Do you want more information, inspiration, or an invitation for dialogue?

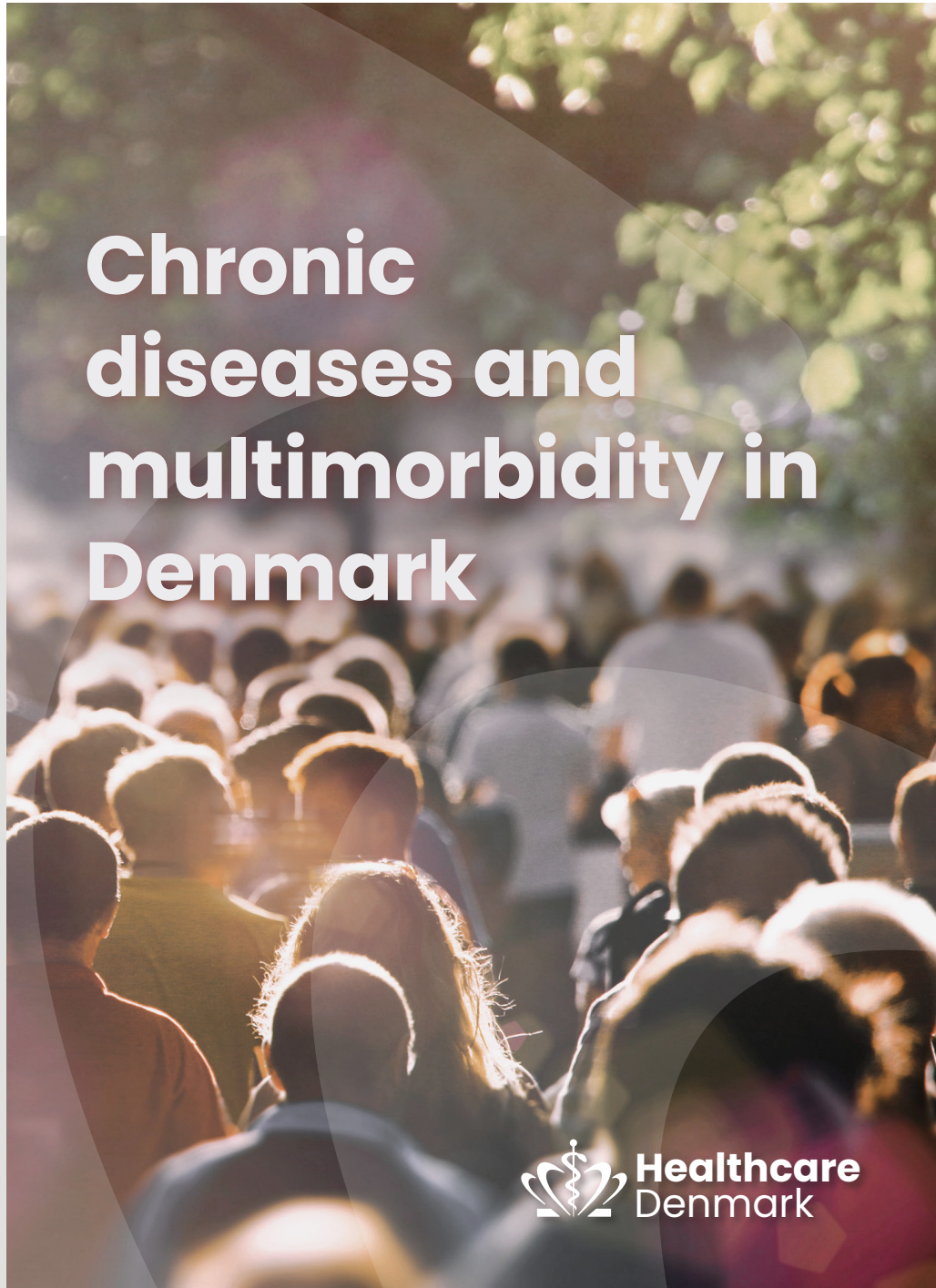
Healthcare Denmark arranges roundtables, webinars and delegation visits and represents Danish Life Science and Healthcare at conferences and meetings abroad.

We look forward to hearing from you.

HEALTHCARE DENMARK

www.healthcaredenmark.dk
info@healthcaredenmark.dk

Chronic diseases and multimorbidity in Denmark



Healthcare Denmark

Table of contents

Foreword

In Denmark, the number of people living with one or more chronic diseases has increased in recent years and is likely to increase even further towards 2030. To meet this challenge, the Danish Government has launched several initiatives. They represent our belief in and commitment to multisector collaboration, the patient centred approach, digitalization, and integrated care.

We strongly emphasize multi-sector collaboration in the development and implementation of initiatives to improve healthcare. By approaching our challenges from different perspectives, we can achieve more sustainable results.

Of course, the most important perspective is that of the patient. We are determined to adjust healthcare services to the individual citizen's situation and resources. By investing in prevention and early detection centred around patient needs, Danes living with chronic disease are empowered to live longer and happier lives. The municipalities and the General Practitioners are absolutely vital for these efforts.

Multisector collaboration and the patient centered approach are also key when we develop digital solutions. Digital solutions can help improve the health of citizens with chronic disease and increase the efficiency and quality of our healthcare system. In Denmark, we have a long tradition of collecting health data which is crucial for developing and personalising health-promoting activities and treatments. Digital solutions also enable data sharing and support for both patient involvement and collaboration across sectors, saving valuable time for health professionals.

Going forward we are ready to make the necessary decisions and structural changes required to increase coherence across the healthcare system. A commission has been tasked with addressing the structural makeup of the health system to ensure high-quality treatment, equitable access and stronger cooperation across sectors and specialties.

I hope this report will provide valuable insights into our approach to addressing chronic diseases and multimorbidity in Denmark and inspire other countries to act towards improving health for all.

Sophie Løhde
Minister for the Interior and Health

Introduction

Chronic diseases and multimorbidity are the greatest healthcare challenges facing us today, not only in Denmark but worldwide[1].

By 2030, the number of people in Denmark aged 80 and over will have risen by almost 60%[2]. The ageing population combined with vastly improved treatment of diseases like diabetes and cancer has dramatically increased the number of Danes living with one or more chronic diseases.

This development is projected to continue towards 2030 when the number of Danes living with diabetes will have almost doubled compared to 2015, while the number for Chronic Obstructive Pulmonary Disease *(COPD)* will rise by 40%[3].

Today, many people with chronic diseases have a high quality of life, many can manage everyday life, and stay in the labour market, but the growing number of people who need ongoing medical treatment is a challenge for the healthcare system. To meet this challenge, healthcare professionals will need stronger collaboration across sectors and specialities to provide coherent, holistic, and patient-centred healthcare. A key tool will be new digital solutions, empowering people with chronic diseases to play an active role in their own treatment.

