

Branding Nordic Healthcare Strongholds

A Nordic Story About
Smart Digital Health

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Business Finland

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A Nordic Story About Smart Digital Health

Summary

The healthcare systems in most countries are under tremendous pressure. The quality of care delivered by the healthcare system has improved, life expectancy has been extended, and patients are more knowledgeable about their conditions — they are eager to participate in their health management to live longer and healthier lives. This is threatening the financial sustainability of the traditional healthcare delivery model in many countries. New care and imbursement models are emerging as solutions to cost concerns.

The Nordic countries have a combined population of approximately 25 million citizens, and thus the Nordic countries will stand stronger together than individually, as each hosts a population of only 5 or 10 million citizens. Furthermore, Nordic countries are internationally recognized for leading the way in digitally transforming health and elderly care to meet the challenges that all countries are facing with more patients with chronic diseases and an increasing number of elderly people. Smart Digital Health, comprising Nordic solutions, is additionally helping to support the above-mentioned challenges in a way that improves the quality of care by sharing information across sectors.

Introduction

On a global level, demographic challenges have a major impact on health and care services. Like many other countries, the Nordic countries have a growing proportion of elderly people and people with one or more chronic diseases. By 2040, one in four Nordic citizens will be 65 years or older. People live longer due to the development of advanced diagnostic techniques and treatments. In order to keep a larger elderly population healthy and independent in the future, the Nordics are moving towards more efficient and holistic care, an approach that aims to empower and support seniors and chronically ill citizens to stay healthy in their own home.

People from all over the world look to the Nordic countries to see how we address social and demographic challenges. Agility, transparency, and information sharing are key to transform the way care is delivered. Common challenges have made the need for Nordic solutions even stronger; solutions that also comply with a number of the 2030 Sustainable Development Goals.

Building on analyses of Nordic eHealth strategies and the Nordic health tech core qualities and strongholds report, this brief will focus on the stronghold Smart Digital Health, this because of the Nordic countries awareness and ability to see and address the Nordic challenges and meet them with operational smart digital solutions.

This storytelling document describes how public and private actors collaborate and support each other in delivering world class healthcare solutions. The Nordic countries have a strong history in delivering digital health solutions that support and optimise digital transformation in Nordic healthcare organisations. As figure 1 below indicates, the transformation starts by identifying global, regional, and local challenges. The typical Nordic approach is user-centric, wherein challenges are not only identified on a large scale, but also derived from clinicians and end users. It will ensure that the solutions are relevant and, at the same time, will align the process with national and even Nordic priorities. Based on the challenges, Nordic countries create digital transformation strategies and identify concrete initiatives. The strategy and initiative phase is often done with national representatives, regional authorities, and selected hospitals in the country — again, to ensure coherence and relevance. Vendors in this phase are looked upon as partners and equal stakeholders that are expected to contribute in a public-private partnership setting. That arrangement is maintained when creating the solutions and later implementing them.

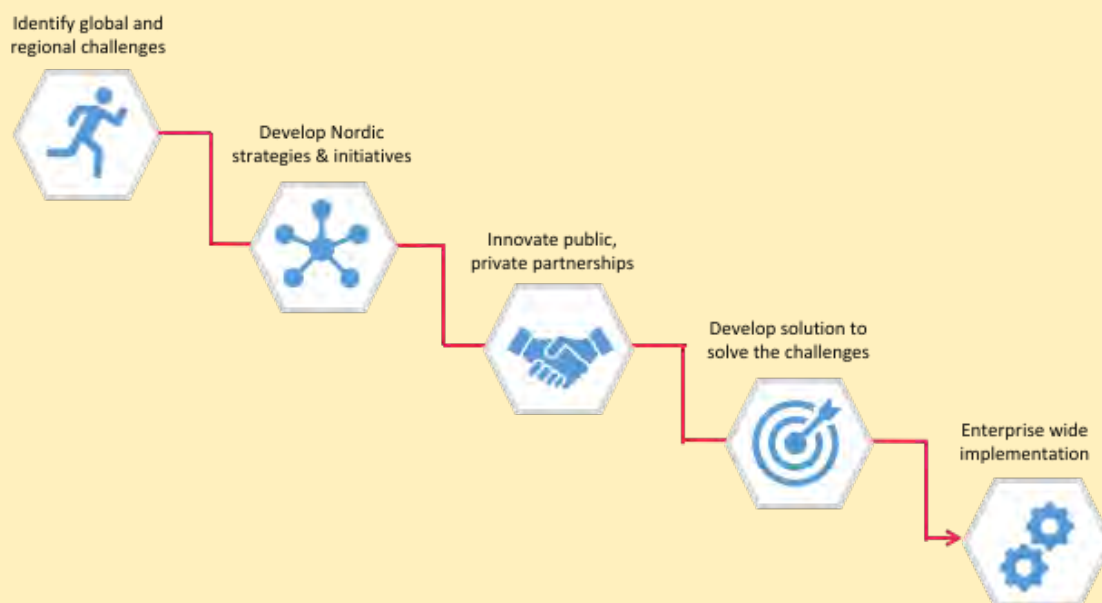


Figure 1: Approach — from identifying challenges to strategy and execution and implementation

Stronger together

The Nordic region is comprised of Finland, Sweden, Norway, Iceland, and Denmark, along with their associated territories Greenland and the Faroe Islands (self-governing under Denmark) and Åland (self-governing under Finland). Combined, the Nordic countries have complementary strongholds, which create synergy through close collaboration. Clustering and collaboration lead to innovative and comprehensive solutions and strong concepts targeted towards international stakeholders. And through an even closer Nordic collaboration, international interest can be stimulated and increased.

The following will provide a story of healthcare strongholds in Nordic countries. These strongholds address challenges within the Nordic healthcare systems. The Nordic story will provide a platform for producing a Nordic video to illustrate the story within specific segments and a Nordic white paper, describing the story and a segment topic in detail.

Nordic welfare services are undergoing a reform, which will ultimately put the patient in the center of care and engage them as an equal stakeholder within the care continuum. The engaged and empowered patients will learn to be aware of issues related to their own life and health independently, with support from care professionals. Reliable data and information sharing, not only from the hospital, but also from other stakeholders — including patient-generated data about well-being — will play a key role in this transformation.

Nordic healthcare transformation and collaboration initiatives have great potential to create comprehensive and clinically proven innovative solutions and products. Through a collaborative political agenda, innovation focus, evidence-based culture, and a highly trained workforce, Nordic initiatives can expand beyond the region where international interest can be stimulated and increased. Establishing even stronger collaboration between the Nordic countries can help to strengthen and enlarge the joint Nordic market into a European or even a global endeavor.

