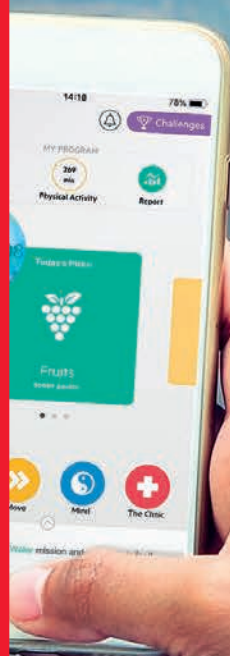


CONNECTED HEALTH

Nordic Smart Digital Health

WHITE PAPER



#nordicsolutions
to global challenges

About this white paper

Nordic Welfare Solutions is one of six flagship projects under the Nordic prime ministers' initiative Nordic Solutions to Global Challenges, which is coordinated by the Nordic Council of Ministers and run by Nordic Innovation.

Nordic Welfare Solutions aims at paving the way for increased export through Nordic cooperation, stronger Nordic branding and storytelling, create critical mass and stronger Nordic networks besides creating better access for Nordic companies.

Project partners

Business Finland, <https://www.businessfinland.fi>

SweCare, <https://www.swecare.se>

Innovation Norway, <https://www.innovasjon Norge.no>

Promote Iceland, <https://www.islandsstofa.is/en/about>

Healthcare DENMARK, <https://www.healthcaredenmark.dk>

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Michael Fernel, FERNEL & CO. Kommunikation, fernel.dk

Layout

Trine Hynkemejer

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Healthcare DENMARK

Contributors

Cambio Healthcare Systems, <http://www.cambio.se/>

CoalaLife, <https://www.coalalife.com/>

Zenikor, <https://zenikor.com/>

Megical, www.megical.com

Kaiku Health, <https://kaikuhealth.com>

Docrates, <https://www.docrates.com/en/>

Deltabit, <https://www.deltabit.com>

Jodacare, <http://www.jodacare.no/>

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Executive Summary

This white paper presents some of the smart digital health solutions developed and implemented in the Nordic countries. While these solutions cover a wide range of diseases, they have much in common: they help patients monitor and manage their own conditions; they improve treatment and diagnostics; and they facilitate cooperation, shared information, and shared decision-making between patients and healthcare professionals.

Large-scale telehealth for COPD patients

The Nordic countries have introduced a number of telehealth projects aimed at the growing number of patients with Chronic Obstructive Pulmonary Disease (COPD).

In Denmark, a home monitoring solution allows patients to measure blood pressure and pulse rate in their own homes, transmitting the results in real time to healthcare professionals. It has empowered patients to take a more active role in their own treatments, improved their quality of life and reduced the need for hospitalization. Denmark has also introduced an electronic citizen record that allows a seamless exchange of information between hospitals, municipal caregivers and general practitioners (GPs).

Building dementia-friendly societies

The Nordic countries also provide a unique level of treatment and care for people with dementia. This treatment is increasingly supported by smart digital solutions.

In Norway, patients, families, and professionals have embraced a new information-sharing platform. The platform helps dementia patients maintain their dignity, their safety, and their quality of life. Another solution uses images and sound effects from familiar surroundings to help dementia patients stay physically active, offering several physical and mental health benefits — such as better mobility, increased appetite, better sleeping patterns, and improved memory.

Personal data improves cancer treatment

High-quality health data, extensive use of digital solutions and standardized clinical pathways form the foundation for fast and personalized cancer treatment in the Nordic countries.

In Finland, symptom-monitoring software provides staff with up-to-date information

on symptoms, improves the efficiency of clinical visits, and encourages patients to become more committed to their treatment. Another solution, inspired by the highly standardized safety procedures in the aviation industry, has helped improve clinical safety and has optimized the workflows of surgical staff.

Partnerships improve diabetes management

In the field of diabetes treatment, there is an increasing global demand for digital solutions that support patients' involvement, self-management, and compliance. This is especially a concern among the elderly, for whom adherence to treatment can be difficult due to limitations such as reduced eyesight, reduced mobility or reduced cognitive capacity.

In Iceland, a new mobile app has been designed for patients with poor health or low technological literacy. The app enables them to track their progress on a 'gamified' platform: for instance, they receive points for logging their exercise and water intake.

Another solution enables real-time monitoring and analysis of all medical data on a cloud computing system.

Intelligent solutions prevent strokes

New technologies can also play a major role in preventing strokes. Time to treatment is often crucial to survival, and a number of intelligent solutions have been developed to ensure fast and accurate decision making.

Sweden has introduced a clinical decision support system to assess stroke risks based on individual health records as well as demographic data. Another solution, an easy-to-use device connected to a smartphone, allows heart patients to self-monitor their heart rhythm, analyzing it in real time and alerting healthcare staff if necessary.

Building a smart sustainable healthcare system

The Nordic healthcare systems have a strong tradition of data-driven innovation, a patient-centered approach to care and treatment, and extensive cooperation across sectoral boundaries.

These shared values provide them with a unique platform to co-create smart solutions which address common healthcare challenges.



"The patient is at the center of healthcare development in the Nordic countries. The patient is also at the center of his and her own healthcare. This involves sharing information, transparency and respecting the integrity of the individual".

Foreword

In the Nordic countries, innovation and cooperation have paved the way for modern patient-centered healthcare systems, as well as a robust regional ecosystem for the development of smart digital solutions.

Across the globe, advances in the field of healthcare have helped raise life expectancies dramatically. New treatment methods, advanced diagnostic techniques, and an increased focus on prevention mean that the average global citizen will live much longer than he or she did a century or even a decade ago.

While this is a positive development, it also presents healthcare systems across the world with new challenges. The main one is the increasing strain on healthcare resources — financial and human — due to aging populations and a rapidly growing number of patients with chronic diseases.

The Nordic countries are helping to address these common challenges by developing and applying new digital technologies and smart healthcare solutions — in turn creating a better, smarter and more cost-efficient healthcare system.

Innovation and cooperation

The Nordic region has come a long way in transforming their healthcare systems to take a more efficient and holistic approach to healthcare. Our aim is to empower and support citizens to lead healthy lives in their own homes. It involves a new way of delivering healthcare, one that requires high levels of agility, transparency, and information sharing.

The success of this model has relied heavily on innovation and cooperation.

The Nordic countries share new ideas, new research, new technology, and new solutions in the field of

healthcare, across sectors and geographies. They collaborate extensively on developing high-quality smart digital solutions to enhance treatment, diagnostics, and prevention as well as patients' self-care skills.

The Nordic countries have all recently launched eHealth strategies, with the common goal of boosting collaboration on digital healthcare solutions across sectors.

A sustainable health region

In the Nordic countries, citizens have universal access to public healthcare systems primarily funded by general taxes. They are renowned for providing cost-efficient and high-quality healthcare to their entire populations.

The similarities among the Nordic healthcare systems and the long-standing tradition of cooperation and co-innovation form the foundation for a shared ambition: to create the most sustainable and integrated health region in the world, providing the best possible care for Nordic citizens.

The need for solutions that address common challenges and comply with the 2030 UN Sustainable Development Goals will grow in the future. In this context, the Nordic region offers an attractive ecosystem for developing high-quality healthcare solutions and presenting these solutions to the global market.