Furthermore, systematic preventive efforts like efficient disease management and early detection are key to avoid comorbidities and deterioration of chronic diseases. This publication offers cases and background for the Danish approach to chronic diseases and multimorbidity, intending to create dialogue and share knowledge across borders.

Chronic disease

is defined as conditions of long duration, generally slow in progression and not passed from person to person[4]

Multimorbidity

is defined as the presence of multiple diseases or conditions, often with a cut-off of two or more conditions[4]

The Danish Healthcare System

offers universal health coverage with free and equal access to healthcare services, including psychiatric care, and is financed mainly by tax revenue (84%) with some small out-of-pocket payments, for example for dental services and medicine co-pay. It is largely decentralised and divided into 5 regions and 98 municipalities, and is based on the individual's right to autonomy, with a free choice of hospital and general practitioner.

Government strategies targeting chronic diseases

The Danish Government has implemented several strategies aimed at addressing chronic diseases by focusing on prevention, early detection and treatment, as well as improving the overall health and well-being of the population.

The Danish Government platform

In the fall of 2022, the new Danish Government agreed on a platform that prioritises prevention and management of chronic diseases.

This includes the development of a new national strategy for personalised medicine, which will provide targeted treatments to ensure patients receive the most effective treatments possible.

The Government is also committed to addressing mental health through a 10-year plan for psychiatry, which will modernise the psychiatric system with strengthened digital offers and increased geographical accessibility.

Another key focus is addressing overweight and obesity, which are significant risk factors for chronic diseases, through stronger preventive measures and improved treatment for those living with severe overweight.

Overall, the new Danish Government is taking a proactive and comprehensive approach to promote better health outcomes, with a focus on preventing chronic diseases and improving access to personalised, effective care.

CASE *Obesity and Nutrition*

An example of new ways of An example of new ways of addressing obesity is the Obesity and Nutrition *(OaN)* which opened in 2021 at Amager and Hvidovre Hospital with the purpose of creating a holistic and individualised approach to treatment of obesity beyond bariatric surgery.

A multidisciplinary approach combining coaching, dietitian counselling and pharmacological treatment based on GLP-1 hormones is the foundation of the clinic. The long-term goal is to establish a collaboration with municipalities and general practitioners to bring obesity management closer to the daily life of people living with obesity.

The Danish healthcare reform strengthens primary care

The overall objective of the Danish healthcare reform (Sundhedsreformen) from 2022 is to bring the healthcare system closer to the citizens by strengthening primary care. The aim is to ensure consistently high quality of treatment, continued recruitment of healthcare professionals, and strong cooperation within primary healthcare, with a special focus on chronic diseases and inequality in health.

In 2022, a national quality plan was outlined for changes in primary healthcare, with a focus on improving the treatment of chronic diseases and supporting people in living active lives. Additionally, to further cooperation and coherence between regions, municipalities, and general practitioners, health clusters have been established around the existing hospitals in Denmark.

Going forward, the implementation of new digital tools and better use of health data are seen as essential for creating a coherent and sustainable healthcare system.

Task force targeting chronic diseases and inequality in health

In 2021, the Danish Government presented a comprehensive life science strategy that included 38 initiatives aimed at improving public health. One of which was the establishment of a task force addressing chronic diseases and health inequality.

The task force recently released a report that outlines various interventions with valuable insights and practical recommendations to support the treatment of patients with chronic diseases and to reduce inequality in health.

Multi-sector collaboration

To effectively tackle chronic diseases and multimorbidity in Denmark, multi-sector collaboration and public-private partnerships are essential. These partnerships bring together the resources, expertise, and innovation of multiple sectors to address complex health challenges and improve health outcomes for individuals and communities.

By working together, we can promote innovation, improve coordinated care, prevent, and detect diseases early, and scale and sustain new initiatives. Through these collaborations, we can leverage the strengths of different sectors to create lasting solutions that benefit everyone.

I am head of Denmark's smallest emergency hospital, which experiences major health challenges, including a growing number of elderly and chronic patients, demographic inequality, and recruitment hurdles.

To overcome these challenges, I am always looking for new innovative solutions that can enhance healthcare services and bring diagnostics and treatment closer to citizens' homes. For these initiatives to succeed, we need **public-private partnerships** to utilise the know-how and expertise of private companies to develop **sustainable and practical technologies that are accessible to everyone.**

Ricco Dyhr

Hospital Director, Nykøbing Falster Hospital, Region Zealand

CASE *Multi-sector collaboration*

Lighthouse Life Science

Lighthouse Life Science is a strategic public-private partnership to address and solve complex societal health challenges. The purpose of the initiative is to improve health equity and develop solutions that are cost-effective, scalable and implementable nationally and even globally.

Around 130 public and private actors have already joined forces to develop new solutions through innovative partnerships between regions, municipalities, pension companies, knowledge institutions, and small and medium-sized enterprises, among others.

The initiative was launched in March 2022 with the first focus on healthy weight including prevention, detection, and treatment of obesity.

The LIGHTCOM research trial in particular focuses on testing a new management program for people living with obesity.

A second initiative targeting mental health was launched in the spring of 2023.

Obesity *FACTS*

200+ complications
are linked to obesity[5]

Obesity may cut healthy life expectancy by up to 19 years[6]

Severe obesity causes 6% of all sick days in Denmark[7]

Mental health *FACTS*

Denmark spends more than 5% of GDP on mental illness[8]

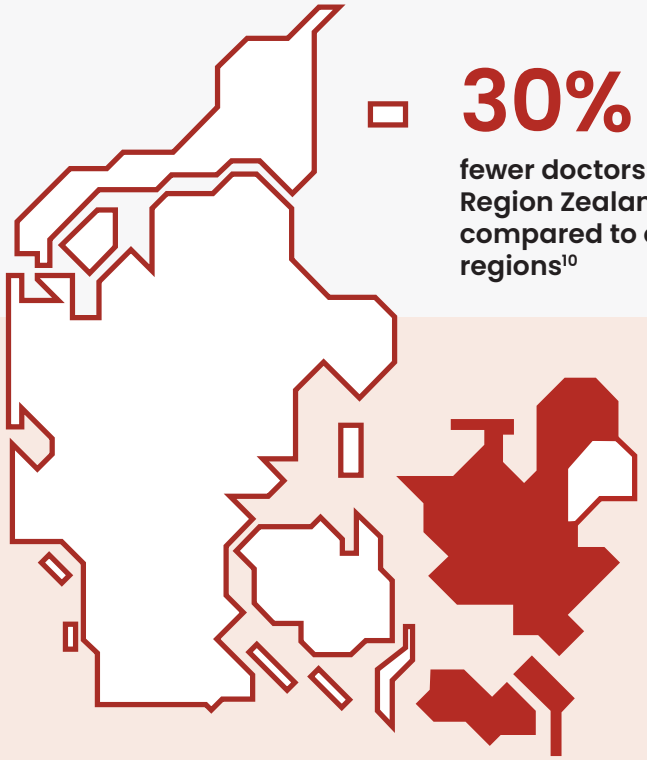
1/10 Danes meet the criteria for having a mental illnesss at any given time[9]

Equity in health

Inequality in health has substantial negative consequences for both the individual and society. Low educational level, low income, unemployment, and social exclusion are all factors associated with increased morbidity, shortened lifespan, and reduced quality of life.