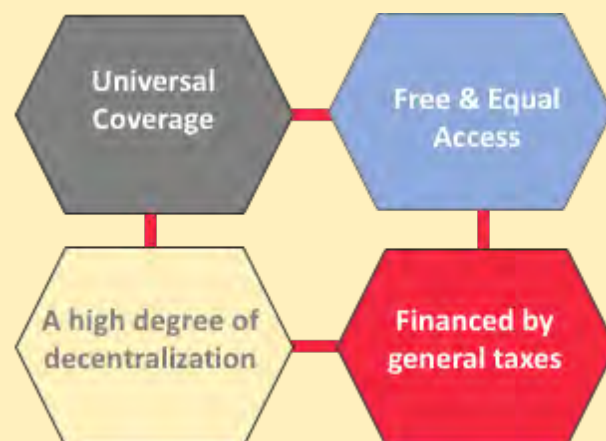
The Nordic healthcare model

The Nordic countries are well-developed democracies with relatively small economic differences. The core qualities of the region are an important reason why the healthcare systems are regarded as both of high quality and equitable in an international perspective¹.

¹ **Strongholds and Qualities of the Nordic Health Tech Ecosystem**, Menon Economics Elin Bergman, Lisbeth Iversen Flateland, Eirik Handegård Dyrstad, Lars H. Lind and Erland Skogli

There are some variations within the Nordic region regarding access to high-quality healthcare. European Observatory on Health Systems and Policies (EOHSP) argues that geographical and socioeconomic inequities with respect to access and usage of healthcare services are comparatively low in Norway, Denmark, and Iceland. Such differences may, however, be more pronounced in Finland and Sweden, according to some studies², which may partly be explained by how both financing and organization of healthcare in these countries are more decentralized than in Denmark, Norway, and Iceland.

At the core of the Nordic welfare model lies the principle of universalism and broad public participation in various areas of economic and social life, which is intended to promote equality of the highest standards rather than an equality of minimal needs. Furthermore, decision making is partly decentralized to municipalities, and, for the hospital sector, decision making is decentralized to regional authorities. To decentralize decision making in the Nordic way increases agility and aligns the provider with patient needs, as the organizational decision power is closer to the local community and, ultimately, to the patient.



The Nordic healthcare systems all share the four characteristics shown above. These characteristics, combined with the fact that each citizen has a unique identifier (social security number) motivates and enables digital transformation and new business models within health and care sectors. The Nordic countries are ahead of the curve in technology adoption and business model initiatives centered around integrated care, personalized medicine, value-based healthcare, population health management, and others. As Figure 3 shows, this integrated and personalized service delivery is at the heart of the Nordic healthcare service provision, and it aims to address the pressure on the demand for health services from the aging population, the growing rate of chronic diseases, and the increasing expectations of patients.

² van Doorslaer, Masseria and Koolman, (2006), *Inequalities in access to medical care by income in developed countries*

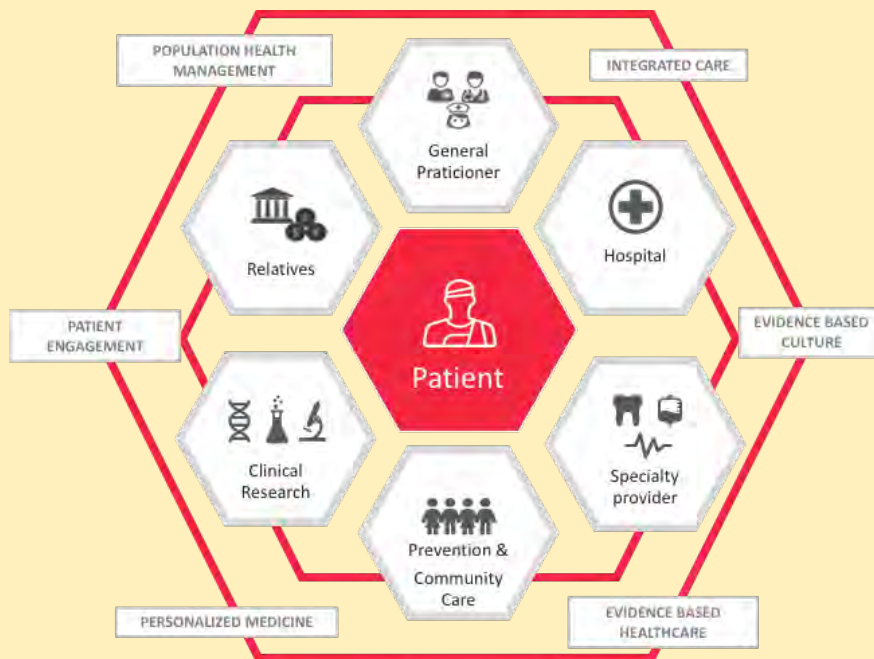


Figure 3: Patients are assigned a more active role in the care environment and are at the core of a patient-centric healthcare ecosystem.

In this way, the healthcare and eHealth strategies in all the Nordic countries both support transformation of the Nordic healthcare systems and comply with digital transformation initiatives and a sustainable roadmap for change:

- Transformation of the Nordic healthcare systems
 - Organizational initiatives that will ensure the well-developed and well-organized healthcare system is continually reformed to adapt to new challenges and demographics through the preparation of action plans on dementia, diabetes, chronic diseases, and so on
- Digital transformation
 - The development of innovative digital solutions that support demographic challenges, as well as the need for information sharing and communication across sectors

The Nordic region has a strong position when it comes to digital transformation due to alignment between healthcare strategies and supporting digital solutions. The ability to clearly formulate needs and requirements and communicate them to vendors has made a huge impact on the way care is delivered. Not only as digital innovators in small scale projects but also when it comes to scaling solutions enterprise-wide and often across the care continuum. In the Nordic terminology, to integrate does not only mean to share data. It is also about integrating stakeholders around the patient, as well as health and care organizations and ICT vendors. No other region within Europe is as advanced as the Nordics when it comes to digital transformation, which at the same time has supported commercial growth. Public-private partnerships, innovation labs, and other collaborating project models have been adopted to inspire ICT vendors to become engaged in the Nordic healthcare change “project”, which again has led to world-class digital solutions worthy of a global reach.

Global Healthcare Challenges

The healthcare systems in most countries are under tremendous pressure. The quality of care delivered has improved, life expectancy has been extended, and patients are more knowledgeable about their own conditions — they are eager to participate in their health management to live longer and healthier lives. But longer life expectancy and the prevalence of chronic conditions are driving an increase in the cost of pharmaceuticals, disease and care management, and certain patient groups such as the elderly and infirm. This is threatening the financial sustainability of the traditional healthcare delivery model in many countries. New care and imbursement models are emerging as solutions to cost concerns.

Digital health initiatives are playing a crucial role in making the transformation possible. Health and care systems that want to contain costs, improve quality of care, and attract talent and money for clinical research must embrace digitalization as a strategic priority³.

The figure below illustrates that during the next 10 years healthcare services all over the world will face a series of difficult and complex challenges. Nordic initiatives have been initiated, and the Nordics have seized the opportunities provided by new technology to address the challenges and initiatives. This justifies the choice of the stronghold Smart Digital Health because the Nordic countries are at the forefront to meet these challenges with digital strategies and operational smart digital solutions.