Dagfinn Høybråten
Former Secretary General of the Nordic Council of Ministers

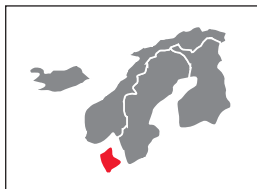
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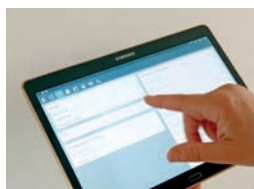
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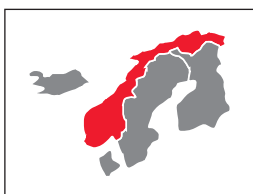
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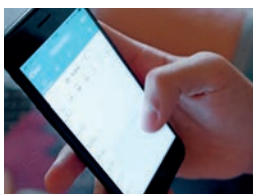
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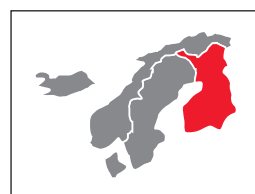
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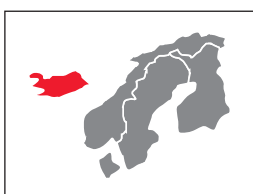
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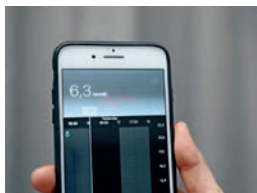
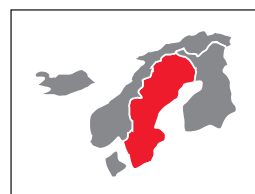
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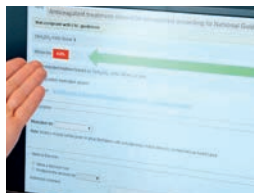
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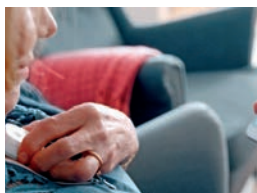
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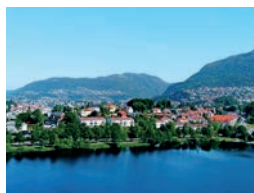
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Denmark

Large-scale telehealth

The Nordic countries have launched a number of telehealth projects to meet the challenges of a growing number of patients with Chronic Obstructive Pulmonary Disease (COPD). In Denmark, small telehealth projects are now being scaled into nationwide solutions.

By 2030, COPD will be the third most prevalent cause of death worldwide. Telehealth solutions allow the Nordic healthcare systems to meet this and similar challenges at the most efficient cost level.

A key concept in telehealth solutions in Denmark is 'home monitoring', which allows patients to measure indicators such as blood pressure or pulse rate in their own homes. Telehealth solutions can also include video consultations, home training, and tools that give patients access to knowledge or patient networks.

Telehealth solutions facilitate collecting and sharing information — information that provides insights into patients' progress and compliance with treatment. It also ensures efficient and timely intervention by healthcare professionals and family members. These solutions enable a patient's GP or

municipal nurse to provide treatment or care that earlier required an outpatient visit or hospitalization.

Scalable solutions

In Denmark, an integrated care model for home monitoring of patients with more than one diagnosis is ready for scaling at a national level in 2019.

Since 2011, Danish regions and municipalities have carried out three large-scale telehealth projects, each with the aim of implementing telehealth solutions for all relevant patients with chronic diseases. Studies show that these projects have had a number of benefits for both patients and healthcare professionals.

"It's better for the citizens to be treated at home because we see that they experience increased quality of life. COPD patients feel more secure and confident and have more knowledge about their disease. They are able to have a better dialogue with healthcare professionals. Telehealth solutions also make it possible to closely track the development of the disease and establish early interventions."
– Helen Houmøller Rasmussen, Project Manager, North Denmark Region



Implementing home monitoring requires high-functioning IT infrastructure, proper telehealth equipment, and software solutions designed to meet the needs of patients and healthcare professionals.

In Denmark, these requirements are supported by an inter-organizational service center concept based on an open-source telehealth platform. The service center delivers the logistics, education

and maintenance solutions that are necessary to operate large-scale telehealth services.

In 2014, Norway implemented a telehealth pilot project that focused on ambient-assisted living technology for elderly people. It has led to fewer hospitalizations and improved health-related indicators while reducing the need and demand for home visits. All of this has lowered healthcare costs.

"It's better for the citizens to be treated at home because we see that they experience increased quality of life. COPD patients feel more secure and confident and have more knowledge about their disease. They are able to have a better dialogue with healthcare professionals. Telehealth solutions also make it possible to closely track the development of the disease and establish early interventions."

Facts

- The 'Strongholds and Qualities of the Nordic Health Tech Ecosystem' report, published by Nordic Innovation in 2018, has examined some of the pilot projects on telehealth in Denmark and Norway. It showcases the impact of and gains from these projects.
- Denmark has launched a national digital health strategy, 'A Coherent and Trustworthy Health Network for All', for the period 2018-2022. The strategy aims to support better coherence, higher quality and greater geographical equality in the provision of health services, as well as an increased focus on chronically-ill and elderly patients.
- In 2014, the City of Oslo launched a pilot project on ambient-assisted living technology. An evaluation of the project published in 2016 revealed that ambient-assisted living technology had a major positive impact on health-related indicators and perceived well-being, and significantly reduced healthcare costs in municipalities.

Efficient home care and patient engagement

An innovative electronic care and social record system, implemented in Danish municipalities, meets cross-sectoral needs for mobile support and engages patients in their own treatment.

The electronic care and social record system, 'Columna Cura', combines decision support, ease-of-use, and mobility to meet some of the key requirements when treating elderly or chronically-ill citizens.

With the electronic record, home-care professionals and citizens collaborate to register information about ongoing care and treatment. This gives healthcare professionals more time for actual care, while citizens can become more involved in their own health and treatment.

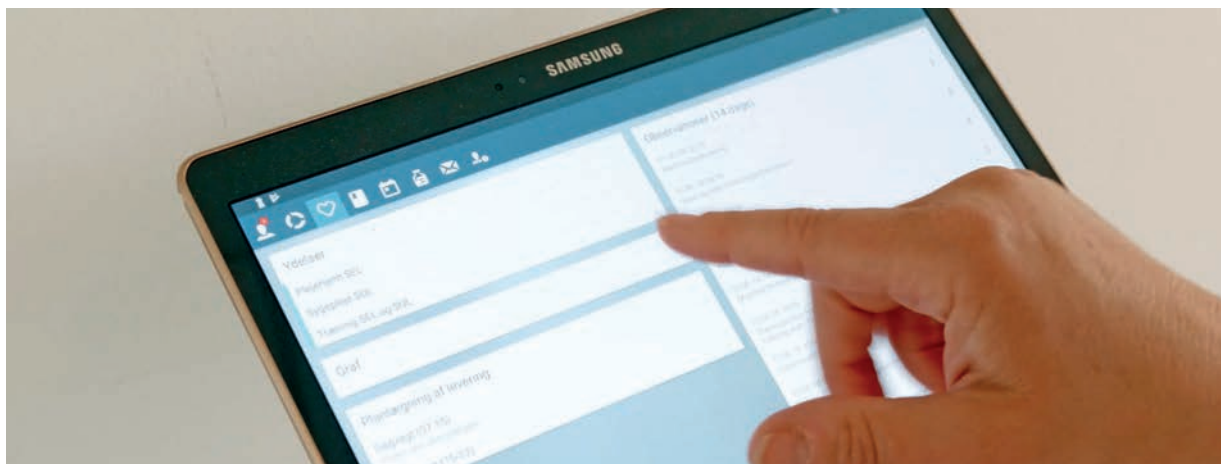
"The solution has meant a huge change in our organization. Care workers now have the possibility to complete the documentation together with the citizen rather than during a lunch break, several hours later."
– Mette Harbo, Head of Digitization, Municipality of Copenhagen, Denmark

Using this solution, hospitals focus on making operations and workflows more efficient and in

turn reducing the duration of the patient's stay. The average length of stay is reduced to three days, meaning that patients will often be discharged at an early stage and continue treatment in their own homes supported by home-care professionals. To ensure patient safety, efficient cross-sectoral communication and documentation flows are critical.

