make it easier to communicate and share data internally in the region as well as between systems and sectors.

The strategy also describes a vision where there will be a shift from the current practice of sharing messages between systems to a regime where data and information is shared by and accessed directly from local IT systems. The strategy shortly describes how to achieve this shift through investments in common solutions and standards to link the systems together.

### 3.4 England

Below is a summary table of EHR solutions, Collaboration approach and other National initiatives in three levels (Social welfare, Primary and Specialist healthcare services):

The information on England is limited to what was found during the desktop study in 2018:

Country	Context	EHR/EMR		Collaboration		National initiatives		
		Vendors	Examples	Vertical	Horizontal	Infostructure	Standards	Other
UK	Social welfare	National	Emis,	Paper-based	API	Spine, HSCN, GP Connect, GP2GP	FHIR, SNOMED CT	GPSoC, Summary Care Record
	Primary (GPs)	National	EMIS, TPP, Vision	Paper-based, API, messaging	Paper-based, small-scale HIE, API		FHIR, SNOMED CT	
	Specialist	National, Global	DXC, Cerner, InterSystems, Allscripts		Direct		FHIR, SNOMED CT	

(Table: Vertical collaboration = between Primary and Specialist, Horizontal collaboration = between the GPs or between the hospitals)

#### 3.4.1 NHS Digital

[NHS Digital](#) supports the NHS and social care services. NHS Digital delivers the following services to NHS:

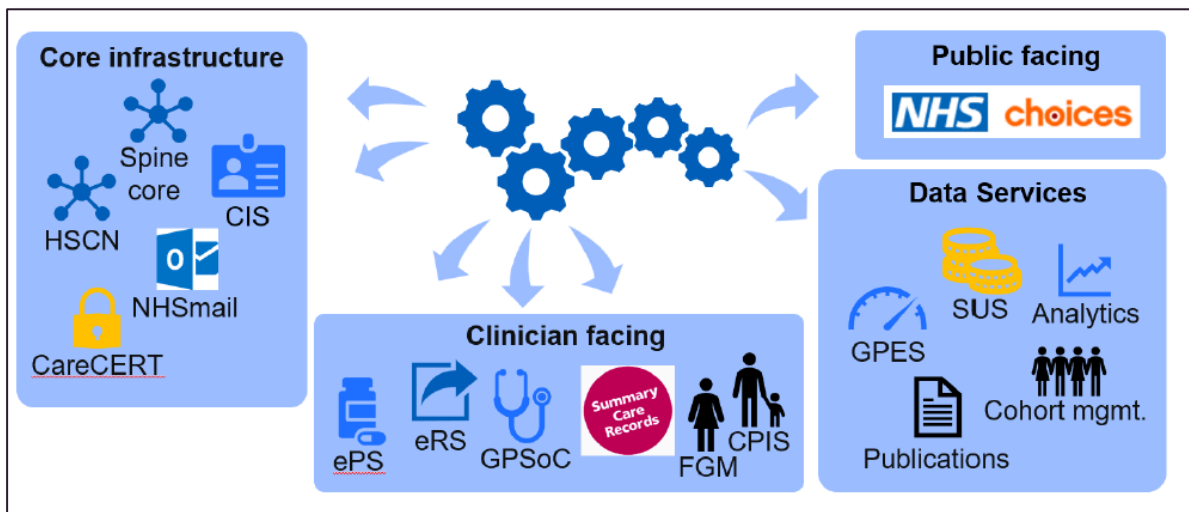


Figure 14: NHS Digital's "Service landscape"

- Core Infrastructure Services (core capability across other IT services)
  - [Spine](#) supports the IT infrastructure for health and social care in England;
    - Joins over 28,000 healthcare IT systems in 21,500 organisations<sup>34</sup>
    - Handles six billion messages each year (at peak > 1,500 messages/s)
    - Typically has 250,000 users accessing the services at any one time

34

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/550866/Wachter\\_Review\\_Accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/550866/Wachter_Review_Accessible.pdf)

- Holds more than 500 million records and documents
- [Care Identity Service](#) enables secure access; smartcards for 1.2m users
- [Health and Social Care Network](#) is the reliable, efficient and flexible way for health and care organisations to access and exchange electronic information
- [NHSmail](#), used by 1.3 million account holders to share sensitive information
- [CareCERT](#) offers advice and guidance to cyber security threats
- Clinician Facing Services (capability across primary, secondary and urgent care)
  - [GP System of Choice](#) (GPSoC): [Choice](#) of IT and services suppliers to GPs
  - [e-Referral Service](#): electronic booking w/choice of place, date for first hospital or clinic appointment
  - [Summary Care Record](#): important patient information created from GP records
    - +55 million SCRs, +70,000 accessed per week (2016)
  - [Electronic Prescription Service](#): from GP surgeries to pharmacies
- Public Facing Services
  - [NHS Choices](#) is a public facing portal service w/information, services etc.