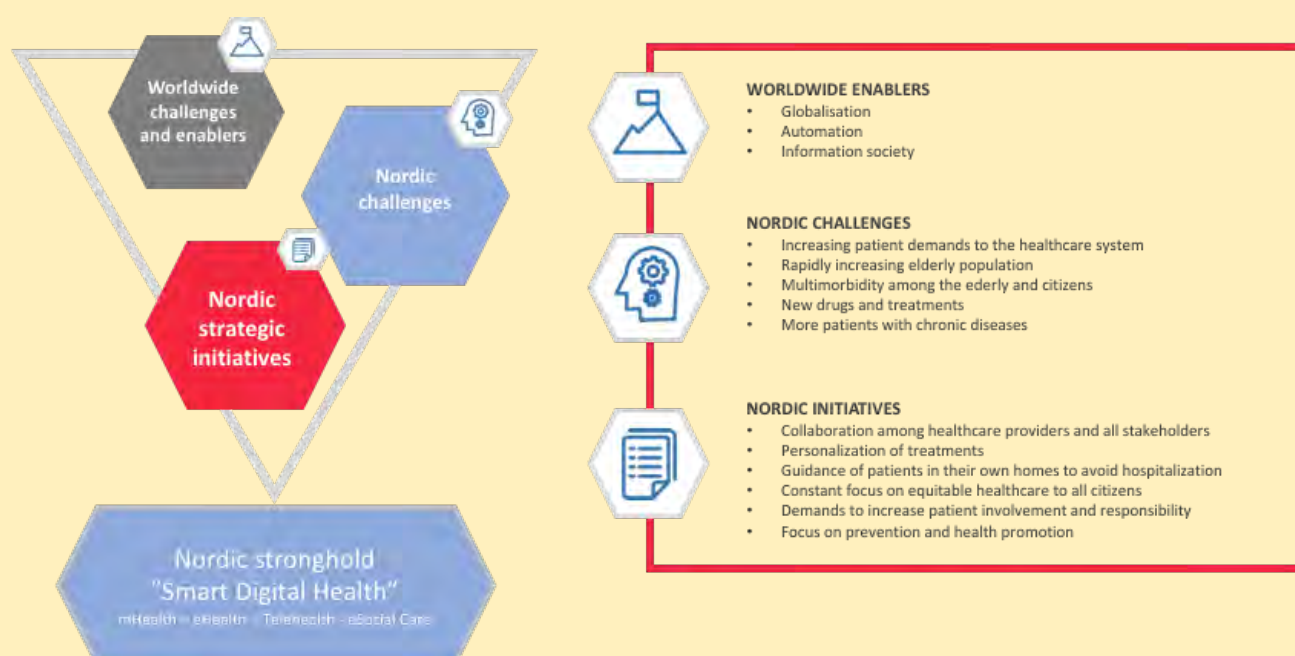


Figure 4: An illustration of the choice of stronghold Smart Digital Health through worldwide challenges, Nordic challenges, and Nordic initiatives. The stronghold Smart Digital Health comprises healthcare solutions that address the challenges that all countries are facing. Smart Digital Health includes the following sub-strongholds: mHealth, eHealth, Telehealth, and eSocial Care.

Hospitals and municipalities in the Nordic countries, as well as in other regions of the world, must meet the worldwide challenges; at the same time, they must increase operational performance, stakeholder integration, and coordination. All of which could have serious effects on the future healthcare system if not handled properly⁴. It has already led to many innovative solutions being implemented in order to meet the global challenges.

World-class Nordic eHealth strategies: from healthcare to care management

The Nordic region is in a strong position when it comes to Smart Digital Health. Enhanced coherence in patient journeys, a stronger focus on the chronically ill and the elderly patients, and data sharing are important objectives when it

³ Tailoring the approach to multimorbidity in adults with respiratory disease: the NICE guideline, Lowie E.G.W. Vanfleteren^{1,2}, Martijn A. Spruit^{1,3} and Frits M.E. Franssen^{1,2}, page 2

⁴ National Institute for Health and Care Excellence. Improving Health and Social Care through Evidence-based Guidance. www.nice.org.uk

comes to meet the challenges. As an acknowledgment, all of the Nordic countries have recently launched eHealth strategies, which all support the agenda for connected and Smart Digital Health and will boost digital healthcare collaboration across sectors.

The vision of **Sweden** is to be the best in the world to make use of digital health and smart health by 2025⁵. By using the opportunities offered by digitization, Sweden wants to make it easier for all people to achieve good and equal health and welfare services, while developing and strengthening their resources to increase the level of independence and participation in good life society.

The **Norwegian** digitization strategy for 2017-2022⁶ sets three overall goals: 1) Healthcare professionals must have easy and secure access to patient information. 2) Citizens must have easy and safe access to healthcare services. 3) Data must be available for quality improvement, health monitoring, management, and research. Overall, the strategy aims to establish more coherent patient journeys working towards implementing the concept "one citizen one healthrecord"

The eHealth strategy of **Iceland** 2016-2020⁷ aims to establish integrated and interconnected health information systems and a secure national network where health professionals can smoothly exchange health information to support the continuity of healthcare delivery. The objective of the Icelandic eHealth strategy is to ensure quality, safety, efficiency, and financial effectiveness of healthcare services that should be improved through implementation of shared and integrated eHealth solutions such as a smooth reliable and easy electronic access for consumers to their own health information, whenever and wherever needed.

"Information to support well-being and service renewal" is the title of the **Finnish** eHealth and eSocial Strategy 2020⁸. This strategy aims to develop eHealth and eSocial services to support the healthcare and welfare services of the future, focusing on empowering citizens as service users. Professionals in social welfare and healthcare have access to information systems that support their work and IT operating processes to support effective utilization of limited resources. A central idea of the strategy is to put information related to social welfare and healthcare services to effective use in the support of citizens' well-being and the services that need to be renewed.

In 2018, **Denmark** launched an ambitious new Digital Health Strategy 2018-2022⁹, which aims to assist a coherent and trustworthy health network for all. The strategy must ensure the continued momentum towards a more holistic effort to enable hospitals, municipal health services, GPs, and other public and private participants throughout the health system healthcare ecosystem to cooperate in an integrated network focusing on the patients. It involves digitization and use of health data as part of preventive efforts, care, and direct treatment. The five focus areas are: 1) the patient as an active partner, 2) knowledge on time, 3) prevention, 4) trustworthy and secure data, and 5) progress and common building blocks.

Nordic initiatives: from strategies to initiatives

Based on the Nordic eHealth strategies, the Nordic countries have launched individual initiatives, which are described below.

All five Nordic countries have cancer strategies or action plans, which aim to form a foundation and, through a joint set of policies, to increase the overall quality of Nordic cancer care. Digital tools are fundamental to support and engage cancer patients in joint decision-making processes with their careperson of choice. Personalized and tailored care pathways for everyone based on their personal requirements and needs will be the goal of this strategy.