Equal and free access to public healthcare has been part of the Danish healthcare policy for many years. Going forward, the goal is to take a more individualised approach, adjusting healthcare services to the individual citizen's life situation and resources, ultimately strengthening the health of vulnerable groups.

Geography is often a factor when it comes to inequality in health, and it is a continued focus to ensure equal access to uniform high-quality treatment in all parts of Denmark.



- 30%

fewer doctors in Region Zealand compared to other regions[10]

+60%

More than 60 percent of Region Zealand's citizens have at least one chronic disease[10]

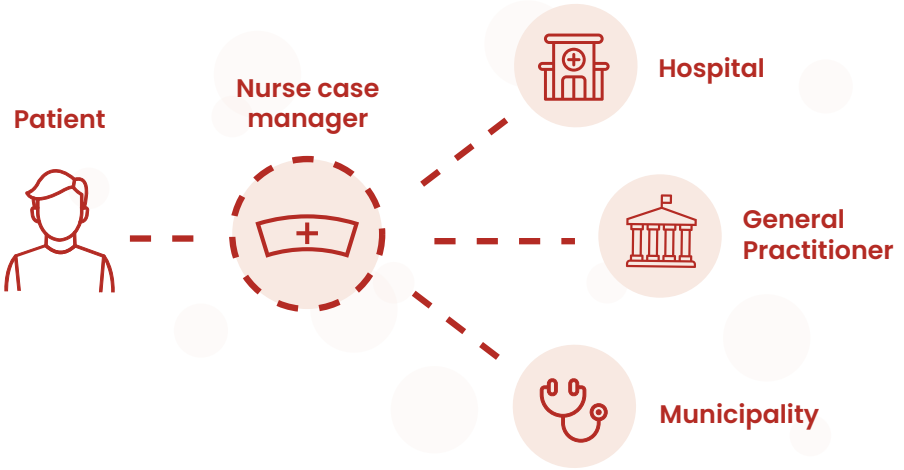
CASE *Nurse case managers for vulnerable patients*

Aalborg Univeristy Hospital and Psychiatry, North Denmark Region

To ensure that all patients have equal access to healthcare, regardless of their social circumstances, individual prerequisites, and social capital, Aalborg University Hospital and Psychiatry has nurse case managers to support vulnerable patients during hospital treatment and follow-up.

When admitted to the hospital, patients with special psychosocial needs are assigned a nurse case manager to help them navigate the healthcare system. Besides offering a familiar face in a hospital setting, where patients often meet many different healthcare professionals, the nurse case managers assist the patients by coordinating complex patient pathways, both in the hospital and after discharge where they collaborate with municipal social and healthcare services, thereby strengthening coherence and patient adherence to treatment in their own homes.

The nurse case managers collaborate extensively with hospitals, social workers, rehabilitation centres, temporary housing for the homeless, and street social workers, providing a gateway between the municipal setting and the specialised hospital setting.



Health literacy

Improving health literacy responsiveness within the healthcare system is essential to achieving health equality. In 2022, The Danish Health Authority released a report that included specific examples that promote health equity and health literacy responsiveness in the Danish healthcare system.

Health literacy

is defined as the personal characteristics and resources that determine a person's ability to find, understand and use information to make health-related decisions.

Health literacy responsiveness

is defined as a measure for how well health services, organisations and systems make information and resources available to people with different health literacy skills.

Scan to read the report

CASE *OS! - An approach to develop health literacy responsiveness in organisations*

Improving health literacy responsiveness

OS! is a tool for healthcare managers to assess whether their organisation can accommodate people with different levels of health literacy.

OS! uses co-design methodologies and provides tools to improve the health literacy responsiveness in the organisation, making healthcare services more accessible for people with low health literacy.

Examples of initiatives

- A website offering easily accessible infomartive material
- Identification of specific work procedures that can help meet the needs of citizens with low health literacy
- Implementation of tools to strengthen employees' skills and knowledge about

CASE *A website promoting health literacy*

"Helbredsprofilen.dk"

Developed by Region Zealand "Helbredsprofilen.dk" promotes health literacy by offering plain language advice to citizens with chronic diseases and their relatives. The website aims to empower individuals with limited reading abilities, disabilities, and IT skills to better understand their diseases, thereby improving collaboration between healthcare professionals and patients. The website provides short videos that cover a range of topics, including consultations with GPs and other health professionals, exercises, guides on how to handle equipment, and testimonials from patients, relatives, and healthcare professionals.

Prevention and early detection

Chronic diseases come at a great cost not only for the individual but for society as a whole by reducing productivity in society and straining healthcare resources. If we want to sustain a functional healthcare system in the future, it is necessary to invest in the promotion of health, prevention of diseases, disease management and early detection.

Denmark has taken proactive measures with strengthened prevention efforts at general practitioners and municipalities through new initiatives for tracking, treating, and rehabilitating citizens at risk or living with chronic diseases.

This approach prioritises proactive healthcare to improve population health and alleviate healthcare burdens.

Point of contact

Gatekeeper to healthcare services

Coordinator of treatment

General Practitioner

The general practitioner *(GP)* plays a key role as the patient's main point of contact with the healthcare system. In Denmark, approximately 90% of all patients are treated at the GP without being referred to a specialist.

A significant role of the GP is to handle early detection and prevention through examination and dialogue. The GP works with the specialised healthcare system at the hospitals and the municipalities and can refer the patient to either of these when relevant.

The GP takes a facilitating role as the anchor point to ensure that the citizen receives the right treatment and necessary follow-up.

PREVENTION AND EARLY DETECTION

Community psychatri

Home care

Prevention

Rehab

Municipality

Health promotion and disease prevention are core tasks for the Danish municipalities and include a variety of initiatives aimed at reducing the use of alcohol, tobacco, and nicotine, promoting exercise and healthy eating, and improving mental health.

To ensure that all citizens in Denmark are offered the same quality of prevention services, guidance and practical support, the Danish Health Authority has issued special recommendations for preventive initiatives in municipalities, along with planning tools to help prioritise and plan initiatives.

For optimal impact, municipal health promotion and disease prevention should be approached holistically and through a multidisciplinary lens, incorporating both structural and individual-focused initiatives[11].

The Danish Health Authority has launched 11 prevention packages with knowledge-based tools and scientific recommendations supporting the municipalities in prioritising resources and ensuring high quality prevention efforts.

CASE *Pay-for-performance model for municipalities fighting type 2 diabetes*

Aarhus municipality and the Social Investment Fund

Aarhus municipality and the Social Investment Fund collaborate on a pay-for-performance project targeting socioeconomically vulnerable citizens in Aarhus Municipality. The goal is to encourage a healthier lifestyle and prevent late complications of type 2 diabetes.