"The solution has meant a huge change in our organization. Care workers now have the possibility to complete the documentation together with the citizen rather than during a lunch break, several hours later."

About one-third of Danish municipalities have already implemented the new solution. The solution helps them address the challenge of an increasing number of elderly and chronically-ill patients who need care or treatment from several healthcare providers.





Many citizens in need of home care (provided by the local municipality) are also frequently treated at hospitals (run by the five Danish health regions). To ensure seamless, correct and timely treatment and care, professionals across the healthcare system must be able to access all relevant information for any citizen.

This is what the electronic record allows. Having the documentation at hand, on a mobile device is another benefit. It facilitates preventive intervention, as it is easier for both citizens and healthcare professionals to register and access information about early symptoms and changes in the citizen's situation. This helps reduce hospitalization.

Facts: the Danish healthcare system

- The Danish healthcare system operates across three political and administrative levels: the state, the regions, and the municipalities.
- The state holds the overall regulatory and supervisory functions in health and elder care.
- The five regions are primarily responsible for hospitals and general practitioners.
- The 98 municipalities are responsible for a number of primary healthcare services as well as elder care and population health.



Improving quality of life for COPD patients

A Danish public-private partnership project has developed an innovative home monitoring solution for COPD patients. It has improved their quality of life and reduced the number of hospitalizations.

COPD is a disease that develops over time, slowly reducing the patient's ability to engage in everyday activities. As the disease progresses, breathing and moving around requires more effort, often leading to social isolation and reduced quality of life.

Evidence shows that home monitoring solutions increase COPD patients' confidence and knowledge about their disease.

One such solution, OpenTeleHealth, makes it possible to track more closely how the disease progresses and carry out early interventions if necessary.

Twice a week, the patient measures his or her own blood pressure, pulse rate, saturation and weight. The measuring equipment is connected via Bluetooth to user-friendly telehealth app on a

tablet computer. Using the app, the patient also responds to health-related questions on possible difficulties such as a cough or shortness of breath.

The results are transmitted in real time to healthcare professionals, who can take immediate action if necessary. For instance, they are able to respond to early signs of deterioration and prevent hospitalization in favor of personalized self-management plans recommended by the patient's own GP.

At the same time, home monitoring allows patients to take a more active role in their own treatment. As a result, a majority of patients experience improved disease control, more confidence and better self-management. Knowing more about their illness also prepares them better for their conversations with healthcare professionals.

The perceived quality of life of patients with severe COPD improved significantly, while the number and length of hospitalizations were reduced by 11 percent and 20 percent respectively.



Facts

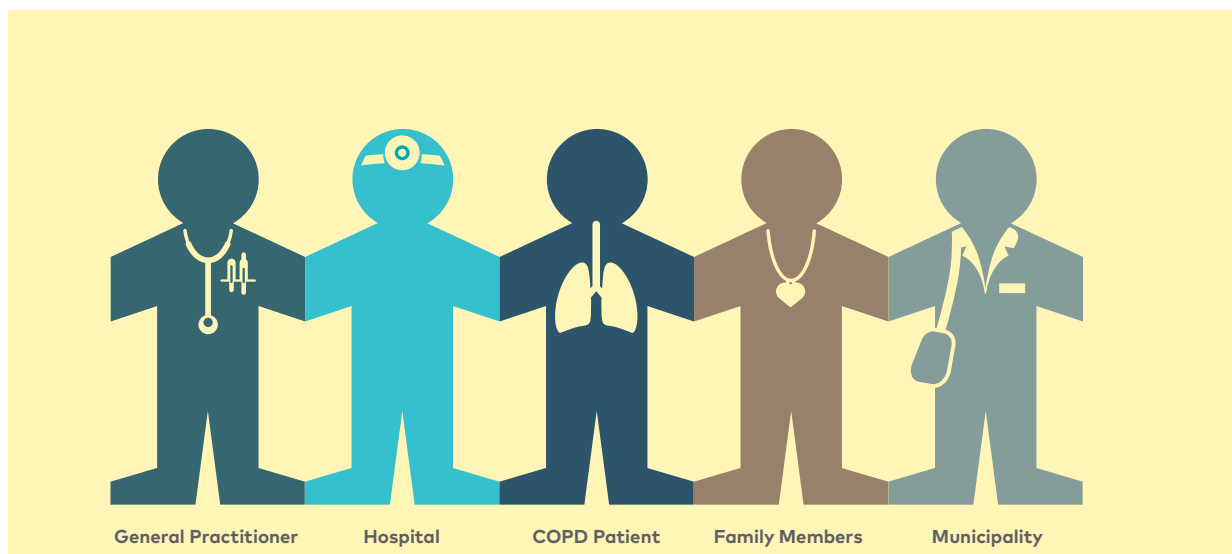
- Studies show that telehealth solutions have increased rehabilitation activities for patients with severe COPD. This is important as exercise helps patients maintain their functional ability, improves their independence, and reduces the need for healthcare services. The home monitoring solution for COPD patients is based on robust results from four PhD studies, including randomized clinical trials conducted in collaboration with TeleCare North.



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Patient centered telehealth

The Telecare North project puts the patient in the center of attention from the GP, the hospital, the municipality, and family members. The telehealth project facilitates the collection and sharing of information in order to improve both patient insight and compliance as well as efficient and timely interaction by clinicians and relatives.



Building dementia-friendly societies

The Nordic countries provide a unique level of treatment and care for people with dementia. In Norway, smart digital health solutions allow professionals to provide high-quality services, building stronger communication between patients, families and healthcare professionals.

The Nordic countries are world leaders when it comes to providing high-quality treatment and care for dementia patients. Norway, Finland, Denmark, and Sweden have ambitious national health strategies aimed at maintaining and improving their status as dementia-friendly societies.

The strategies share a strong focus on maintaining the dignity, safety, and quality of life for people with dementia, involving families as much as possible, and exploring new initiatives based on the principles of person-centered care.

The Nordic countries have applied a number of organizational and technological initiatives to address the challenges that dementia presents. For instance, Norway and other Nordic countries have established 'dementia villages' i.e. diverse and safe communities for citizens with and without dementia. These villages are designed to meet

the needs of people with dementia by rethinking connections between architecture, healthcare, and nursing homes.

A growing challenge

The number of people with dementia is increasing dramatically worldwide. Patients typically experience progressive symptoms with an increasing need for care and support, and a growing impact on the lives of their families.

Dementia calls for highly individualized care and support. Therefore, new innovative technologies supporting a person-centered approach have the potential to empower patients, helping them remain as resourceful and independent as possible in their daily lives.