### 3.4.2 Electronic Health Record systems

In 2002, the UK government launched development of the National Programme for Information Technology (NPfIT) NHS Care Records Service, which was intended to deliver an electronic health records system containing patient records from across the UK<sup>35</sup>. The NPfIT was officially dismantled in 2011<sup>36</sup> and "[effectively halted any momentum toward a fully digital and interoperable NHS](#)".

The current UK ambition is a staged approach to EHR: "*.. - by 2016 all patients should be able to access their own GP electronic record online in full, seeing not just a summary of their allergies and medication but blood test results, appointment records and medical histories. By 2018 this record will include information from all their health and care interactions. By 2020, the NHS has committed to be "paper-free at the point of care"*<sup>37</sup>.

#### National approach to EHR

One of the current NHS strategies is to develop "[Sustainability and transformation plans](#)" (STPs) for 44 geographical UK areas with an average population of 1,2 million inhabitants (from 300k-2,8 million). The work shall include "plans for regional interoperability"<sup>38</sup>.

This approach means that "*NHS organisations are now being told to collaborate rather than compete to respond to the challenges facing their local services. This new approach is being called 'place-based planning'*". STPs come in addition to the '[vanguard](#)' programme, covering some 50 geographical areas and, from 2017, STPs "*became the single application and approval point for local organisations to access NHS transformation funding*".

National Summary Care Record (SCR) is updated from GP EHRs like this<sup>39</sup>:

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<sup>35</sup> The Electronic Health Records System In the UK ([Case study](#), 2017)

<sup>36</sup> [A Glimpse at EHR Implementation Around the World](#) (U.S., UK, France, India)

<sup>37</sup> A paperless NHS: [electronic health records](#)

<sup>38</sup> [Wachter review, p.24](#)

<sup>39</sup> [Mapping out the obstacles of free movement of electronic health records in the EU in the light of single digital market](#), KPMG Baltics, 2017

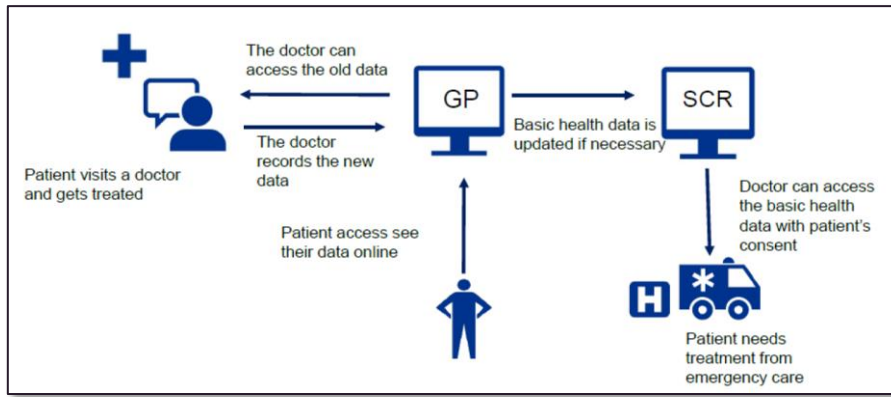


Figure 15: The GP EHR seen in conjunction with the NHS Summary Care Record

In addition, NHS invests in Local Health and Care Record Exemplars (LHCRE)<sup>40 41 42</sup> that (within a defined framework) will assist in developing requirements for a National EHR approach. The approach is to use Exemplars of a certain size (between 2 to 5 million patients) as this is considered tipping point in giving economies of scale.

When looking at UK as a whole, a report on Healthcare IT Trends in the UK<sup>43</sup> (p.28) describes PAS vendor market share like this:

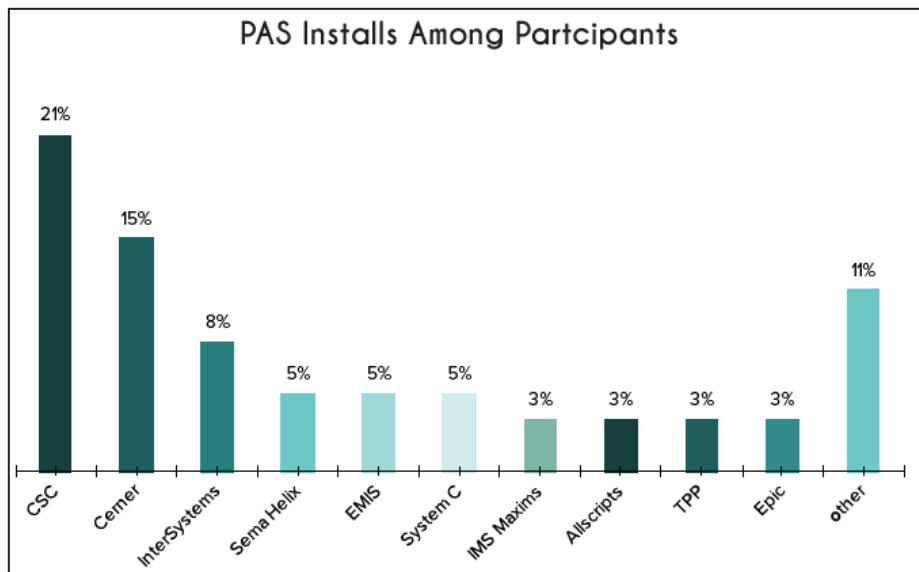


Figure 16: PAS installations in the UK (Primary + Specialist healthcare levels)

And similarly, EPR installations:

<sup>40</sup> NHS England [chooses care record exemplars](#) (May 2018)

<sup>41</sup> [Local Health and Care Record Exemplars](#)

<sup>42</sup> [CIO analysis: Local Care Records Exemplars](#)

<sup>43</sup> [Healthcare IT Trends in the UK — Who's Winning & Losing](#),

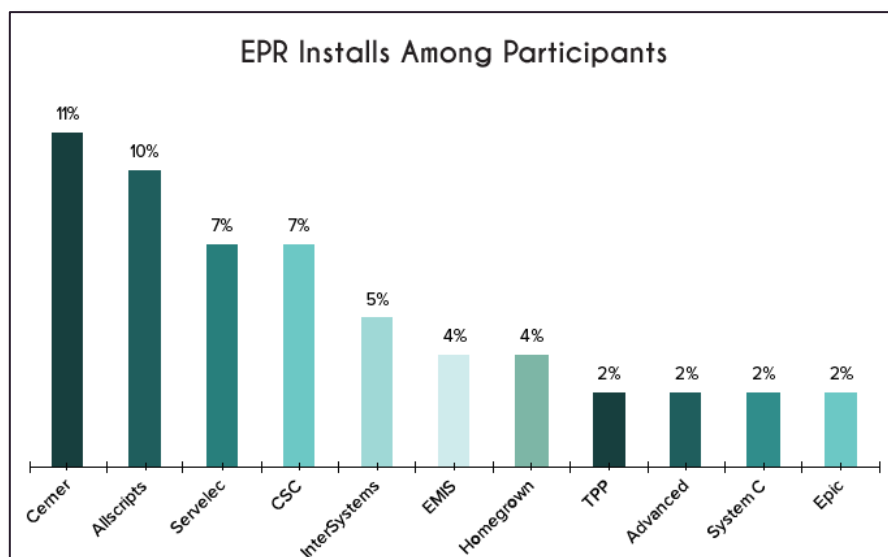


Figure 17: PAS installations in the UK (Primary and Specialist healthcare levels)

### EHR used in Primary healthcare

The UK market and vendors offering GPSoC-accredited EHRs are now four (EMIS, TPP, In Practice Systems, and Microtest), with [EMIS \(56%\) and TPP \(30%\)](#) dominating the market. There have been no new entrants to this market since 1997<sup>44</sup>. The GPSoC process is rigorous and EMIS recently lost its "[preferred vendor](#)" status in Wales.

### EHR used in Specialist healthcare

Vendors in Specialist healthcare are: Cerner, Allscripts, Selvelec, CSC, InterSystems and some others (incl. Epic).

## 3.4.3 Collaboration within Primary and Specialist healthcare

A [KLAS' report](#) from May 2018 "*Report Reveals 3 Core Barriers to NHS Interoperability in England*", pointing to market, supplier and internal barriers as restricting the ideal operability.

### Collaboration methods used inside Primary healthcare

Although virtually all GPs use a computer, much correspondence, particularly that received from secondary care (both hospitals and consultants) remains paper-based and must be scanned.

Interoperability between the main EHR systems have been developed by the vendors themselves, or by HIE-variations, like the "[Medical Interoperability Gateway – MIG](#)". There is also a GP2GP file transfer component developed, that packs and sends an EHR Patient record from one GP EHR system to another<sup>45</sup>.

At the primary care level, NHS Digital is working through the GP Connect programme to create open APIs between all primary care systems. Interoperability is named the highest priority for [NHS IT chiefs two years running](#).