The initiative is a new pay-for-performance type of investment and is developed in cooperation with Steno Diabetes Center Aarhus and the Organisation of General Practitioners.

The goal is to establish an economically sustainable program to help 450 citizens with type 2 diabetes within the three-year project period.

The prevention efforts, e.g., dietary advice and education, are initially financed by the Social Investment Fund. If the result is satisfactory, Aarhus Municipality will return an agreed amount of money to the Fund. This way, the economic risk for the municipality is reduced.

A coherent and holistic patient-centred approach

Treatment of chronic diseases often involves many different healthcare professionals across the healthcare sector, and the need for multisectoral cooperation is expected to increase with the rise in chronic diseases and new therapies being added.

The Danish healthcare system increasingly focuses on developing a holistic patient-centred approach, and treatment and rehabilitation efforts are to be organised around the patient's life situation, needs, and wishes, enabling the patient to cope with one or more chronic diseases while obtaining the highest possible quality of life.

A patient-centred approach has proved to motivate patients to take on more responsibility for their treatment. Patient empowerment helps build up the patient's capacity to become more active partners in their care.

Patient-responsible healthcare professional

To support vulnerable patients, patients with multimorbidity, competing disorders, or parallel treatment courses, a patient-responsible healthcare professional is assigned to them during hospital treatment. These professionals coordinate care, ensuring continuity and providing a sense of security for patients with complex medical needs.

CASE *Same-day complication screening package*

Region of Southern Denmark

Living with diabetes involves a lifelong risk of developing complications such as renal failure, amputations, and visual impairment. It is important to screen for these complications as they often exhibit no symptoms in their early stages, and specific treatments must be initiated to prevent them from progressing to disabilities or life-threatening conditions.

To accommodate the former unstructured approach to screening and address the need for a more patient-centred approach, the Region of Southern Denmark has implemented a "same-day complication screening package" for all diabetes patients in outpatient clinics in the region. This service has now also been extended to Type 2 diabetes patients receiving care from GPs in the region of Fyn.

Patient arrives at same-day screening

Blood samples are collected
results available in 1,5 hours

Patient is screened for eye diseases
results available in 1 hour

Patient is screened for foot problems

Patient is weighed and recieves test results

The improvements are expected to provide:

- A better service for patients, as they no longer have to show up at, for example, three different places to have examinations carried out, and they receive the immediate results the same day
- That more patients are assured that all screening examinations are carried out at appropriate intervals
- That screening examinations become easier to access, so that more patients with diabetes are examined for complications

CASE *Danish Headache Center*

The first headache center in Scandinavia, Capital Region of Denmark

The Danish Headache Center is Scandinavia's first headache center, offering a multidisciplinary approach to diagnosing and treating severe or uncommon headache disorders, including migraine.

An estimated 10% of Danes experience migraines[12]

The team comprises psychologists, physical therapists, headache-specialised neurologists, psychiatrists, and dentists.

During the first consultation, patients receive tailored recommendations for individual or group treatment programs based on their medical history, previous treatments, and current diagnosis. In addition to medications, the centre offers non-pharmacological interventions like biofeedback, physical therapy, relaxation techniques, and stress management.

Migraine causes 14% of all sick days in Denmark[12]

The Headache Center also includes the National Headache Knowledge Center *(NHKC)* which aims to improve the level of knowledge about headache disorders in Denmark, ensuring knowledge sharing and dissemination to healthcare professionals – especially the GPs. One strategic goal is to ensure high-quality assessment, treatment, and follow-up for headache patients in the healthcare system.

The Danish Headache center aims to

- Provide the highest international level of treatment for patients severely affected by headaches or facial pain
- Develop and ensure the quality of diagnostics and treatment of headache diseases
- Do research in headaches and pain disorders

CASE *The National Center for Autoimmune Diseases*

Aarhus University Hospital, Central Denmark Region

In collaboration with patients and healthcare professionals, Aarhus University Hospital co-designed a new approach for people living with several autoimmune and skin diseases.

The National Center for Autoimmune Diseases applies an interdisciplinary patient-centred approach, acknowledging that patients not only experience physical but also social and psychological challenges concerning their disease.

The centre focuses on strengthening the patient's attachment to the labour market and offers guidance to better eating and sleeping habits and psychological support to cope with the loss of identity and challenges in personal life.

The treatment and care plan is developed by a doctor in cooperation with the patient. The plan is tailored to the specific needs of the patient, and the patient will be supported by a team of specialists such as doctors, nurses, psychologists, dietitians, and social workers.

Early insights

The patients experienced

- better communication with healthcare professionals
- Increased confidence in managing their disease
- clearer treatment plans
- reduced stress

The healthcare professionals experienced

- increased work satisfaction
- better interdisciplinary communication
- opportunities for professional development

Complex multimorbidity

Although many individuals with one or multiple chronic diseases can maintain a good quality of life and do not place significant demands on the healthcare system, a small group of patients with complex multimorbidity accounts for a disproportionate share of healthcare costs.

In Denmark, **this group represents just 5%[13] of the population but is growing rapidly** and faces challenges in sustaining an active work life and enjoying a high quality of life[14]. Moreover, complex multimorbidity challenges the current structural setup of the Danish healthcare system and calls for stronger collaboration between sectors and healthcare professionals, especially across different medical specialities.

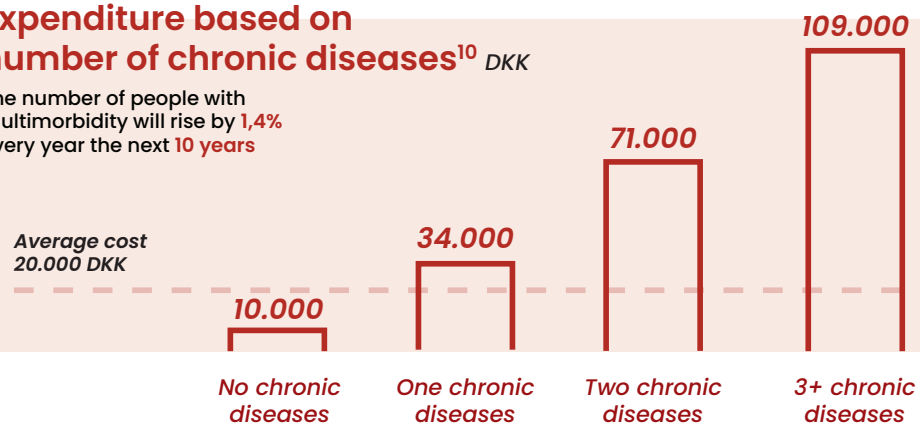
Complex Multimorbidity

is often defined as persons with 3-4 or more chronic conditions or persons with multiple diseases and polypharmacy[15]

Denmark is increasingly focusing on finding new ways to address complex multimorbidity and enhance collaboration across sectors and specialities in the healthcare system. In 2023, the Danish Health Authority will release a report containing recommendations for organising treatment courses for individuals with multimorbidity.