The extensive digitization and use of e-health solutions in Norway provide a strong basis for information sharing between the patients' families and the healthcare system. New digital solutions can improve the patients' relationship with their families, motivate them to stay physically active, and support their perception of consistency in their everyday lives.

Health strategies in Nordic countries:

- 'A More Dementia-friendly Society' is Norway's dementia plan for 2015-2020.

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 in particular.

- 'Creating a Memory-friendly Finland' is Finland's national memory program for 2012-2020.
- 'A National Strategy for Dementia Care' is Sweden's dementia strategy which defines seven key strategic areas.
- 'A Safe and Dignified Life with Dementia' is Denmark's national action plan on dementia which sets goals for 2025.



Sound and vision benefit therapy and encourage exercise

Images and sound effects from familiar surroundings have a positive impact on people with dementia living in nursing homes, and help them stay physically active.

High quality of care and rehabilitation are essential to maintaining the quality of life, dignity, and safety of dementia patients.

An innovative solution, Motiview, addresses the fact that certain patient groups are also physically under-stimulated. The solution motivates and stimulates seniors and people with dementia to be more physically active. Using moving images and sounds, the users can take bicycle trips in familiar surroundings or relive childhood memories.

"One of the ways we work with our patients with dementia is by using pictures and films from home surroundings. When we find the right film for our patients from the countryside, we can bring back their memories and it will also motivate them to exercise."
– Monica Grøtnebø Knapstad, Project Manager, Municipality of Bergen, Norway

The solution was developed in collaboration with the Municipality of Bergen. Building on an idea from the city's agency for nursing/senior homes, the solution was tested in six of the city's nursing homes in 2012 and 2013. Evaluations revealed such positive results

that an organization, Motitech, was established to continue the work and make the solution available to all Nordic countries.

"One of the ways we work with our patients with dementia is by using pictures and films from home surroundings. When we find the right film for our patients from the countryside, we can bring back their memories and it will also motivate them to exercise."

In addition to increased physical activity, the solution also offers other significant health benefits, physical as well as mental. These include better mobility, reduced risk of fall accidents, increased appetite, lower excess weight, a significant reduction in aggressive behavior, and better sleeping patterns. The daily recreation and stimulation also enhance memory recall and promote a sense of accomplishment in dementia patients, both of which contribute to improving their quality of life and overall well-being.

Improved communication strengthens bonds between families and professionals

A digital solution implemented in the Norwegian municipality of Bergen enables caregivers and families to share pictures and information about the daily activities of elderly people with dementia.

Dementia not only affects the patients themselves but also has an extensive impact on the people around them. As the disease progresses, maintaining patients' dignity, safety, and quality of life requires a collaborative effort from families and professional caregivers.

"Dementia makes it hard for patients to remember what is going on in their everyday lives. They need strong communication between family caregivers and healthcare personnel."
– Line Federly Kirkemo, CMO, Nursing Home Asker, Norway

A new solution, JodaCare, promotes stronger communication between family caregivers and healthcare personnel. It allows them to share pictures, conversations, and other information about the patient's condition and their daily activities. Delivered on a mobile platform, the solution keeps all relevant stakeholders up-to-date, improving collaboration and often relieving some of the concerns of the patient's family.

The solution was invented by a dementia patient's daughter. Her mother would often have trouble remembering what had happened during the day and this personal experience revealed a need for

better communication between the patient, the family, and health professionals.

The solution allows patients, families, and staff to share information and gives the family access to relevant information about a patient's everyday life at the nursing home.

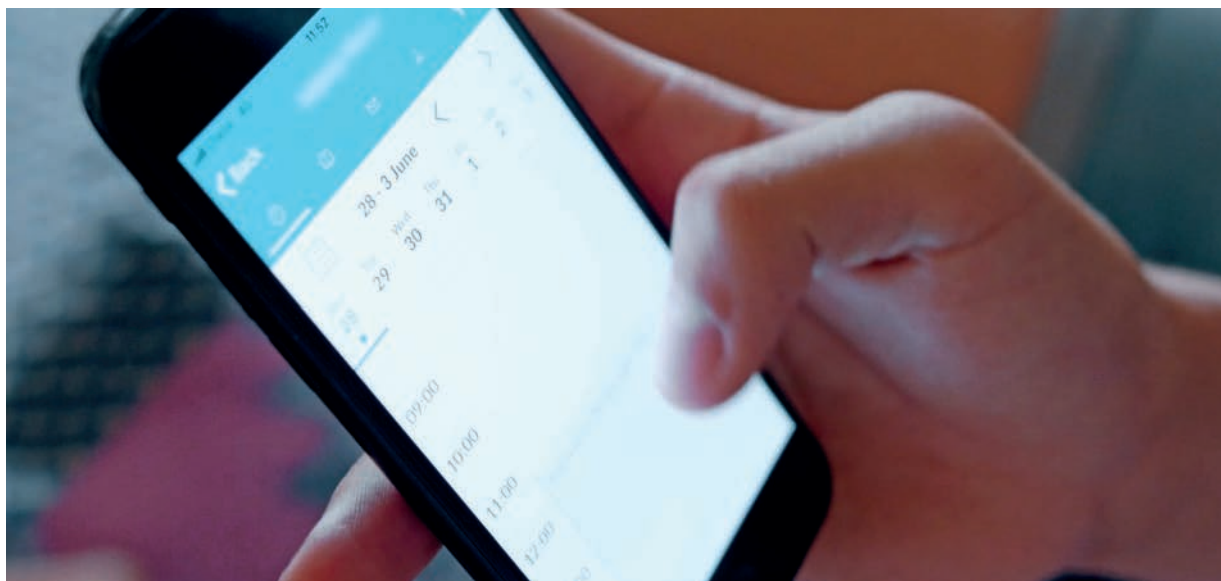
"Dementia makes it hard for patients to remember what is going on in their everyday lives. They need strong communication between family caregivers and healthcare personnel."

The solution has been very well received. Elderly patients with dementia and their families are able to maintain a close relationship through the shared information about the patient's daily activities and condition. The improved communication, in turn, strengthens the relationship between patients, families, and healthcare professionals. It ensures more consistency in patients' everyday lives and helps them maintain their quality of life and live their lives with dignity.



For more information please contact:

Innovation Norway
Hans.Eirik.Melandso@innovasjonnorge.no





Finland

Standardized pathways and personal data improve cancer treatment

As part of their national cancer plans, the Nordic countries have developed innovative solutions based on intelligent genomic data. In Finland, these solutions support joint decision-making between cancer patients and their GPs to arrive at the right, personalized treatment.

More people are being diagnosed with cancer than ever before. However, the availability and impact of personalized treatment mean that the number of patients recovering from the disease is also rising.

In the Nordic countries, high-quality health data, unique personal identification numbers, extensive use of digital solutions, and standardized pathways provide a solid foundation to offer personalized cancer treatment. The overall objective of the Nordic cancer strategies and action plans is to provide personalized and tailored care pathways for all patients based on their personal needs.

The Nordic region is focusing its efforts on the unique opportunity available to develop personalized medicine based on genomic data. This enables patients to get the best possible treatment with the biggest impact while also reducing the risk of side effects. Over the next few years, the use of genomic data in healthcare will increase heavily. In 2015, Finland launched an ambitious national genome strategy that sets key targets for utilizing genomic data in healthcare and in the promotion of health and well-being by 2020.