<sup>44</sup> Making IT work: [The Wachter report](#)

<sup>45</sup> [GP2GP connector](#)

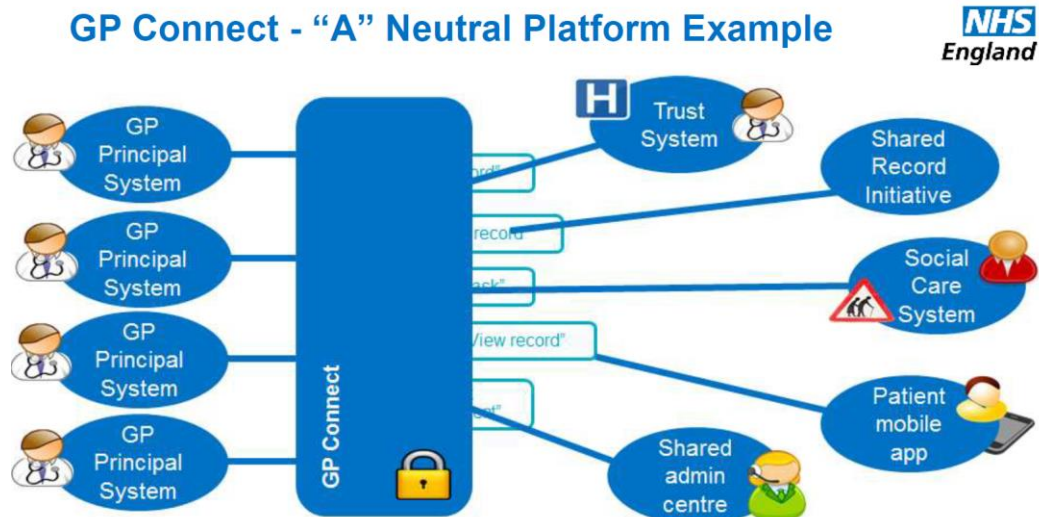


Figure 18: GP Connect<sup>46</sup>

The GP Connect platform will for example support FHIR<sup>47</sup>:

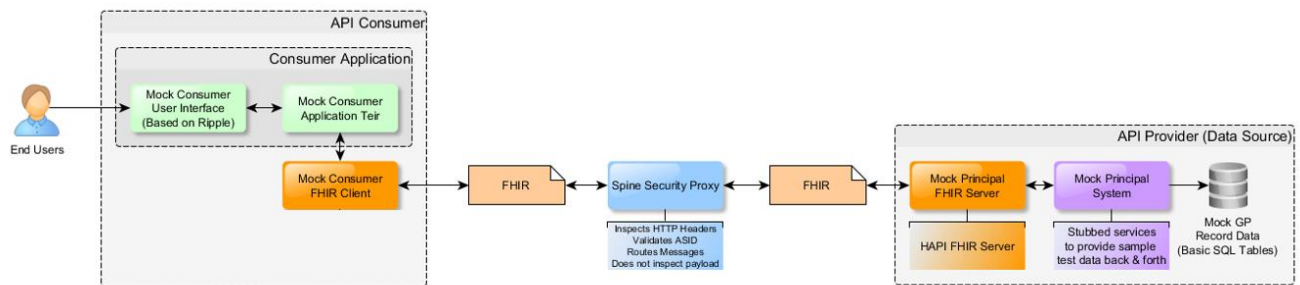


Figure 19: GP Connect and FHIR support

The beforementioned Local Health and Care Record Exemplars (LHCRES) will assist in "creating an information sharing environment".

### Collaboration methods used inside Specialist healthcare

UK Specialist healthcare use primarily large integrated solutions (DXC, Cerner) and collaboration is therefore assumed to be direct access to a common EHR database. Between hospitals (especially those with different systems) it is assumed that either messaging is used, or other transfer (paper-based, CD's). The strategy is to build GP Connect (see above) but further enquiries is needed to detail out current and future plans.

### 3.4.4 Collaboration between Primary and Specialist healthcare

The degree of collaboration between primary and specialist healthcare is not well developed and there is no predominant solution. But there are other services active, like pharmaceutical services, [lists relevant](#) standards that support interoperability (FHIR, APIs, HIEs, standards etc. are mentioned). And there are active communities like [Code4Health](#) which are NHS

<sup>46</sup> [GP Connect 1.2.3](#)

supported and working for increased collaboration. Among vendors, the [INTEROPen](#) action group (Healthcare IT interoperability in the UK) work to "accelerate the development of open standards for interoperability in the health and social care".

### 3.4.5 Collaboration challenges, experience, and future plans

NHS England has recently changed the name of accountable care systems to [integrated care systems](#) that focus on populations. It seems like the UK is moving away from the 2-tier healthcare structure.