⁵ [Swedish Vision of eHealth 2025](#)

⁶ [Norwegian Nasjonal e-helsestrategi og mål 2017-2022](#)

⁷ [Icelandic National eHealth Strategy 2016-2020](#)

⁸ [Finnish EHealth and eSocial Strategy 2020](#)

⁹ [Danish Digital Health Strategy 2018-2022](#)

The National Genome Strategy in **Finland**¹⁰ sets key measures for ensuring that, by 2020, genomic data will be used in healthcare and in the promotion of health and wellbeing. Achieving this objective will require the development of a Finnish national reference database of genomes to be used in clinical care and research. The capacity of healthcare professionals to apply genome-based information should be strengthened, and people need to be empowered to improve their own health by effective use of genomic information.

With a Personal Medicine Strategy 2017-2020¹¹, **Denmark** also focuses on developing better and more targeted treatments that benefit patients through the use of more in-depth knowledge and new technologies.

In 2016, **Norway**,¹² and later in 2017, **Denmark**¹³, each launched their own dementia action plans 2020/2025, which have certain similarities. The goal is to form a more dementia-friendly society where people with dementia are cared for with dignity and are integrated in the community. In these action plans, digital transformation plays a vital part. Furthermore, **Norway** focuses on mental health, and with the Strategy of Good Mental Health 2017-2022, the country will support transparency and knowledge about how physical and mental health affect each other.

In **Denmark**, care plans for patients with COPD¹⁴, type 2 diabetes, and chronic lower back pain will be implemented in general practices from 2018. The care plan is owned by the patient, but the content is created in collaboration between the patient and the general practitioner. In the years ahead, telemedical home monitoring will be rolled out throughout Denmark for pregnant women with complications and for patients with COPD. Large-scale telehealth projects in Denmark have provided the benefits and evidence for supporting COPD patients with telehealth. As a result, Denmark is in process of deploying telehealth for COPD patients on a national level by 2019.

By 2025, **Sweden's** vision is to be the best in the world at using the opportunities offered by digitization and eHealth to make it easier for all people to achieve good and equal health and welfare services and to develop and strengthen their own resources to increase their level of independence and participation in society. To fulfill this vision, Sweden has many activities under way¹⁵.

eHealth and especially clinical decision support (SDS) plays an important role in **Sweden** when it comes to stroke prevention, rapid treatment, and rehabilitation. For prevention, clinical decision support systems (CDS) and wearable technology (WT) can be used to identify risks associated with diabetes and cardiovascular diseases. Rapid treatment covers both response time to emergency calls and accessibility and rapid solutions, since time to treatment is a critical factor in saving lives. When it comes to rehabilitation, a good integrated and connected support system with consulting and interoperability is important. Sweden has a good quality register on the stroke¹⁶ active patient group (www.strokeforbundet.se/) and good safety data sheets from companies targeting the whole journey from prevention to rehabilitation.

The **Icelandic** Directorate of Health aims to put healthcare data at the center of its efforts to increase safety in the healthcare system.¹⁷ A key functionality of eHealth is the implementation of connected and integrated electronic health records (EHRs) for sharing of important health information at point of care to support clinical decision making. The system enables the general public to access their key health records, including prescriptions, biometric data, and so forth.

¹⁰ [National Genome Strategy of Finland 2015-2020](#)

¹¹ [Strategy of personal Medicine, 2017-2020](#)

¹² [Dementioplan 2016-2020, Norway](#)

¹³ [A safe and dignified life with dementia, Ministry of Health, January 2017](#)

¹⁴ [Denmark - a telehealth nation, Healthcare DENMARK, 2018](#)

¹⁵ [Vision for eHealth 2025, Sweden](#)

¹⁶ [The Swedish Stroke Register](#)

¹⁷ [National eHealth Strategy 2016-2020](#)

Data and digitization can support increased patient safety, efficiency, clinical quality and strengthen the reciprocity in using health data for treatment and research¹⁸. The present strategy in **Iceland** outlines future visions of eHealth implementation looking forward to 2020. The main focus is on improving access to information and health services, patient safety, and quality of care with efficient use of financial resources¹⁹.

The Nordic healthcare systems are digitally transforming healthcare to meet the challenges that all global care providers are facing. The Nordic countries are already rethinking the way health and welfare services are delivered to support the increased focus on prevention, self-care management, health, and physical wellbeing.

Digital Innovation Is at the Core of Nordic Healthcare

The Nordic countries are at the forefront in Europe when it comes to adopting connected health technologies on a large scale. The strongholds Smart Digital Health and solutions refer to the use of eHealth, telehealth, telecare, telemedicine and self-care in providing convenient, accessible and cost-effective care for patients with long-term conditions. Overall, the Nordic digitization strategies and initiatives aim to increase the focus on staying healthy, increase the quality of care, and avoid hospitalization.

The above-mentioned trends underpin the increasing need for a joint focus for the Nordic countries and healthcare organizations to work smarter and together in a patient-centric way.

For patients, it is not about a single encounter at a hospital, it is about the entire care journey. Data created in one instance must be made available in others to save lives and increase quality by enabling patient-centric pathways. With more control over their own healthcare choices and increasing deductibles, patients are putting pressure on the healthcare system with the objective to achieve high-quality care. Patient engagement has become a key strategy to promote informed decision-making and behaviors to facilitate improved health outcomes.

A precondition for this is the integration of stakeholders and the development of an overall healthcare data and governance ecosystem. For this purpose, healthcare organizations should be able to handle a large amount of data and information across heterogeneous and disparate information systems to make the data available at the point of care. The data has to be accurate, timely, and understandable for every stakeholder in the ecosystem in order to reduce medical errors and drive down health delivery costs.

The Nordic countries have an increased focus on both organizational and technological development and the combination within the above-mentioned areas of change, which offers a perfect opportunity for radical innovation in the fields of communication, information utilization, and collaboration across sectors in a client-centric way. This requires smart digital solutions to support Smart Digital Health.

Smart Digital Health is defined as:

Healthcare solutions that facilitate communication among healthcare professionals and between healthcare professionals and patients/clients, as well as solutions that enable patient/client self-care. The solutions support health prevention and treatment at home to avoid hospitalization. If necessary, the solutions can even support treatment at home.

Connected health is a commonly used term, which sets the framework to resolve the healthcare challenges by connecting the sectors through remote healthcare services provided by technology. Figure 5 illustrates the technologies within the field of connected health that enable the healthcare system to provide a patient-centered healthcare service in which information is shared and used across stakeholders and sectors.

Smart digital solutions are not just about technologies; implementing them requires organizational change. This may act as a catalyst for new routines and workflows, which put the patient at the center of treatment. Instead of admitting the patient to the system, the system is deployed to the patient. That is why we collectively refer to the technical solutions within this field as Smart Digital Health — they enable the patient and stakeholders within the ecosystem to share relevant data.