In 2007, Denmark introduced a concept called 'cancer packages' – standardized pathways focusing on faster diagnosis, faster initiation of treatment, more coherent treatment courses, and targeted

rehabilitation of cancer survivors. Today, there are 32 such pathways. Taking a systematic and uniform approach, they have had a very positive impact on cancer treatment. The Danish healthcare system is also taking a strategic approach to personalized medicine in order to strengthen the possibilities of using health data for treatment and research.

All the Nordic countries have launched cancer programs to improve the overall quality of cancer care. In general, Nordic initiatives also enable patients to play an active role and take responsibility for managing their own health.

A goldmine of data

The Nordic countries have several decades of experience in collecting comprehensive and unique patient-health data. Digital tools play a key role in supporting the use of data and in involving cancer patients in joint decision-making processes with their care person of choice.

The availability of digital technologies means that these data represent a goldmine of knowledge that can be utilized in a number of ways to improve the quality of treatment and care. For instance, artificial intelligence solutions make it possible to personalize cancer treatment even more.

The new innovative solutions in cancer treatment overcome some of the limitations of the traditional follow-up care model that relies on telephone calls and face-to-face consultations, often spread out over weeks and months.

New solutions enable symptoms to be continuously monitored while also allowing patients to report their health data at any given time. This not only reduces patients' stress, but also ensures that the care team is always up-to-date on patients' condition and can respond with the right intervention at an earlier stage.

Facts

- The Finnish public administration system consists of three levels: state, province, and municipality. The provinces are regional representatives of the central state administration. In Finland, there are three different healthcare systems that receive public funding: municipal healthcare, private healthcare, and occupational healthcare.

Key facts

- Finland's national Genome Strategy sets key targets to ensure that, by 2020, genomic data will be effectively used in healthcare and in the promotion of health and well-being.
- Denmark's Cancer Packages.
- Sweden's National Cancer Program 2015.



Advanced monitoring of cancer symptoms

Ground-breaking symptom monitoring software provides up-to-date information on cancer patients' symptoms, improves the efficiency of clinical visits, and encourages patients to become more engaged and committed to their treatment.

In the next decades, the number of cancer patients is expected to rise dramatically. This will strain the resources of healthcare systems around the world and challenge researchers to develop new solutions – solutions that are able to handle large amounts of data in a cost-effective way.

Applying advanced analytics to patient-reported data collected in real-time is expected to play an increasingly crucial role in the quest to find more targeted ways to treat cancer. It will also play an important role in evaluating how effective current treatments are.

"High-quality health data based on a personal unique identification number create the opportunity to offer personalized cancer treatment. Every cancer patient is different. That is why we need personalized cancer treatment."

The Finnish company, Kaiku, has developed an innovative symptom monitoring solution. It addresses the limitations of the traditional follow-up care model for cancer patients, where communication between the patient and medical staff relies on telephone calls and face-to-face consultations, often spread out over weeks and months. The app-based solution is compliant with all cancer-care pathways and is designed

to simultaneously improve cancer research and support more cost-efficient treatment.

For example, the solution allows a nurse to effectively monitor hundreds of patients. The underlying algorithm can automate certain interventions to reduce the workload of nursing staff as the amount of data grows.

When using the traditional reactive system, medical staff would remain unaware of nearly half the symptoms affecting cancer patients during follow-up. With the new proactive solution, mild symptoms trigger self-care instructions, while more severe symptoms will alert the patient's care team. This makes it possible to respond to any alarming symptoms at an early stage.

"High-quality health data based on a personal unique identification number create the opportunity to offer personalized cancer treatment. Every cancer patient is different. That is why we need personalized cancer treatment."
– Katri Siltanen, Counseling Nurse, Docrates Cancer Center, Finland

At the same time, hospitals have up-to-date information on their cancer patients that improve the efficiency of clinical visits. The solution also strengthens information sharing and cooperation between different hospital units involved in a patient's treatment.

The introduction of the monitoring app has also been shown to reduce stress symptoms among patients. Being able to report on their health at any given moment simultaneously helps their recovery process and improves their quality of life.



Intelligent checklists improve safety, quality, and efficiency

A new digital solution combines intelligent checklists, instant reporting, and real-time analytics in one easily accessible platform, helping hospitals to improve clinical pathway safety.

Surgery-related mistakes and complications are not uncommon in hospitals. These can both impair and prolong the treatment of cancer patients and be a huge cost for the healthcare system.

Megical has developed a digital platform for hospitals and operating theatres, which prevents and minimizes harmful and costly errors. It is inspired by the strong risk management culture and the extensive checklist practices of the aviation industry, where customer safety is paramount. Using this platform, Helsinki University Hospital has experienced fewer errors in patient pathways.

The platform automatically collects and reports data and key metrics in real time, along the clinical pathway. This enables a process of continuous analysis and improvement of safety and efficiency. The solution entails customized checklists, which can be tailored to the needs of hospital units and

their staff, for instance specific processes of a given cancer-care pathway.

If a cancer patient is due for surgery, the checklists will ensure that: all the required patient data is available; the operating theatre is correctly prepared; the right medication is given at the right time; and that the patient is given the appropriate follow-up information.

The system, which can be accessed through an easy-to-use interface on ordinary tablet computers, has given clinical professionals the benefits of 'cognitive ergonomics'. It ensures patient safety and quality assurance, helping them to optimize their daily workflow and concentrate on patient-centred treatment.

BUSINESS FINLAND

For more information please contact:

Business Finland
eero.toivainen@businessfinland.fi



Iceland

Public-private partnerships improve diabetes self-management

Diabetes is one of the major health challenges of the century, and untreated or dysregulated diabetes has severe consequences for citizens as well as society. Iceland has taken a strong stance to reduce the number of patients with diabetes.

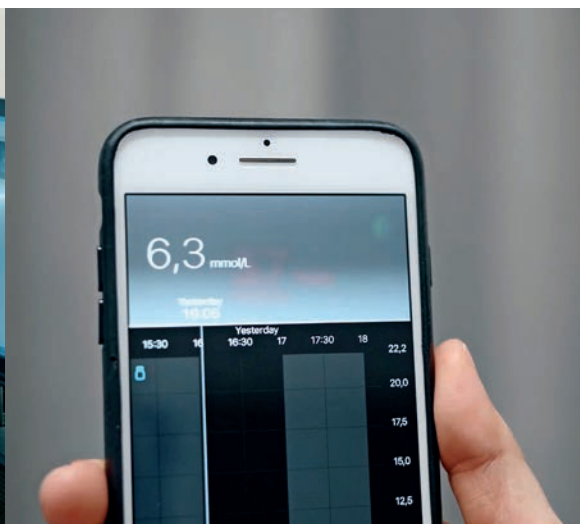
All the Nordic countries have introduced operational action plans and guidelines to tackle the growing number of patients with diabetes. These plans focus on bringing specialists closer to citizens, allowing important health information to be shared over long distances, and raising awareness about diabetes prevention and healthy living.

Telehealth solutions empower citizens with diabetes to engage in and take responsibility for their own treatment. At the same time, these solutions can ensure that information is shared with specialists and relatives at all times in order to improve the quality of care.

Public and private healthcare providers cooperate closely to support patient-centered innovation – with the aim of implementing these solutions in the Nordic healthcare systems. Public-private partnerships have developed a large number of unique patient tools to enable early diagnosis and support communication and cooperation between patients, healthcare professionals, and families.