*"Our aim is to use the next several years to make the biggest national move to integrated care of any major western country."*

[NHS England 2017, p 31](#)

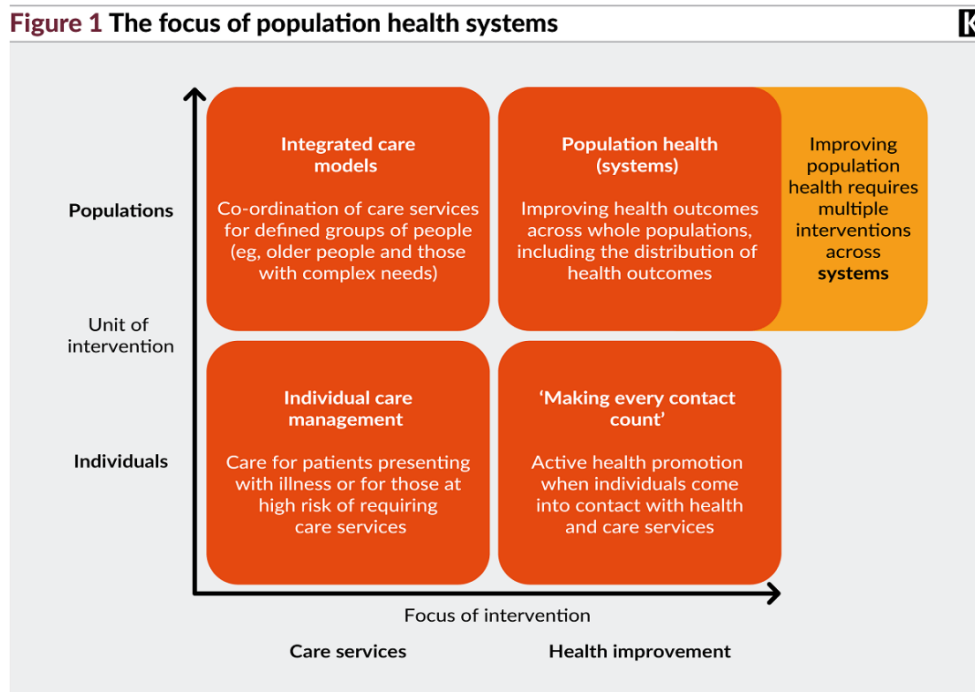


Figure 20: Focus of population health systems<sup>48</sup>

There are already several regions supporting this model<sup>49</sup>.

## 3.5 USA

Below is a summary table of EHR solutions, Collaboration approach and other National initiatives in three levels (Social welfare, Primary and Specialist healthcare services):

Country	Context	EHR/EMR	Collaboration	National initiatives
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<sup>48</sup> [Four new integrated care systems announced by NHS England](#) (digitalhealth, May 2018)

<sup>49</sup> Overview of [Integrated Care systems in UK](#), June 2019

		Vendors	Examples	Vertical	Horizontal	Infostructure	Standards	Other
USA	Social welfare/ LTC	International	AOD Software, HealthMEDX LLC, MatrixCare, Optimus EMR	Messaging, CD	Paper, CD	(No state / regional structure; ONC coordinates), large populations are either integrated or HIE		HIPAA Act, HITECH Act, TEFCA
	Primary (GP clinics)	National, Global	Allscripts, athenahealth, Cerner, Epic, Evefinity	Paper, CD, API, HIE, Direct	Direct, HIE..		(talking about: SNOMED CT, HL7 FHIR)	
	Specialist	Global	Epic, Cerner, Meditech	API, HIE, Direct	HIE, API			

(Table: Vertical collaboration = between Primary and Specialist, Horizontal collaboration = between the GPs or between the hospitals)

The U.S. is working on how to solve nationwide interoperability and collaboration through the [Office of the National Coordinator for Health Information Technology](#) (ONC). ONC is a resource to the entire U.S. health system to support the adoption of health information technology and the promotion of nationwide health information exchange to improve health care. ONC is the principal federal entity coordinating nationwide efforts to implement and use electronic exchange of health information.

The position of National Coordinator was created in 2004, through an Executive Order, and legislatively mandated in the Health Information Technology for Economic and Clinical Health Act (HITECH Act) of 2009.

There is no shortage of interoperability standards and initiatives (see ONC's "[Nationwide Interoperability Roadmap](#)"), but challenges and sustainable funding, have put in question the viability of nearly half of U.S. health information exchanges<sup>50</sup>.

The U.S. [Nationwide Health Information Network](#), now renamed the [eHealth Exchange](#) was developed under ONC with a vision of a "network of networks" deployed over the internet, rather than a physically separate network. The eHealth Exchange is now managed by a non-profit coalition named [Sequoia Project](#).