¹⁸ [National eHealth strategy 2016-20202, Iceland.](#)

Connected Health

Connected health is understood as a socio-technical model for healthcare management and delivery by using technology to provide healthcare services remotely. And it is a collective term for telecare telehealth, telemedicine mHealth, digital health and eHealth services.

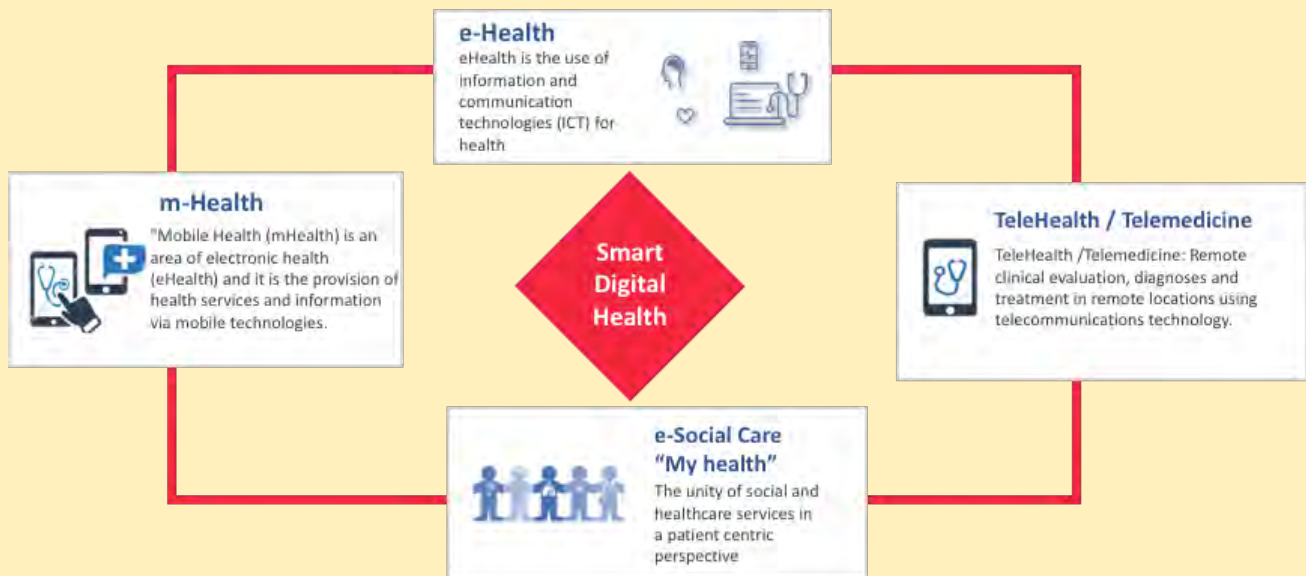


Figure 5: Data and information sharing across solutions and sectors. Solutions that facilitate communication among healthcare professionals and between healthcare professionals and patients/clients and solutions that enable patient/client self-care.

Patient Journeys — World-Class Examples of Digital Healthcare Transformation

Longer life expectancy and the increasing prevalence of chronic conditions are causing an increase in healthcare expenditures, threatening the financial sustainability of the traditional healthcare delivery model. New models of care supported by new technologies are emerging as a solution to the "burning platform".

As described above, Nordic countries are so similar that they can easily work together, yet so different that they can still learn a lot from each other. With the political reimbursement structure and healthcare organizational elements being very similar, the examples below have proven to be sustainable solutions outside their innovation lab and in an international setting.

Each Nordic country listed presents a different scenario that illustrates the patient journey through Nordic healthcare services. Each patient journey presents a specific area within some of the main healthcare challenges. The Nordics want actual results that will impact healthcare, and the examples described below illustrate such results on a large scale. The focus in each journey is based on the challenges that all the Nordic countries are facing relating to chronically ill and elderly people. However, it is not an indication that only the individual country works within these focus areas, but rather a selection of best practices.

Norway focuses on developing a dementia-friendly society, **Finland** on the use of data in cancer treatment, **Iceland** on the use of telemedicine in diabetes treatment, **Sweden** uses data to prevent strokes, and **Denmark** has targeted efforts for COPD patients. These will be described in detail below, and the following supports the Nordic strongholds and where the solutions are successfully implemented enterprise-wide. The Nordic countries have similar initiatives, and it is often the case that several countries are working on the same initiatives.

Finland



More and more people are getting cancer worldwide, but due to the benefits of personalized treatment, people are increasingly recovering from the disease. High-quality health data based on a personal unique identification number creates the opportunity for personalized treatment of cancer. In Finland, collecting this health data also depends on the involvement of the citizens. For decades, this has made it possible to collect comprehensive and unique patient data, which the Nordic countries plan to make available in order to increase the quality of care.

Several Nordic companies are engaged in projects to develop solutions that can use the data goldmine in new ways — e.g., for artificial intelligence solutions aimed at cancer treatment. Finland has created a national genome strategy that sets key measures for ensuring that, by 2020, genomic data will be effectively used in healthcare and in the promotion of health and wellbeing²⁰.

Matti's story – a cancer patient's complete service journey

Finland has systematic remote monitoring of cancer patients' symptoms, well-being, and quality of life, which helps the care teams to predict complications and relapses at an earlier stage than before. The patient journey will illustrate an example of how this can optimize the treatment for Matti.



²⁰ National Genome Strategy of Finland 2015-2020, Ministry of social affairs and health, Finland

Matti, the patient, who feels fit and healthy, gets invited to an age-related screening.

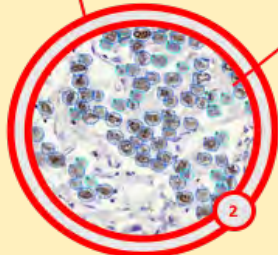


1

Matti and his wife go online to a virtual hospital to investigate Matti's care pathway. They get more information about his condition and find peace of mind. Some of their misconceptions are corrected and their confidence is regained.



3



2

The screening is carried out in a hospital (occupational healthcare) and cancer is discovered. A sample is taken and examined.



4

Matti uses a web app before the surgery. With this app, the hospital provides real-time information on patient preparation and recovery status. Matti is informed on how to prepare for the treatment through the app. This helps the hospital to focus on patients who need special attention.



5

Matti's surgery quality is followed carefully throughout the operation and also after the surgery. Just like airplane pilots, the surgeons use checklists to quality control the procedures to guarantee a safe environment for the patient.



6

After the surgery, Matti needs to do physical exercise. All relevant data is collected automatically from several sources. Data gathering is pre-programmed according to each treatment pathway.

Matti reports the outcome through an app. He reports how the drugs are working and how he feels. He can contact the professionals at his clinic at any time and the state of his health is being monitored continuously. He can alert the care team and get instructions when needed.



8

Matti is booked for radiation therapy at a private cancer clinic. For maximum certainty, the patient is identified through fingerprints, which eliminates the risk of giving treatment to the wrong person.