Facts

- Iceland has a state-centered, publicly-funded healthcare system with universal coverage.
- The main bodies responsible for policy, financing, planning, and regulation are the parliament, the central government (the Ministry of Welfare and the Ministry of Finance), and a mix of public and private service providers, with publicly-provided care as the predominant element.



Promoting self-management

Living well with diabetes depends on early diagnosis and a high level of self-management. Untreated or dysregulated diabetes can have serious consequences on patient health, and be very costly to society.

Encouraging patients to get the right care, at the right time, by the right team, enables Nordic healthcare systems to be both more accessible and more sustainable. In order to achieve this, the Nordic countries provide easy access to basic diagnostics (testing blood glucose levels and determining correct insulin doses), and make it easy to share this information across healthcare systems and sectors.

The increasing prevalence of diabetes is associated with risk factors such as aging, obesity and unhealthy lifestyles. Therefore, many solutions focus on promoting healthy lifestyles in order to minimize complications or prevent citizens from developing diabetes in the first place.

The new patient tools and telehealth solutions not only help the patients directly but also engage healthcare professionals in promoting lifestyle changes and self-management.

To prevent or regulate the potential complications of diabetes, the Nordic countries collaborate closely to develop guidelines and share best practices. For instance, a unique oximetry technology developed in Iceland has been used by Danish specialists to demonstrate changes in the oxygen metabolism of the retina that correlates significantly with the severity of diabetes.

Facts

- Iceland's National Health Policy 2020 focuses on ensuring better well-being, health, equality, and adherence to treatment for citizens with diabetes. It contains a framework for monitoring and evaluation, a time frame for implementation, and a number of target indicators. Evidence-based guidelines, protocols, standards, and criteria for referral to higher levels of care have already been partly implemented.
- The main objective of Sweden's National Guidelines for Diabetes Care is to ensure a high standard of care and prevention efforts regardless of patients' geographical locations and cultural backgrounds.
- Denmark's National Diabetes Action Plan 2017 benchmarks the objectives of preventing future development of Type 2 Diabetes and improving the life and well-being of children and young people with diabetes. To support the implementation of the plan and improve the quality of diabetes treatment nationwide, Denmark has established a national diabetes service, the Steno Diabetes Center. Its ambition is to create the ideal conditions to reduce the number of new diabetes cases, as well as increase life expectancy and the quality of life for people with diabetes.



Simplifying diabetes self-management and self-care

An easy-to-use medical device makes diabetes self-management easier and creates an effective communication network for patients, families, and doctors – anytime and anywhere.

Worldwide, an estimated 75 percent of patients with diabetes do not monitor their condition sufficiently. This can have serious consequences.

Diabetes-care management is complex. It requires a highly-disciplined routine of glucose monitoring and insulin injections, and it involves the patient, multiple caretakers, and patient stakeholders. Inadequate communication between patients and healthcare providers is often an obstacle.

Incorrect or missing insulin doses are potentially life-threatening. Moreover, inaccurate or insufficient information will sometimes mean that doctors are not able to understand symptoms correctly and adjust treatment accordingly. Very often, lack of accurate reporting is partly responsible for deteriorating health among patients with diabetes.

"The increase in the number of people with diabetes is a manifestation of the modern lifestyle. However, it is possible to reduce the number of cases of Type 2 Diabetes by increasing physical activity and following a healthier diet. Therefore, improving health should be the desired goal for all of us."
– Birgir Jakobsson, Director of Health, Directorate of Health, Hospital & Health Care, Iceland

This is a particular problem among elderly patients, for whom a number of age-related issues –multi-medication, failing eyesight, reduced mobility, or impaired cognitive capacity – can make adherence to treatment more difficult. This patient group now accounts for 40 percent of all diabetes patients.

'Insulync', an easy-to-use medical device developed by Medilync, simplifies diabetes self-management.

"However, it is possible to reduce the number of cases of Type 2 Diabetes by increasing physical activity and following a healthier diet. Therefore, improving health should be the desired goal for all of us."

It enables real-time monitoring and analysis of all medical data on a cloud computing system, which detects 'deviations' from behavioral patterns (such as unusual glucose/carbohydrate/exercise levels or insulin dosages).

These data can be shared with the patient's GP and the patient's family. The medical device and the cloud solution are integrated to help the patient keep track of medication and to organize all data related to diabetes management in a single solution.



Combating diabetes with an engagement app

A mobile health-engagement platform implemented in the municipalities of Iceland can encourage weight loss among overweight and obese adults and ensure adherence to in-person lifestyle modification programs.

Behavioral engagement is a core mitigator in the fight against lifestyle diseases. When it comes to prediabetes and Type-2 Diabetes, there is an increasing demand for solutions that put patients at the center of treatment and supports their involvement in their own treatment.

An app developed by SidekickHealth enables individuals to track their progress on a 'gamified' platform. For instance, they receive points for logging their exercise, vegetable, and water intake.

People who have low technological literacy, or are in very poor health, often experience negative outcomes after using technology-driven health information solutions. The app has been designed with these limitations in mind, which has proven to be successful in both research and practice.

"One of my clients was heavily overweight and suffered from both depression and hypertension, she was unable to work, and her socioeconomic circumstances were not favorable. She was very motivated by the program and lost over

60 pounds over a six-month period. She now has a part-time job, and her quality of life has improved significantly."
– Erla Gerdur, MD at Heilsborg Health Clinic, Iceland

At Heilsborg Health Center, which is a public-private partnership, the app has been part of the SÍBS Life and Health Lifestyle Training program. The training program is based upon the Diabetes Prevention Program by the Center for Disease Control and Prevention (CDC).

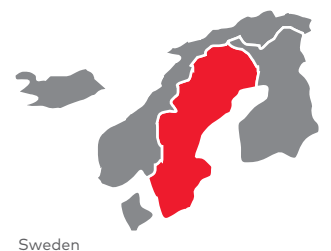
"One of my clients was heavily overweight and suffered from both depression and hypertension, she was unable to work, and her socioeconomic circumstances were not favorable."



PROMOTE ICELAND

For more information please contact:

Promote Iceland | ingveldur@islandsstofa.is



Unique solutions that can predict and prevent strokes

In Sweden, new technologies help patients and healthcare professionals monitor and manage the risk of strokes.

Strokes and other cardiovascular diseases (CVD) are the single most prevalent cause of death worldwide, and one of the most frequent reasons for hospitalization. Atrial Fibrillation (AF) is a cause for special concern. Over 30 million people are diagnosed with this condition, and an estimated 30 million more remain undiagnosed and have a significantly increased risk of strokes and premature death.

The first step to prevent strokes is to be aware of the risk factors. An unhealthy diet, physical inactivity, tobacco consumption, and alcohol abuse are the most important behavioral risk factors. These factors often manifest themselves as raised blood pressure, raised levels of blood glucose and/or blood lipids, and are also associated with being overweight or obese. Such 'intermediate risk

factors' indicate an increased risk of heart attacks, strokes, heart failures, and other similar conditions.

In Sweden, as well as in other Nordic countries, a number of intelligent solutions have been developed to monitor and analyze these factors, allowing for correct and timely interventions.

These technologies can improve the quality of life for patients who have already suffered a stroke, help identify potential stroke victims, and assist healthcare professionals in choosing the best treatment.

Wearable technology (WT) applications for mobile phones or tablets and other eHealth solutions can play an important role in prevention, rapid treatment, and rehabilitation.