The U.S. approach to the eHealth Exchange vision and interoperability in general has not fundamentally changed from the guidance and direction established over a decade ago. However, advances in technology and progress in standards development have made more things possible. For example the ONC has in 2019 released draft 2 of the [Trusted Exchange Framework and Common Agreement](#) (TEFCA) – where the goal is to *enable nationwide exchange of electronic health information (EHI) across disparate health information networks (HINs)*. [TEFCA](#) is a common set of principles, terms and conditions that will need to be adopted by the actors.

### 3.5.1 Electronic Health Record systems

The U.S has been slow to adopt fully integrated EHR systems in practices in both primary care settings and within hospitals<sup>51</sup>. Around 2005, nine out of ten doctors in the U.S. updated their patients' records by hand and stored them in color-coded files. This changed radically

<sup>50</sup> HealthAffair, 2016 ([payable report](#)), "The Number Of Health Information Exchange Efforts Is Declining, Leaving The Viability Of Broad Clinical Data Exchange Uncertain"

<sup>51</sup> EU/JAseHN INFORMATION PAPER on Main eHealth activities outside of the EU Annex 11: Main USA eHealth policies and activities (Paper not released per 2018-05-23)



with the [HITEC act](#) in 2009 and by the end of 2017, approximately 90% of office-based physicians nationwide was using electronic health records.

### 3.5.1.1 National approach to EHR

A regular flow of federal regulations and laws is aimed at bringing more coherence and equity and integrate ICT techniques to communicate and share:

- 1996: [HIPAA](#), Among its main objectives: To combat waste, fraud, and abuse in health insurance and healthcare delivery, guidelines for:
  - Standardised Electronic Data Interchange transactions and codes
  - Standards for security of data systems
  - Etc.
- 2004: [Office of the National Coordinator for Health Information Technology](#) (ONC)
  - .. support the adoption of health information technology and the promotion of nationwide health information exchange to improve health care
  - A set of standards and interoperability rules on the Internet (Nationwide Health Information Network (NwHIN – not a physical network))
  - The ONC develops information centers to stimulate adoption of EHRs
- 2009: [HITECH Act](#): The Health Information Technology for Economic and Clinical Health Act
  - aimed to promote transparency in health care effectiveness and to reduce regional differences
  - Certified EHR
- 2010: [ACA](#) ("Obamacare")
  - Evaluate whether operating rules are consistent with electronic standards
  - The review committee shall ensure coordination...
  - HIT (Health Information Technology) for reduced... medical errors
  - HIT enrollment standards and protocols - Verify interoperability
  - Etc...
- [2010 Blue Button](#): A voluntary engagement for all healthcare providers and insurers that manage personal citizen's data so they can download a view of all their data
  - Currently being extended to [Blue Button 2.0](#) and sharing data with providers
- 2015 [MACRA legislation](#): The Medicare Access & CHIP Reauthorization Act of 2015
- 2016: [21st Century Cures Act](#), funding a range of areas (research, innovation etc.)
  - Promoting interoperability through ONC's TEFCA, HIE's and [API certification](#), [reduce burden relating to use of EHRs](#) and Health IT
  - [Supporting adoption of HL7 FHIR](#) standards, by pointing to the market-driven Argonaut Project as an example
  - Establishing a common understanding of a [core data set for interoperability](#)

### 3.5.1.2 EHR used in Primary healthcare

Some of the U.S. "[top EHRs](#)" for Ambulatory care are:

- Allscripts (Allscripts Professional/Enterprise)
- athenahealth (athenaClinicals)

- Cerner (PowerChart)
- eClinicalWorks (eClinicalWorks)
- Epic Systems (EpicCare Ambulatory)

Several of these vendors also cover Specialist healthcare market (inpatient).

Vendors [mentioned](#) in the Long Term Care (LTC) space cover care institutions, for example:

- AOD Software, HealthMEDX LLC, MatrixCare, Optimus EMR, Omnicell, Inc.

### 3.5.1.3 EHR used in Specialist healthcare

In 2017, EHR market share in U.S. hospitals / inpatient are reported as<sup>52</sup>(and<sup>53</sup>):

- Epic (25,8%)
- Cerner (24,6%)
- Meditech (16,6%)
- McKesson (4,6%)

## 3.5.2 Collaboration methods within Primary and Specialist healthcare

### Collaboration methods used inside Primary healthcare

For physicians that work independently, or as part of a small/medium practice, there are several smaller [EHRs available](#) (Infor-Med Praxis, WRS Health etc.). There is a move by the larger vendors to create downscaled solutions to support this market.