7



Matti finds a person-to-person network to make everyday life easier. Here, he can find people in similar situations and can relate to others with cancer. Using this network makes it easier for him to cope with having cancer.

10



Genomic tests for personalized medicine are initiated to identify the best combination of medicine to kill the cancer cells.

9



Matti is feeling depressed due to his illness and seeks specialized help online.

11



12



After a year, Matti goes for a check-up and finds out that he is cancer free.

Iceland



Due to the geographical conditions in Iceland, as well as a desire to bring the specialists closer to the citizens, there is a need for sharing important health information over great distances. In Iceland, telehealth engages citizens in their own treatment and makes sure that information is shared to increase quality of care.

Since 1996, it has been the policy of the Icelandic government to establish an integrated and interconnected health information system and a secure national network where health professionals can seamlessly exchange meaningful health information to support the continuity of health care delivery. The use of eHealth within health care is believed to support increased patient safety, quality of health care, and efficiency. A key functionality of eHealth is the implementation of connected and integrated electronic health records (EHRs) for sharing of important health information at point of care to support clinical decision making. Integrated and shared health records support coordination, collaboration, and continuity of health care delivery, since important clinical information about the patient can be securely accessed any time, any place, instead of being isolated at the health care institutions where the health services were delivered.

Jon's story — A diabetes patient's complete service journey

Integrated and shared health records support coordination, collaboration, and continuity of healthcare delivery, since important clinical information about the patient can be securely accessed at any time, any place. Previously, this information was isolated at the healthcare institutions where the health services were delivered²¹. The patient journey will illustrate which innovative solutions are involved in supporting the health and care services.



²¹ National eHealth Strategies 2016-2020, Directorate of Health, Iceland



Jon visits his general practitioner for a routine check-up. His doctor enters Jon's data into a central database with ISO and HIPAA compliance, which protects Jon's data and ensures his privacy. His doctor also recommends that he adopts a healthier lifestyle.



Jon starts using an app designed for people who are pre-diabetic and at risk of developing Type-2 diabetes. Jon starts following a new lifestyle action plan, redesigning his physical activity, nutrition intake, and even begins to perform stress-reducing exercises.



Jon feels that his vision is worsening. After reading about the risk of developing eye diseases and even becoming blind, Jon finds an online risk calculator that shows his risk of developing diabetic retinopathy, an eye disease that can lead to blindness and is diagnosed only in people with diabetes. Seeing that his risk of developing diabetic retinopathy is high, he decides to make an appointment with his ophthalmologist.



Jon's ophthalmologist uses a new technology that can detect changes in the physiology of his eyes. This enables his doctor to monitor the progression of the eye before it is damaged by assessing changes in how the eye metabolizes oxygen over time. Seeing some changes, his ophthalmologist gives him a non-invasive novel therapy as treatment, in the form of a novel drop. Jon is one of the first to be receiving this novel eye drop as the previous standard treatments were invasive, e.g. eye injections and even implants.



After 6 months, Jon visits his general practitioner again. The doctor notices that Jon's weight is more stable but recommends that he submits a blood sample to check if he has diabetes. After administering the blood test, his doctor confirms that Jon has Type-2 diabetes. Jon receives education on how to manage his health and treat his disease on his own. He is also sent home with an all-in-one device that can automatically read, register, and share his insulin dosing and blood test information with his doctor and even his family to help monitor his health status and progress with treating his diabetes.

After a few months, Jon begins having severe feet pain, noticing that a wound on his foot is not healing. He is rushed to the hospital. The attending nurses safely verify the correct amount and type of medicine he needs for his pain using a hardware technology that optically analyzes the weight, shape, and unique markings of each tablet. Each type of prescription tablet has a unique weight, shape, and marking. The medicine was safely delivered to the hospital by technology that ensures optimal environmental conditions and temperature.



Becoming very sensitive to his deteriorating health, Jon visits the doctor. The doctor receives Jon's risk factor in just a few seconds by entering a few of Jon's metrics. The doctor then assesses Jon's risk of developing other conditions such as osteoporosis and rheumatoid arthritis.



Jon and his clinician attempt to treat his foot ulcers over a couple of months. However, the wounds begin to get worse and Jon has to receive a skin graft. He receives a graft of fish skin that enables faster and better healing than what the normal skin techniques allow.



A couple more years pass and Jon's skin has healed from the previous wound. However, his right foot has developed a plantar foot ulcer. Jon's doctor prescribes him a diabetic walker that will improve his mobility during the wound healing process.



Jon, now in his 70s, is now placed into an assisted living facility. His carers enter new data on Jon on a weekly basis that enable them to better monitor his risks of developing costly operational issues.



Sweden



As a reaction to the challenge of an increasing amount of people with lifestyle diseases, the Nordics focus on preventative applications of data to limit the risk of a chronic condition. In Sweden, citizens are empowered to monitor and track their own health situation, by following their heart rhythm to detect atrial fibrillation.

The government and the Swedish Association of Local Authorities and Regions want to support efforts to make use of the opportunities of digitization in social services and healthcare, and they have now decided to endorse a common vision for eHealth up to 2025.