For instance, Sweden encourages citizens to monitor and track their own health by following their heart rhythm to detect signs of AF.



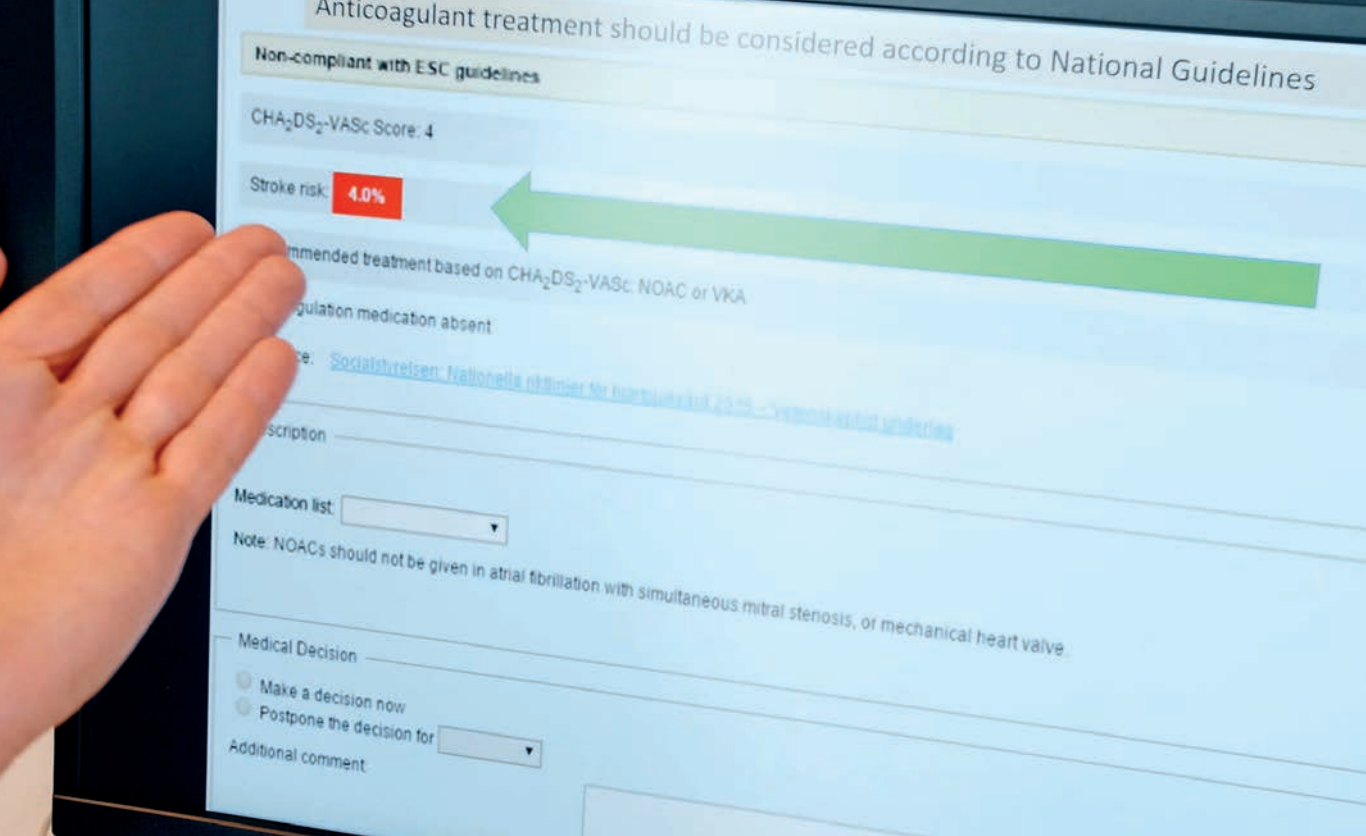
Clinical decision support (CDS) systems can improve the decision-making ability of healthcare professionals, and reduce time-to-treatment, which is often critical to clinical outcomes.

Sweden has established a national register on stroke care, the National Quality Registry for Stroke (Riksstroke). Data on morbidity, hospital stays, and other parameters, are collected, analyzed, and made available for CDS solutions to support healthcare professionals in decision-making.

Finland has established a stroke database, PERFECT, which collects comprehensive national data on performance, effectiveness, and costs of treatment. These data can be used for benchmarking, quality improvement and cost-effectiveness analysis. This, in turn, will improve the quality of care for patients who have suffered a stroke as well as potential stroke victims.

Facts

- The Swedish healthcare system is committed to ensuring the health of all citizens and abides by the principles of human dignity, need and solidarity, and cost-effectiveness. The state is responsible for the overall health policy, while the funding and provision of services lie largely within the county councils and regions, and municipalities are responsible for the care of older and disabled people. The majority of primary-care centers and almost all hospitals are owned by the county councils.



An intelligent CDS app to prevent strokes

An innovative application helps hospitals in clinical decision support to detect risk factors and alert at-risk patients.

To prevent strokes, Sweden has introduced a new clinical decision support (CDS) solution, the Cambio CDS Stroke Prevention App.

Using this application, at-risk patients can be identified earlier and alerted automatically with a recommendation to seek treatment. Embedded in an Electronical Health Record (EHR) system, the app collects demographic data, diagnoses, and medication history from the patient's medical record.

"What makes this app different is that it searches in the background for all a patient's diagnoses, from as far back as 10 years ago. It gives me all this information, including the risk of having a stroke, in a single screenshot."

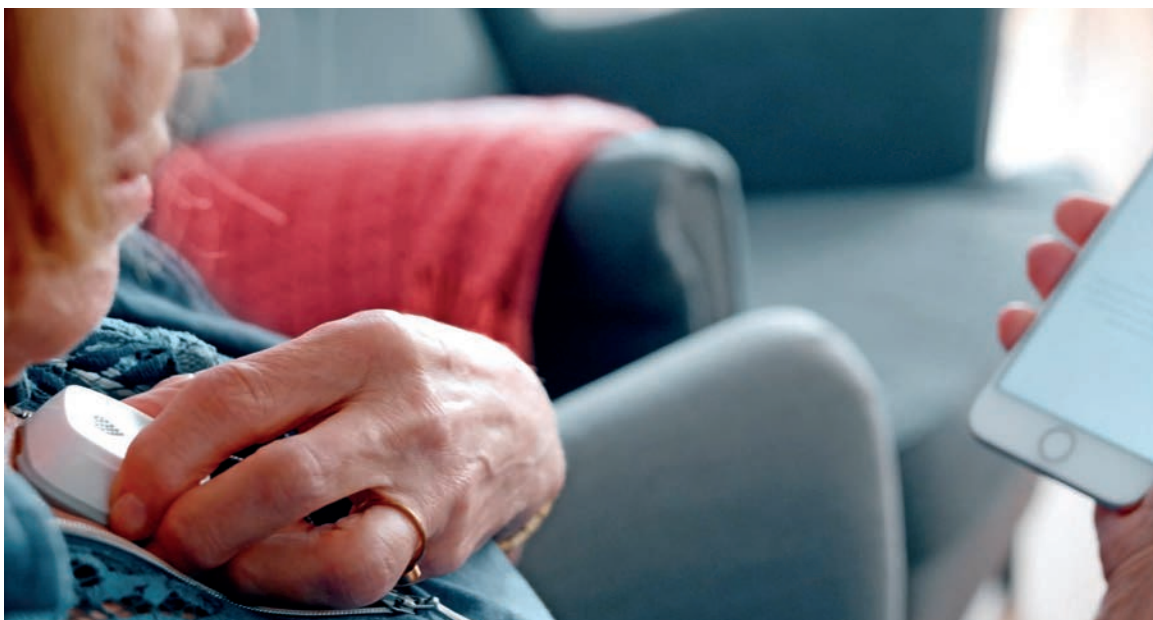
Using rule-based logic, a risk score is calculated to estimate the patient's risk of suffering a stroke within a year. Data are collected automatically, and no input from a clinician is required.