### Collaboration methods used inside Specialist healthcare

Collaboration inside both Primary and Specialist healthcare is solved primarily by using one common solution or a HIE with strong governance. U.S. Specialist healthcare is highly integrated within their domains (Veteran's (VistA, [being replaced by Cerner](#)), Kaiser Permanente (Epic)).

## 3.5.3 Collaboration methods between Primary and Specialist healthcare

Achieving an interoperable health care system remains a top US policy priority. Despite substantial efforts to encourage interoperability, national data in 2015 show that only 29,7% of all hospitals engage in four domains of interoperability: finding, sending, receiving, and integrating electronic patient information from outside providers<sup>54</sup> (2014: 24,5%).

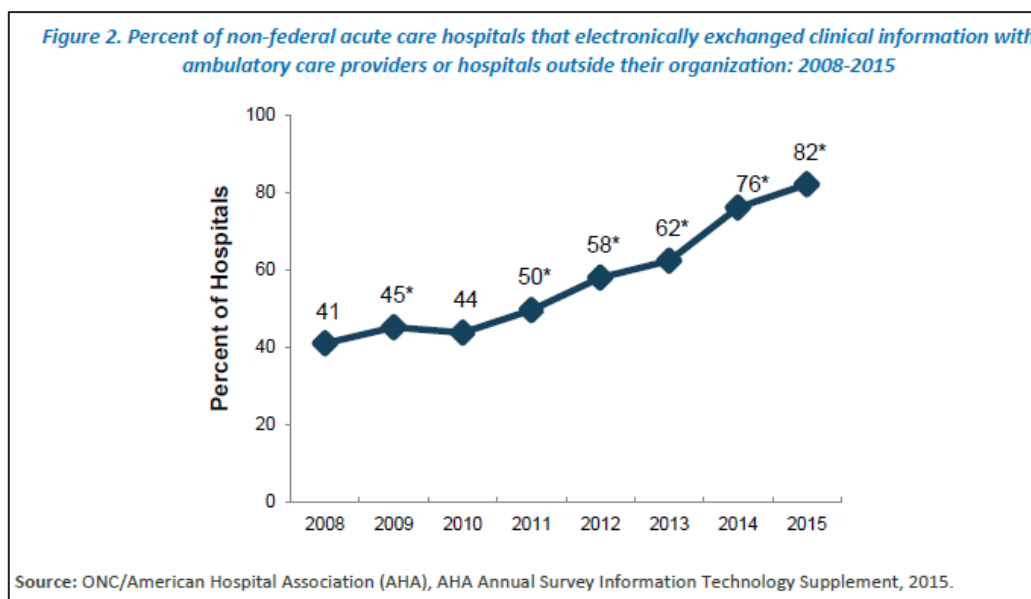
Health Information is increasingly being exchanged between U.S. hospitals and outside health care providers:

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<sup>52</sup> <https://medcitynews.com/2017/05/epic-erner-ehr-market-share/>

<sup>53</sup> <https://healthcareitskills.com/top-ehr-vendors-allscripts-athenahealth-erner-epic-meditech/>

<sup>54</sup> Health Affairs (purchasable article), [2017: Hospitals' Engagement In Sharing Patient Data](#)



*Figure 21: Increased flow of health information from U.S. hospitals<sup>55</sup> to external entities (Source: ONC)*

The previously mentioned eHealth Exchange will serve as basis for sharing health information between actors in the healthcare sector nationwide. Initiatives surrounding the exchange have been mentioned earlier.

There are other issues reducing the collaboration between GP level and hospitals. A EU-report draft<sup>56</sup> points out that some of the main weaknesses of the U.S. Health system is that the system is not equitable, the health situation of the disadvantaged and uninsured is bad and on the whole, practical communication in the "healthcare system" is gravely hampered by the fragmentation between structures and between diversity of insurance and protection systems.

US healthcare experts acknowledge that patient centered relation between GPs and hospitals are often more difficult than in European countries. In fact, continuity of care is the norm only inside medical insurance groups (Health Maintenance Organisations - [HMOs](#)) and integrated systems like Veterans<sup>57</sup>.

Another problem is the growth of healthcare costs (Total health expenditure in 2014/ GDP: USA 17,1%, EU: 10,1%, OECD 12,3%). In this context, new actors are appearing: Accountable Care Organisations, intermediates that evaluate providers' activity and negotiate fees.

### 3.5.4 Collaboration challenges, experience, and future plans

Below is a list of U.S. challenges on improving collaboration in healthcare.