Expenditure based on number of chronic diseases[10] *DKK*

The number of people with multimorbidity will rise by 1,4% every year the next 10 years

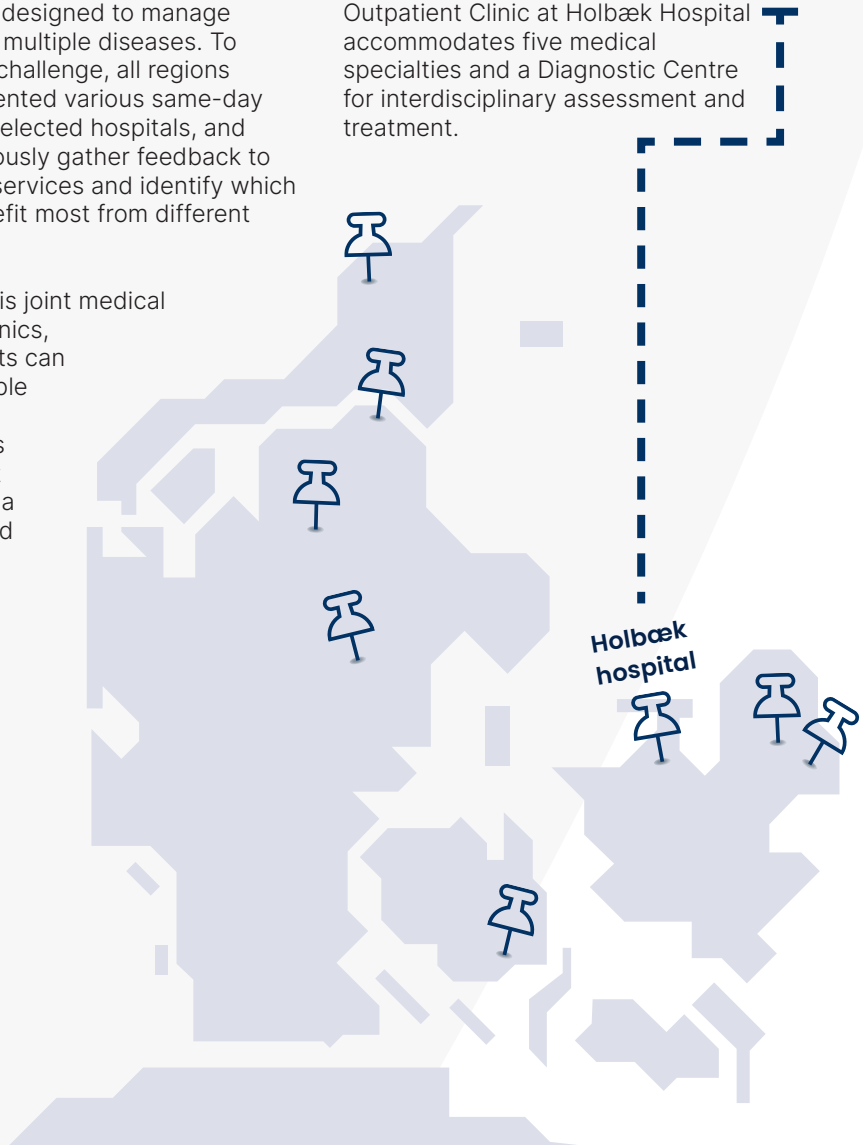


Same-day solutions for patients with multiple chronic diseases

Denmark's emergency hospitals were not originally designed to manage patients with multiple diseases. To address this challenge, all regions have implemented various same-day solutions at selected hospitals, and they continuously gather feedback to improve the services and identify which patients benefit most from different solutions.

One solution is joint medical outpatient clinics, where patients can receive multiple tests and appointments with different specialists in a single day and location.

For instance, the Joint Medical Outpatient Clinic at Holbæk Hospital accommodates five medical specialties and a Diagnostic Centre for interdisciplinary assessment and treatment.



CASE *Patient-centred care model for people with complex multimorbidity at the GP*

Capital Region and Region Zealand

Individuals with complex multimorbidity often require more time than a traditional GP consultation can provide.

To address this issue, the Innovation and Research Centre for Multimorbidity launched a project in 2022 to develop a patient-centred care model for people with complex multimorbidity in GP practices.

The project aims to enhance the quality of GP consultations for both patients and staff while also moving care services from hospitals to GP practices, thus avoiding fragmentation of care.

Under the new model, patients with complex multimorbidity receive a 45-minute consultation with their GP, which focuses on their individual goals and needs for the next 12 months. With the patient's consent, the treatment plan is shared with the municipality and hospital to ensure seamless care coordination.

The project was piloted in 14 GP practices in Region Zealand and the Capital Region in 2022, leading to the final model that is currently being implemented in 600 GP practices across the two regions[16].

> The project aims to **revolutionise healthcare for patients with complex multimorbidity** by developing a patient-centred care model and extending GP consultations to 45 minutes. This approach ensures that **patients' individual needs and goals are considered**, which creates a more personalised treatment plan, improves the quality of care and relieves the burden at the hospitals.
>
> **Anne Frølich**
>
> *Professor, Head of Innovation and Research Centre for Multimorbidity, Slagelse Hospital, Region Zealand*

Psychiatric and somatic comorbidity

Psychiatric and somatic diseases frequently co-occur. For instance, individuals with schizophrenia often develop diabetes, and those with cancer may experience depression.

However, the current structure of the Danish healthcare system separates the management of psychiatric and somatic conditions. To improve the treatment of comorbidity, innovative approaches and increased collaboration between these two specialities are necessary.

Danes diagnosed with a psychiatric disease have a

40%

increased risk of developing severe somatic diseases, such as COPD, diabetes and CVDs[18]

22% of Danes

with multimorbidity live with a psychiatric diagnosis[17]