"What makes this app different is that it searches in the background for all a patient's diagnoses, from as far back as 10 years ago. It gives me all this information, including the risk of having a stroke, in a single screenshot."
– Magnus Janzon, Head of the Department of Cardiology, University Hospital Linköping, Sweden.

The app uses a digital adaptation of the Swedish clinical guideline and medical literature on the prevention of strokes among patients with AF. Studies show that it takes 17 years, on an average, for new knowledge generated by randomized controlled trials to be incorporated into clinical practices. With the app, new clinical guidelines can be implemented instantly.

The app ensures that patients receive relevant and evidence-based treatment at all times, allowing for standardized, high-quality, and value-based preventive healthcare on a large scale. At the same time, it provides a reliable framework for monitoring and evaluating targeted healthcare interventions and services.

Strokes often take a heavy physical, emotional and social toll on the individual. But the new CDS solution has proved to not only increase patients' life expectancy but also their quality of life.



A smart solution that enables cardiac self-analysis

A new cloud-based technology increases the chances of predicting and preventing strokes. It enables heart patients to self-monitor and analyze their own heart rhythm.

A unique medical technology, Coala Heart Monitor, has the potential to significantly reduce the risk of cardiovascular fatalities. The device is connected to a smartphone and continually records the user's heartbeat. This allows for self-screening and analysis, anytime and anywhere, to enable effective arrhythmia assessments. It scans 10 different types of arrhythmia, including AF, and analyses them automatically in real time with advanced cloud-based algorithms.

"The Coala Heart Monitor helps me understand when I have atrial fibrillation episodes. Understanding my heart makes me feel secure, which in turn results in fewer episodes. The monitor also gives my doctor a better understanding of how my heart works."

The self-monitoring process is followed closely by a healthcare professional, who will also set an appropriate review frequency. The solution facilitates the early detection of heart disease and limits the need for face-to-face consultations, benefiting both patients and healthcare providers.

"Coala Heart Monitors are very easy to use. Patients can be instructed by a nurse and don't need to wait for a doctor to attend to them. After patients begin using the monitor, we track their heart rate from a distance."
– Hans-Jörgen Nilsson, Chief Physician of Cardiology, Skåne University Hospital in Lund, Sweden.

With close to 100,000 measurements collected and analyzed to date, this solution is also a powerful tool for medical research. It has the potential to predict and further enhance diagnostics and treatment of CVD. The data can be easily shared with any healthcare professional, who has been given access.

The solution engages patients strongly in disease management, providing them with new skills and better insight into their own condition.

"The Coala Heart Monitor helps me understand when I have atrial fibrillation episodes. Understanding my heart makes me feel secure, which in turn results in fewer episodes. The monitor also gives my doctor a better understanding of how my heart works."
– Richard Björklund, heart patient, 60 years old, Sweden.



SWECARE FOUNDATION

For more information please contact:
Swecare | info@swecare.se

A Nordic vision for 2030: Creating the world's most sustainable and integrated health-tech region

The Nordic countries are committed to transforming their healthcare services by developing and implementing smart digital-health solutions that facilitate communication and data use across the healthcare system.

Health technologies are increasingly a part of larger value chains within the healthcare system. Therefore, the companies delivering these technologies will benefit from a strong regional ecosystem for healthcare innovation. Extensive cooperation across national and sectoral borders will help build a critical mass of health-tech companies, and give Nordic solutions improved access to the global market.

The innovative solutions described in this white paper have already delivered a number of benefits for patients, national healthcare systems, and health-tech companies. By supporting the use and sharing of data, they improve the quality of care, treatment, diagnostics, and patient safety. They support more intelligent and cost-efficient healthcare services, and they have paved the way for a strong regional business environment for healthcare technology.

But this is only the beginning. The Nordic countries have a shared vision of becoming the world's smartest, most sustainable, and most integrated health-tech region by 2030. As ambitious as this goal is, they are already taking the measures to achieve it by:

- **Building on common strengths:** The Nordic countries' healthcare systems have similar core values and share common traits that are recognized as strong drivers for innovation.
- **Dedicating themselves to change:** Faced with new global healthcare challenges, all the Nordic countries have acknowledged the need for new solutions and have set out ambitious strategies to develop new solutions.

- **Putting the patient at the center:** In the future, patients will play a much more active role in managing their own health. The Nordic countries have already come a long way in transforming their healthcare systems to support self-management and joint decision making between patients and professionals.

- **Maintaining an evidence-based and data-driven approach:** New digital technologies have the potential to further consolidate a strong tradition of improving the quality of treatment, diagnostics, and organizational set-ups based on data and evidence. Collecting, utilizing, and sharing big data will play a major part in developing personalized health solutions.

Realizing the full potential of the Nordic health region will ultimately depend on sustained cooperation between authorities, healthcare providers, businesses, patient organizations, and other healthcare stakeholders in the five Nordic countries.

An integrated Nordic health region will generate a number of benefits for patients, healthcare providers, businesses, and society. Patients will be able to access their data, medical histories, and prescriptions and share them with relevant healthcare providers in all the Nordic countries. Meanwhile, healthcare providers will be able to deliver better, more personalized, and more cost-efficient treatment and care.

The health-tech industry and other healthcare businesses will gain from the competitive advantages brought about by a strong, innovation-friendly business environment. Such an environment will help them develop new products and services, test these solutions in a safe and transparent setting, and ultimately present them to the global market.



Nordic co-operation

Showcasing and demonstrating Nordic welfare solutions to the global market.

People from all over the world look to the Nordic countries – how we address social challenges, how we care for the elderly and build our hospitals and care homes. The world needs new and holistic welfare solutions. This project will showcase and demonstrate some of them. In this project, the Nordic countries will work even more closely together to coordinate the way in which these solutions are presented to other selected markets.

The Nordic countries are often trail blazers, and lead the way in transforming healthcare to meet the challenges of the future. Due to a well-developed and well-organized health and welfare system, the Nordic region is able to offer tailored and innovative welfare solutions both in hospitals, care facilities and homes. Our health and welfare solutions often also intersect fields like architecture, (service) design and digital solutions – to name but a few. Many of these new solutions promote environmental, economic and social sustainability.

We believe that Nordic Welfare Solutions will help the world make progress toward a number of the UN 2030 Sustainable Development Goals: SDG 3 (ensure healthy lives and promote well-being for all at all ages), SDG 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), and SDG 12 (ensure sustainable consumption and production patterns).

Nordic Welfare Solutions will present Nordic solutions to the rest of the world and:

- Promote progress toward the UN 2030 Sustainable Development Goals (SDGs)
- Boost exports of Nordic products and solutions
- Strengthen networks of Nordic exporters (value chains)
- Create a strong brand and story about Nordic Welfare Solutions
- Enhance knowledge of innovative Nordic health and welfare solutions both inside and outside the Nordic region.