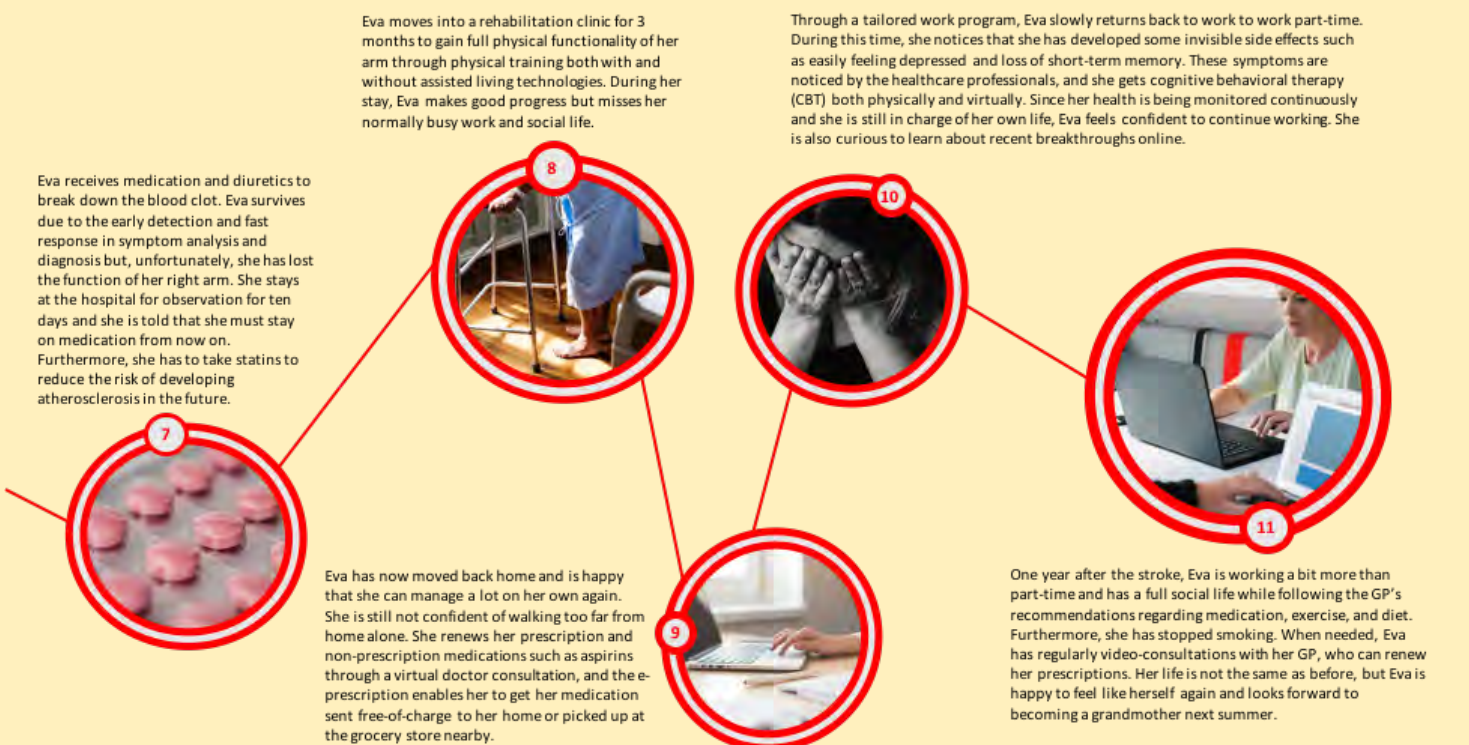
In 2025, Sweden's overall goal is to be the world leader at using the opportunities offered by digitization and eHealth to make it easier for all people to achieve good and equal health and welfare and to develop their own resources for increased independence and strengthen their participation in society. Many activities are underway at various levels related to digitization and eHealth, and it is very important that various actors work together to make better use of the potential in the area of eHealth in the short and long terms. An integrated vision for eHealth can contribute to equitable, gender-equal, and efficient health care, as well as social services for individuals that are user-friendly, accessible, and safe.

Eva's story — a stroke patient's complete service journey

Digitization offers great opportunities for future social services and health and medical care. Modern information and communication technologies can make it easier for individuals to be involved in their own health and social care, support contact between individuals and service providers, and provide more efficient support systems for staff at service providers²².



²² Vision for eHealth 2025, Ministry of Health, Sweden





Norway

The amount of people with dementia is increasing worldwide. Accordingly, dementia has an extensive impact on both relatives and caregivers to receive and give high professional quality health care based on dignity. In Norway, elderly citizens with dementia and their relatives maintain a close relationship by sharing information about daily activities and changing conditions. It has been noted that images and sounds effects from familiar surroundings have a positive effect on this group of patients.

Norway has implemented a new strategy for treating dementia called *Dementia Plan 2020*. The goal of the Plan is to build a more dementia-friendly society, where people with dementia are cared for and integrated into the community. This will require greater openness and knowledge about dementia in society in general, and in the health and care services arena in particular. The strategies and measures in the Dementia Plan 2020 are intended to help put dementia and its challenges on the agenda of ordinary municipal planning. The aim is to ensure long-term, integrated planning for the local community and the physical environment and high-quality services designed to meet the needs of the growing number of people with dementia and their families.

Ola's story — a dementia patient's complete service journey

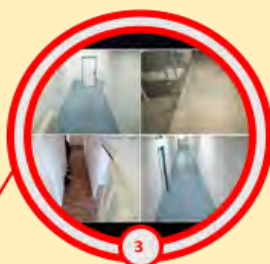
"The strategies and measures in the Dementia Plan 2020 are intended to help put dementia and its challenges on the agenda and to improve health and care services for people with dementia and their families."²³



²³ Nasjonal e-helsestrategi og mål 2017-2022, Ministry of Health, Norway



1 After a long period of distress for the family and Ola himself, Ola is diagnosed with mild dementia at the hospital.



3 In the apartment, several technologies are installed to make Ola and his family feel safe. They now feel safe because they know that the care staff are looking after Ola day and night. One night, Ola falls out of bed during his sleep. The surveillance system immediately notices this and assures Ola that the staff is aware of his situation and that help is on the way.



4 The surveillance system has optimized the use of resources by freeing up some time for the care staff, who is able to offer Ola a more personalized and attentive treatment.



2 He has moved from his home to an apartment with care facilities and modern technology, which is similar to a nursing home. This allows him to be self-sufficient and have a "normal" life for as long as possible.



5 Due to the new overall IoT system, all the other systems that are in use "talk" with each other, exchange information, and also report the necessary information to the electronic patient journal. This increases efficiency and overview for the staff and secures a faster and more targeted treatment for the patient.



6 Ola forgets to take his medication, which makes his condition more unstable and reduces his quality of life. His relatives also spend a lot of time calling and double checking on him. A robot reminds Ola to take the medication, which the doctors have prescribed. Whether Ola takes his medication or not, the robot sends the information to the nursing home or a family member.



8 Ola has always taken an active part in his family's life. By using a new communication unit, it is easier for him to talk to and get news from family and grandchildren.



7 Ola's family is very concerned about his situation, but they do not live close by, so they cannot come and visit as often as they would like to. Calling Ola sometimes make them more worried, as he sometimes cries and is worried because he does not remember if he has had any visitors or anyone to look after him that day, or if he has taken his medication. Earlier, the family would spend a lot of time calling the responsible nursing staff to double check. Activities from the surveillance system are automatically included in the patient journal in the nursing home's system, and the family can concentrate their talks with Ola to focus on his daily life and activities.

In his younger days, Ola was always busy with something and seldom had a rest. He is happy that it is possible for him to stay active in the nursing home and enjoys bike rides and competing with his friends. This always brings out laughter and happy moments, and the new opportunity of biking in his childhood street in familiar surroundings brings joyful memories from a long life.



Denmark



Like many other countries, the Nordics have a growing number of chronic patients. Telehealth solutions may help the healthcare system to meet this challenge in a way that also improves the quality of care. In Denmark, citizens are helped to sustain their quality of life, by reducing the length of stay in the hospital and providing home treatment.

Large-scale telehealth projects in Denmark have provided the benefits and evidence for supporting COPD patients with telehealth. As a result, Denmark is in process of deploying telehealth for COPD patients on a national level by 2019.

The Danish Ministry of Health, the Danish Ministry of Finance, Danish Regions, and Local Government Denmark have launched the new Danish Digital Health Strategy 2018-2022. It is an ambitious strategy that brings together all previous strategies that support the agenda for a coherent and trustworthy health network in Denmark.