CASE *The Fusion Clinic*

Slagelse Psychiatric Hospital, Region Zealand

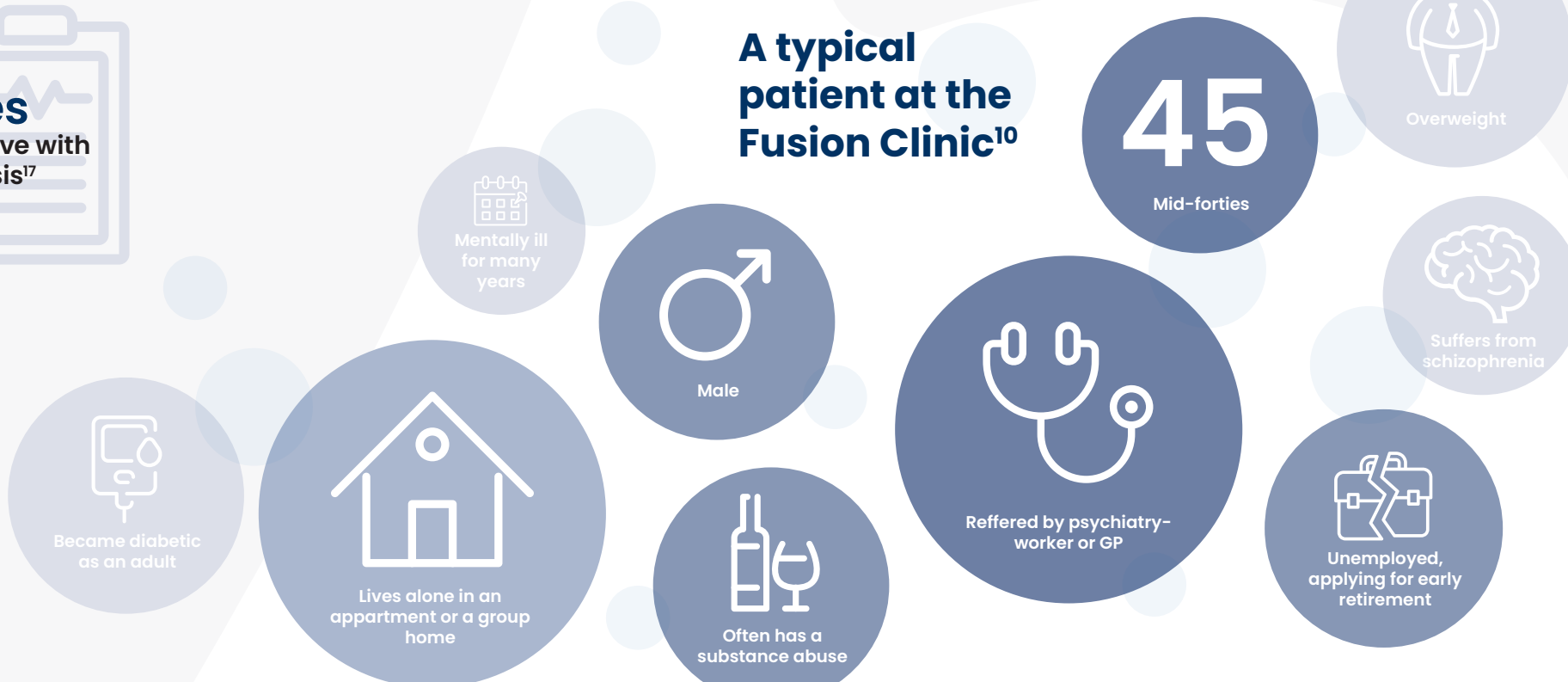
Individuals who suffer from both severe mental illness and diabetes have a higher risk of developing diabetes complications, a lower quality of life, and premature death compared to those with diabetes alone[19].

To address this comorbidity, the Fusion Clinic in Region Zealand provides an individualised and flexible treatment that includes examination, medication adjustments, guidance, and psychoeducation.

The treatment is based on the F-ACT model (Flexible Assertive Community Treatment), an intensive outpatient psychiatric recovery-oriented approach for individuals with severe mental illness, and takes place primarily in the patient's own home.

The clinic's interdisciplinary team comprises nurses, psychiatrists, endocrinologists, social workers, and dietitians and can coordinate with other services to ensure optimal care.

A typical patient at the Fusion Clinic[10]



Inappropriate polypharmacy

Inappropriate polypharmacy has huge negative effects for patients, society, and the healthcare system.

Patients can experience dangerous adverse reactions and drug interactions, but inappropriate polypharmacy also comes at great socioeconomic costs.

Studies have shown that 11–21% of all hospitalisations are medicine-related, and 3–5% of all deaths are due to fatal side effects from medicine[20].

To reduce these numbers, several initiatives are currently being explored across the Danish healthcare sector to optimise medicine prescriptions.

Pharmacist review of medication at discharge, along with GP guideline preparation and patient follow-up, reduced hospital readmissions by 8%, saving approximately 1,800 euros per patient.

Additionally, in 2022, the Danish Health Authority published a report with recommendations on polypharmacy in multimorbidity[21].

CASE *NordKAP – review of polypharmacy patients at the GP*

North Denmark Region

In the North Denmark Region, a project has been launched to provide GPs with support from pharmacists in reviewing medication for their patients with polypharmacy. Together, the pharmacist and GP create a plan of action to reduce the number of medications prescribed.

The patient then receives a consultation with the pharmacist and, if necessary, a nurse. The pharmacist and nurse work together to gradually reduce the patient's medication and provide follow-up care.

Patients have reported feeling well-informed and involved in the medication changes, and GPs have generally found the support to be beneficial. They have been comfortable delegating the treatment plan and medication consultations to the pharmacists.

CASE *A tool to reduce inappropriate polypharmacy*

The Polypharmacy Clinic, Nordsjællands Hospital

Established in 2019, the Polypharmacy Clinic aimed to minimise inappropriate polypharmacy for individuals with multimorbidity.

GPs were able to refer their patients for evaluation by specialist doctors and pharmacists at the clinic, who used a digital tool to present a visual summary of suggested medication adjustments to optimise treatment.

The clinic's success in reducing inappropriate polypharmacy and improving treatment outcomes has sparked interest in its approach.

The digital tool used by the clinic has been shared widely and there are ongoing discussions about implementing similar initiatives in other parts of the healthcare sector.

Outcomes from the GPs clinics[22]

- An average reduction of 3.6 medications per patient
- Average patient satisfaction with communication and involvement rated 5.75 out of 6
- Over 10% of patients experienced significant relief from severe, debilitating symptoms
- 38% of patients reported improvements in symptoms and quality of life within 2 weeks of their visit

Data in healthcare

Denmark has a long history of collecting and utilising healthcare data to drive progress in prevention, treatment, and research.

The large amount of high-quality health data offers great potential for enhancing communication between healthcare sectors and between patients and the healthcare system, ultimately leading to more comprehensive and cohesive treatment outcomes that prioritise coherence and holism.

Looking ahead, intelligent use of health data can facilitate improved disease prevention, prediction, and patient empowerment, ultimately advancing public health outcomes as a whole.

Denmark has a long tradition of collecting and using healthcare data for treatment and research, and data is collected from cradle to grave for all Danes. This is possible because we have a high degree of trust in the responsible and secure handling of healthcare data in Denmark, and there is a common understanding that healthcare data is necessary for providing the best treatment and research outcomes.

Lisbeth Nielsen

Director General, Danish Health Data Authority

The percentage of Danes using health-apps has increased[23]

Patient reported outcomes

The use of Patient Reported Outcome (PRO) measures is a crucial step towards a more personalised and coordinated healthcare system.

PRO

PRO is defined as the patient's systematic response to questionnaires about their health status[24]

It offers a multitude of benefits, including clinical assessments, pre-screening before clinical encounters, and facilitating discussions during encounters, and can support treatment planning and ongoing health monitoring.