<sup>55</sup> The ONC: [2016 Report To Congress on Health IT Progress](#)

<sup>56</sup> EU/JAseHN INFORMATION PAPER on Main eHealth activities outside of the EU Annex 11: Main USA eHealth policies and activities (Paper not released per 2018-05-23)

<sup>57</sup> [Veterans](#): Large integrated health care system, 1,240 facilities; 170 medical Centres, 1,061 outpatient sites of care of varying complexity, 9 million Veterans served each year

### **Challenge: Cultural and practical resistance**

As in many cases, the first obstacle is acceptance of HIT and eHealth by health professionals, in ambulatory care as well as in hospitals. It must be stressed that this resistance is often the result of badly conceived software, which impose an excessive workload for health professionals.

### **Challenge: States legal differences**

In the U.S., all national acts have to comply with states laws, very often not directly related to health. It is also necessary to prove the validity of all acts and regulation overriding states role in healthcare but also specific characteristics of a given State.

Example: House Bill 1437 aims to ease up the restrictions on telemedicine laws from 2015 by eliminating the requirement that patients must be at a healthcare facility to receive telemedicine services. In Arkansas, Teladoc, which conducts visits over the phone, points out that this will still leave out a lot of Arkansans because they lack the internet speed required to conduct video visits: 40% of residents are without access to broadband at 25 mbp/s or faster needed to support video visits.

### **Challenge: Technical difficulties**

Telemedicine and eHealth need high speed Internet connections for many applications. This is a difficulty for deployment in the USA and rural and disadvantaged populations cumulate difficulties. Indeed, even Internet connections are rare in some areas: despite the USA being the third country in the world for total number of connected people, they rank only 40th in terms of proportion of connected population: in 2015 25% of Americans were not connected (this proportion is much higher than in most EU member states).

## **3.6 References to healthcare collaboration / networks in some other countries**

- Spain, Catalan Institute of Health (ICS), project: "The collaborative Model Between Health and Social Care "(MECASS<sup>58</sup>) ([Press release IBM](#))
- Brunei: One Patient, One Record for the whole country, [Bru-HIMS](#), [DXC case study](#)

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<sup>58</sup> "[Internasjonale eksempler på bruk av helseanalyse](#)", NSE 2017

## 4 Appendix

### 4.1 Description of terms used in the report

Term/concept	Description	Example
Collaboration	occurs when two or more people or <b>organisations</b> work together to realise or achieve a goal. <b>Collaboration</b> is very similar to cooperation	Messaging between a General practitioner's EHR system (primary healthcare) to an EHR in a hospital (specialist healthcare)
Interoperability	is a characteristic of a product or system, whose <b>interfaces</b> are completely understood, to work with other products or systems, at present or future, in either implementation or access, without any restrictions	HL7, ebXML, XDS, DICOM
Continuity of care	Continuity is the degree to which a series of discrete healthcare events is experienced as coherent and connected and consistent with the patient's medical needs and personal context. Continuity of care is distinguished from other attributes of care by two core elements—care over time and the focus on individual patients. Three types of continuity exist in all settings: informational, management, and relational  The emphasis on each type of continuity differs depending on the type and setting of care (Haggerty, Reid et.al "Continuity of care: a multidisciplinary review)	Continuity of care is not supported yet in Norway but the three programs mentioned above all seek to support a future state where Continuity of care is the norm.
Electronic Healthcare Record (EHR)	The EHR is a more longitudinal collection of the electronic health information of individual patients or populations	<a href="#">DIPS</a> (Norwegian EHR vendor)  (here, PAS is part of the EHR)
Health Information Exchange (HIE)	HIE is the mobilisation of health care information electronically across organisations within a region, community or hospital system. In practice the term HIE may also refer to the organisation that facilitates the exchange	(here, HIE is simply defined as Collaboration)
Welfare technology / Telecare	Telecare is the term for offering remote care of elderly and physically less able people, providing the care and reassurance needed to allow them to remain living in their own homes	Home monitoring, "fall"-sensors, GPS tracking of persons with dementia, remote health monitoring etc.
Primary healthcare	Primary healthcare General Practitioner (GP) level and Primary Care (nursing home, community care) are split in Norway but for simplicity described as one entity here. In Norway a visit to the GP level is mandatory (gatekeeper function) before being referred to the specialist healthcare level	Includes <ul style="list-style-type: none"> <li>• General Practitioner level</li> <li>• Primary Care Practitioner level</li> <li>• Community care institutions</li> <li>• Nursing homes</li> </ul>
Specialist healthcare	Specialist healthcare here is a hospital, a specialist service or other (see examples on right)	Includes <ul style="list-style-type: none"> <li>• Hospitals</li> <li>• Outpatient clinics</li> <li>• Specialist healthcare institutions</li> </ul>

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