The new strategy focuses on digitization and use of health data in the context of prevention, care, and direct treatment. In this way, health data is used for primary purposes. However, the information that is recorded and collected during daily workflows is also essential for secondary purposes — e.g., quality development, management, and research within the field of healthcare. At the same time, a close collaboration across regions, municipalities, and general practices will ensure visibility of activity and quality across the entire healthcare sector.

Jens' story — one COPD patient's complete service journey

Through hands-on experience from large-scale projects and day-to-day operations, we have learned that telehealth is smarter healthcare: Instead of sending the patient to the system, we deploy the system to the patient, thus benefitting everyone involved.²⁴



²⁴ Digital Health Strategy 2018-2022, Ministry of Health, Denmark,

Jens has just been diagnosed with COPD and has an appointment with his GP. Jens feels that the doctor is well-prepared and has great insight into his new situation. This is possible because the doctor has already digitally received the diagnosis report from the hospital.



Via the digital portal, Jens shows his wife, Ulla, the exercises and precautions, which will be part of his life from now on. She can also read about how Jens can live a healthy life with COPD, which means that she will be better able to support him.



In this way, the doctor gets a quick patient overview with relevant information about Jens' health. He can access information about blood pressure, lung function measurements, etc., from Jens' visit to his GP. The doctor can then initiate the necessary treatment.



Ulla is at work. But since she is listed as the contact person in Jens' master data, the nurse in the emergency ward can quickly notify Ulla. She is at the hospital by her husband's side within an hour.



Jens has the flu and experiences shortness of breath. He calls an ambulance. At the emergency ward, he has difficulty speaking due to shortness of breath. However, the doctor can see from Jens' personal data in the record system that he has been diagnosed with COPD.



The doctor provides Jens with an overview of the actions that need to be taken. Jens can see the simple care plan on the doctor's screen. Jens and the doctor jointly fill out the plan and set goals for Jens' health.

Each week, the municipal physiotherapist at the rehabilitation centre checks whether Jens is doing his exercises correctly and according to the plan. She can contact Jens via digital messages so he knows that he is being looked after.



Jens has been given a tablet for his home measurements. He also uses the device to view instructions for the rehabilitation exercises agreed in the rehabilitation plan. By using sensors, Jens can check that he is doing the exercises correctly.

The hospital has discharged Jens with a rehabilitation plan. Jens' doctor suggests that he begins telemedical home monitoring, which can also be used to follow up on the rehabilitation. They update Jens' care plan.



The practice secretary at Jens' GP receives a reminder along with the discharge summary that a consultation appointment is needed in a week. She sends Jens a digital message via the clinic's app. Jens responds quickly and an appointment is recorded in Jens' joint calendar of appointments with the healthcare system.



Following the consultation with his own GP, the municipality is informed that Jens has now been referred to telemedicine. A few days later, the home care nurse therefore visits and helps Jens to get started with the home monitoring equipment.



After one year, Jens has to see his own GP for a check-up. The GP can digitally compare Jens' home measurements with similar COPD patients. They agree on new diet and training targets and update Jens' care plan.



Definitions of Nordic Strongholds in Practice

As described above and shown in the patient journeys, Smart Digital Health and connected health is technology-enabled care, and it will rapidly evolve because of the potential to leverage personalized health. The restructuring of care models and implementation of new solutions and integrated care programs providing coaching and advanced intervention possibilities enable medical decision support and personalized healthcare services²⁵.

Smart Digital Health – a Nordic stronghold

The key objective of Smart Digital Health solutions is to create and facilitate a network, or ecosystem, of connected healthcare providers, stakeholders, and patients that use the information and services available to them at the point of care. Smart Digital Health is the emerging technology architecture that accelerates digital transformation initiatives for the enterprise, enabling the rapid creation of externally facing digital products (integrated care, services, and experiences) while aggressively modernizing the internal IT environment in the hospital toward an intelligent core in parallel. Smart Digital Health consists of eHealth, mHealth, telehealth and eSocial care, which is further elaborated below.

eHealth

eHealth consists of core clinical applications primarily focusing on processes and care delivery within the boundaries of one organization. That could be the hospitals electronic healthcare record (EHR), a clinical decision support service (CDS) or a radiology information system (RIS). eHealth will provide the digital foundation upon which all other digital transformation initiatives will be built.

Examples of successful implementations: **Cambio CDS**, Using patient data to identify people at a higher risk, regional solution, Sweden. **Klinikhealthcare** for artificial intelligence to assess the need for treatment in an emergency, Central Ostrobothnia, Finland. **VERA**, for integrating health records, Iceland. **JodaCare** for information sharing, Norway. **KMD Nexus** for primary care, regional solution, Denmark. **Danish eHealth Portal** (sundhed.dk), Denmark.

mHealth

mHealth is the delivery of healthcare service on a mobile device via an app or apps. For example, patient administration services (such as bookings, appointment reminders, and discharge and referral letters), which are offered via multiple channels such as the internet and mobile devices. mHealth also converges data from wearables such as fitness trackers and patient-reported outcomes into the care continuum, treating them as relevant data sources equivalent to traditional healthcare data.

Examples of successful implementations: **Coallife** to collect heart information, regional solution, Sweden. **Kai-kuHealth** for intelligent patient monitoring and **Docrates** Private Cancer Clinic, Finland. **SidekickHealth** improving health by collecting information, Iceland. **Patient reported outcome** (PRO), Denmark.

Telehealth and telemedicine

Telemedicine (also referred to as telehealth or eHealth) allows healthcare professionals to evaluate, diagnose, and treat patients in remote locations using telecommunications technology. Telemedicine allows patients in remote locations to access medical expertise quickly, efficiently, and without travel. It is well documented that telehealth/telemedicine solutions will increase patient satisfaction, while reducing the number of internal resources that are needed in hospitals (staff, beds, equipment, etc.).

Examples of successful implementations: **OpenTeleHealth** for remote patient monitoring, Northern region of Denmark. **Kanta** for patient data repository for use in telehealth, Finland. **Kvikna** for information management, Iceland. **Motitech** for people with dementia, Norway. **Zenikor** for early diagnosis of arrhythmias and stroke prevention, Sweden. **Columna Cura (Systematic)** Creates a clear overview for employees and citizens and share information across sectors, regional solution, Denmark.

eSocial care

This area unites the social and health services from a patient-centric perspective. The active role of citizens in producing reliable information on well-being and services will facilitate the utilization of information. New business models

²⁵ **Integrated Care and Connected Health** Approaches Leveraging Personalized Health through Big Data Analytics, Mar 12, 2018.

such as population health management are enabled by the integration of social and healthcare data in one repository where clinical predictive analytics, artificial intelligence, and risk stratification can be applied.

Examples of successful implementations: **Coalalife** for providing collected heart information to GPs, regional solution, Sweden. **VideoVisit** for virtual home care, city of Helsinki. **RoomMate** for sharing image information to increase safety for all citizens, Norway. **Stiki Solutions**, to secure information collected in a healthcare system, Iceland. **Telepsychiatry**, home-based video consultations, regional solution, Denmark.



Nordic
Innovation

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