With the information accessible to all relevant healthcare providers, including patients themselves, this data can be shared seamlessly across all healthcare sectors.

Denmark recognises the importance of PRO and has implemented various tools to encourage patient involvement, improve communication between patients and healthcare professionals, and ultimately enhance healthcare outcomes.

To ensure consistent use throughout the entire healthcare system, Denmark has taken a national approach to standardise the use of PRO since 2017.

The national steering group for PRO

includes representatives from The Ministry of Health, Danish Regions, Local Government Denmark, Organisation of General Practitioners, municipalities, regions, and patient organisations

The steering group aims to:

- Standardise PRO data questionnaires for patients
- Establish guidelines for standardised use of PRO-data across geography, sectors, and treatment
- Contribute to systematic knowledge sharing on the use of PRO data in clinical practice and quality development

CASE *Increased citizen involvement with patient reported data*

The Center for Diabetes and Heart Diseases, Copenhagen Municipality

The Center for Diabetes and Heart Diseases *(CDHD)* is a Copenhagen Municipality initiative that provides a holistic approach to treating people with type 2 diabetes or heart diseases.

To facilitate patient engagement, the CDHD uses Municipal PRO, which is a national solution for collecting, comparing, and sharing data across municipalities, and later across the entire healthcare sector.

Before consultations with a healthcare professional, patients are asked to fill out a PRO questionnaire online in the Municipal PRO solution, and the answers are used in the conversation with the healthcare professional. The patients can highlight specific topics they want to discuss, thus enabling a focused dialogue to create the most value for the patient.

Results have shown that citizens feel better prepared and safer knowing in advance what the conversation will entail, enabling them to prepare more effectively in advance.

Kommunal PRO (Municipal PRO)

Benefits of the system include:

- Increased citizen security and preparedness for meetings with municipalities
- Shared patient information across municipal boundaries and healthcare domains
- A continuum of care with citizens at the center
- Citizen involvement is strengthened

DATA IN HEALTHCARE

The citizen journey using PRO

Population health management

The large amount of health data collected in the Danish healthcare system is used in population health management to identify individuals at high risk of developing chronic diseases or who already have multiple chronic diseases and develop tailored interventions to improve their health outcomes.

CASE *The National Health Profile – health of the Danes*

A collaborative popoulation health management tool

The National Health Profile is the largest population health survey in Denmark and is conducted every four years by the five regions, The National Institute of Public Health, and The Danish Health Authority in collaboration with municipalities and Local Government Denmark.

The nationwide survey identifies health patterns and trends, as well as high-risk groups for chronic diseases, and the results enable municipalities and regions to develop tailored interventions to improve health outcomes for these groups.

The most recent survey was conducted in 2021, and the report highlighted significant health concerns such as smoking, alcohol consumption, mental health, obesity, physical activity, and social inequality.

Telemedicine

Denmark has been utilising telemedicine for several years, and this field continues to expand. One of the goals is to provide more digital assistance to individuals with chronic diseases by employing innovative technology that allows hospital services such as monitoring and consultations to be conducted in the citizen's homes.

CASE *Telemedicine for COPD and heart failurethe GP*

North Denmark Region

For over a decade, TeleCare Nord COPD has provided a permanent telemedicine home monitoring service to support patients with COPD in the North Denmark Region in collaboration between hospitals, municipalities, and GPs[25].

Building on the success of Telecare Nord, the project launched a new initiative in 2016 aimed at people diagnosed with heart failure in the region. Furthermore, the success led the Danish government to decide on a national implementation of telemedicine home monitoring for COPD and heart failure patients[26].

Data collected in the TeleCare Nord project is used to develop AI solutions to predict disease aggravation among COPD and heart failure patients, *see page 36.*

7 out of 10 felt more secure and empowered managing their disease[27]

Annual savings are estimated to be up to **EUR 1,200** per COPD patient, primarily due to reduced frequency and duration of hospitalisations and less need for primary care services[28]

CASE *Motion sensor and app motivate physical activity*

Helping patients attain greater indepencdence

In illness or hospitalisation physical activity is crucial for overall well-being and physical function but can be challenging to maintain.

The Icura motion sensor and app, along with an exercise programme, help motivate patients to engage in daily activity and exercise. The app analyses training and activity data and provide therapists with an accurate picture of the patient's performance.

This serves as a foundation for patient-therapist dialogue in addition to helping patients attain greater independence and improve their quality of life.

CASE *The first digital out-patient clinic in Denmark*

Empowering patients to take an active role in their treatment

The PreCare Clinic, Denmark's first fully operational digital clinic, opened in 2018 with a patient-centric approach.

Patients receive a tablet, emergency medicine, and measuring equipment, which enables them to self-monitor and enter information directly into the clinic's online system.

This ensures that the clinic stays updated on patients' health status, while empowering them to participate in their treatment, track their progress, and react to their condition, while the healthcare system becomes a supporting party.

Results from the PreCare Clinic show[29]

- 33% reduction in acute contacts
- 50% reduction in acute bed-days for all COPD patients
- slowdown in disease progression

Citizen-generated data through wearable technology

Technological progress in healthcare has created an entirely new type of data in the form of citizen-generated data collected from wearable technologies.

Wearable technology

is defined as devices that citizens attach to their bodies to collect health and fitness data, which they may provide to health providers. Examples include fitness trackers, blood and pressure monitors

This new high-quality data has multiple advantages

CASE *app to monitor and treat diabetic foot ulcers*

The Wound App is a platform for people with diabetic foot ulcers that allows them to photograph and register wounds, report data daily, and track healing progress with self-registered data and wearable technology data sources.

Co-created and tested citizens, healthcare professionals, companies, and researchers, the app is optimised to meet user needs and improve the likelihood of adoption and sustained use.

By enabling home monitoring, it allows for timely interventions, more efficient use of healthcare services, and better outcomes for users.

Artificial intelligence in healthcare

Artificial intelligence (AI) has huge potential for optimising prevention, prediction, early detection, and more precise diagnosis of chronic diseases, as well as supporting efficient resource utilisation.

In 2020, The Danish Government, Danish Regions, and Local Government Denmark *(confederation of the municipalities)* established an investment fund to support projects testing the use of AI in the healthcare system[30]. The purpose is to explore where AI can improve the quality and efficiency of key tasks in the public sector and provide process and decision support for the GPs, in municipalities, and hospitals.

CASE *AI to detect at-risk COPD patients*

Using patient-reported measurements to prevent hospitalisations

One example is using AI to develop an algorithm that can predict exacerbation of COPD and heart failure patients. By detecting at-risk patients and initiating early preventive treatment before exacerbation occurs, it is possible to reduce the number of hospital admissions and prevent deterioration.

The initiative uses data collected from the previously mentioned TeleCare Nord project (page 33).

Based on patient-reported measurements of blood pressure, oxygen saturation, and heart rate, the algorithm identifies whether there is a risk of exacerbation or heart failure before it occurs.

A deterioration in the patient's condition warns the healthcare professionals and early preventive treatment can be initiated, potentially preventing the need for hospitalisation[30].

Personalised medicine

Personalised medicine means that diagnostics, prevention, and treatment increasingly target a patient's individual needs by using knowledge and data about the patient's biology and personal preferences.

The Danish healthcare system has a unique position to seize the opportunities offered by personalised medicine, as data and knowledge on diseases and treatments have been systematically collected for decades.

Personalised medicine is a shift from the one-size-fits-all way of thinking, where treatment is standardised for all regardless of gender, genetics, age, lifestyle etc. to look more individually at the patient.

With a more personalised treatment, future patients should experience improved diagnosis, fewer side effects, and a higher degree of certainty that the treatments used have an effect.

As part of the National Strategy for Personalised Medicine, a number of patient groups are offered genome sequencing as part of their treatment to ensure better diagnostics and treatment of, for example, hereditary heart diseases, child and adolescent psychiatry, and rare diseases in children and adults.

The National Genome Center

was established as an independent organisation under the Ministry of Health to ensure a visionary and balanced development of personalised medicine in Denmark.

It is tasked with building a nationwide infrastructure for personalised medicine, including an infrastructure for carrying out genome sequencing and using genetic information for patient treatment and research.

References & Credits

Editor-in-Chief
Healthcare Denmark; Lene Qvist Larsen, lql@hcd.dk
Healthcare Denmark; Anne Katrine Griesen, akg@hcd.dk

Associate editor
Healthcare Denmark; Ari Vigur Hansen, avh@hcd.dk

Chronic diseases and multimorbidity in Denmark - April 2023
A publication in the Triple-I paper series: Denmark Informs - Inspires - Invites

References

1. WHO (2022). Noncommunicable diseases. Retrieved April 2023 from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases
2. Statistics Denmark (2021), Befolkningsfremskrivninger 2020-2060 [Danish]
3. National Institute of Public Health (2017), Sygdomsudviklingen i Danmark fremskrevet til 2030 [Danish]
4. The Ministry of the Interior and Health (2022), Kronisk sygdom og multisygdom [Danish]. Retrieved April 2023 from: https://sum.dk/arbejdsomraader/sygdomme/kronisk-sygdom-og-multisygdom
5. Yuen MM, Earle RL, Kadambi N, et al (2016). A systematic review and evaluation of current evidence reveals 236 obesity-associated disorders
6. The Lancet Lancet Diabetes & Endocrinology (2014). Years of life lost and healthy life-years lost from diabetes and cardiovascular disease in overweight and obese people: a modelling study
7. Isabelle Mairey, Siri Rosenkilde, Marie Borring Klitgaard and Lau Caspar Thygesen, National Institute for Public Health, University of Southern Denmark, Danish Health Authority (2022), Sygdomsbyrden i Danmark – sygdomme [Danish]
8. OECD/EU (2018). Health at a Glance: Europe 2018: State of Health in the EU Cycle
9. Psykiatrifonden (2021). Tal og fakta om psykisk sygdom i Danmark [Danish]
10. Lægemiddelindustriforeningen magasin (March 2023). Multisygdom bliver fremtidens udfordring [Danish]
11. Danish Health Authority (2018). The municipality's work on health promotion packages. Retrieved April 2023 from: https://www.sst.dk/-/media/Udgivelser/2018/Forebyggelsespakker/103612-Forebyggelse-190×260-Introduktion-UK-FINAL-WEB.ashx
12. Flachs E, Eriksen L, Koch M et al. (2015), Sygdomsbyrden i Danmark: sygdomme. Sundhedsstyrelsen [Danish]
13. Larsen FB, Pedersen MH, Friis K, Glümer C, Lasgaard M (2017). A Latent Class Analysis of Multimorbidity and the Relationship to Socio-Demographic Factors and Health-Related Quality of Life. A National Population Based Study
14. Larsen FB, et al (2017). A Latent Class Analysis of Multimorbidity and the Relationship to Socio-Demographic Factors and Health-Related Quality of Life
15. World Health Organization (2016). Multimorbidity: Technical Series on Safer Primary Care
16. Birke H, et al (2020). A complex intervention for multimorbidity in primary care: A feasibility study Schiøtz ML, et al (2017). Quality of care for people with multimorbidity – a case series
17. Anne Frølich (2020). Innovation and Research Centre for Multimorbidity
18. Natalie C. Momen, et al. (2020). Association between Mental Disorders and Subsequent Medical Conditions
19. Steno Diabetes Center Sjælland (2022). Diabetes i Region Sjælland Forekomst, sociodemografi, helbred og kontakt til sundhedsvæsenet hos personer med diabetes [Danish]
20. Ravn-Nielsen LV, et al (2018). Effect of an In-Hospital Multifaceted Clinical Pharmacist Intervention on the Risk of Readmission: A Randomized Clinical Trial
21. Sundhedsstyrelsen (2022). Anbefalinger om polyfarmaci ved multisygdom [Danish]
22. The Danish Patient Safety Authority (2020). Polyfarmaciklinikken. [Danish] Retrieved April 2023 from: https://stps.dk/da/laering/lokale-indsatser-for-patientsikkerhed/projekter-om-polyfarmaci-og-medicingennemgang/2020/polyfarmaciklinikken/
23. Danish Centre for Health Informatics, Aalborg University (2022). Borgernes holdning til og anvendelse af e-sundhed: Udvalgte resultater fra den 5. nationale undersøgelse
24. PRO-Secretariat (2023). PRO – patient reported outcome. Retrieved April 2023 from:https://pro-danmark.dk/da/pro-english)
25. The TeleCare North Project Secretariat (2012). Large-scale telemedicine TeleCare North
26. Danske Regioner (2016). Aftale om regionernes økonomi 2016 [Danish]
27. The TeleCare North Project Secretariat (2015). TeleCare Nord Afslutningsrapport [Danish]
28. Anne Sig Vestergaard, et al. (2020). Is telehealthcare for heart failure patients cost-effective? An economic evaluation alongside the Danish TeleCare North heart failure trial
29. Data and Development Support — Region Zealand (2022). PreCareKlinikken – resultater efter 3 år [Danish]
30. Agency for Digital Government (2021), Knowledge Assessment of Projects of the Danish National Artificial Intelligence Uptake Fund. Retrieved April from: https://en.digst.dk/policy/new-technologies/national-uptake-fund-for-new-technologies/

Photo & Illustration credits

Front page: Getty Images / Maksim Tkachenko
Page 3: Left, Denmark's Liberal Party
Page 10: Illustration taken from The Danish Association of the Pharmaceutical Industry (LIF)
Page 16: Getty Images / Yalana
Page 25: Illustration taken from The Danish Association of the Pharmaceutical Industry (LIF)
Page 31: Getty Images / Sandy Bell