HOSPITALS AND HEALTHCARE
ABOUT COWI

COWI’s hospital and healthcare services are part of the COWI Group, which is a leading international consultant within engineering, environmental science and economics.

Since COWI was founded in 1930, we have been involved in more than 85,000 projects in 124 countries. We have 6,100 employees, including healthcare planners, health specialists, electrical, mechanical, IT, security and fire engineers, biologists, geologists, economists, surveyors, anthropologists, sociologists and architects.

COWI’s hospital and healthcare services are offered through our main business regions:
- COWI Denmark
- COWI Norway
- COWI Sweden
- COWI CMC (China, Middle East and Central East Europe)

COWI leads some of the largest infrastructure projects in the world. We have companies and offices in 35 countries and run project offices in all the countries in which we operate. COWI is currently engaged in some 17,000 projects within a wide range of disciplines.

When undertaking consultancy and planning projects, we do so on the basis of extensive local knowledge, and knowing that we can draw on the international experience of our entire organisation.

Our hospital and healthcare projects benefit from more than 800 multidisciplinary engineers, healthcare planners and other professionals within COWI’s cross regional network.
HEALTHCARE BUILDINGS

Healthcare buildings are a matter of substance as well as form. Patients, staff, relatives and visitors must feel comfortable in the buildings that COWI participates in creating, just as the buildings should contribute to improving the overall standard of health.

COMPLETE HEALTHCARE SOLUTIONS
COWI’s consultancy services for hospitals and healthcare buildings are based on a profound understanding of the complex healthcare processes which must work in order to provide patients and staff with a high quality experience.

We have long-standing experience in providing coherent and flexible solutions for the healthcare sector. By sharing knowledge and exchanging experiences with our international offices, we constantly broaden our specialist knowledge about patient needs, methods of treatment, electro medical equipment, information technology, quality, economics, energy and environment, building technology as well as operation and maintenance.

The client benefits from our extensive experience with cost management and model calculations, hence our solutions create the optimal building in regard to economic and operational efficiency. We aim to create a modern framework for the care and comfort of patients and relatives, ensuring the staff the best possible work environment as well as efficient utilization of the available financial resources.

It is for this reason that COWI is among the leading consultants in the field of healthcare solutions.
CORE EXPERTISE:
› Facilities analysis
› Capacity forecasts and calculation of spatial requirements
› Healthcare planning
› Hospital logistics
› Electro medical equipment
› Clean room technology and technical hygiene
› Risk management
› Quality assurance
› Organizational development in the healthcare system
› User involvement.

CONSULTANCY SERVICES AND STRATEGIC HEALTHCARE PLANNING:
› Regional planning
› Feasibility studies
› Project and contract management
› Healthcare and process consultancy
› Physical planning of healthcare facilities
› Design and construction management
› Operation and maintenance.

We are familiar with working in multi-disciplinary environments and always assemble a project team specifically selected for the individual assignment. Thus, we focus on providing professional consultancy services customized to the needs of the client.

COWI PROVIDES CONSULTANCY SERVICES FOR THE FOLLOWING TYPES OF HEALTHCARE BUILDINGS:
› Hospitals
› Private clinics
› Patient hotels
› Outpatient facilities
› Nursing homes
› Hospices.
HOSPITALS

A hospital must provide healthcare services that are characterized by high standards of quality and efficiency for the patients. At the same time, the patients and their families should feel that they are in an environment which supports the individual patient’s need for comfort and safety.

This is a delicate balance which requires that the consultant has in-depth knowledge of both technological possibilities and human needs. This comprehensive knowledge is the centre of COWI’s consultancy and is continuously updated based on the most recent research and development within the technical and humanistic areas.

WE THINK ABOUT TOTALITY
The planning and implementation in connection with building a new hospital involve more than time schedules, finances and building processes. Equally important is the ability to understand the needs of the patients, their families and the staff as well as the knowledge about which technical and practical solutions are available to the specific challenges. COWI combines this approach with extensive expertise within medical engineering, technical installations, IT and flexible building solutions for hospitals. We can provide operational consultancy to hospitals, including new public and private forms of financing and collaboration.

EXCELLENT PATIENT SAFETY
It is vital for COWI’s consultancy that our services support and improve patient safety. We have broad experience within technical hygiene and the area of preventing, minimizing and handling adverse events and near miss medical errors. Ways to improve patient safety include appropriate documentation and standard procedures as well as adapted technical installations.

It is because of this accumulated knowledge that COWI is capable of contributing with flexible and state-of-the-art building solutions for hospitals which ensure the best facilities for all users.
HOSPITAL LOGISTICS

The logistics in the building are essential to a hospital’s unconfined functionality. COWI’s consultancy on hospital logistics ensures efficient operation and optimal supplies at all times.

PATIENT FOCUS
The planning of hospital logistics revolves around the patient, who should experience his or her stay in the hospital as a coherent process which is characterized by high quality and efficiency. Together with the client and the architect, we optimize the use of the building and rationalize the operation without compromising the work environment of the staff. The objective is to work smarter, not harder, and in this way gain more time for the patients.

We use Lean Management as a general guideline for the planning and optimization of hospital logistics and for creating effective treatment processes that minimize the strain on the patients. The goal is to create an optimal patient pathway from admission to discharge.

SMOOTH FLOW OF GOODS
Logistics are also about how the hospital handles different types of goods. Each day, the hospital handles large amounts of different types of goods which are transported, stored and used. Many of the goods require special handling and storage, e.g. sterile equipment, food, medicine. Furthermore, a number of hygiene and safety requirements must be met during transportation, storage and use.

SUPPLY RELIABILITY
Supply reliability is vital to hospitals. The patients may be fatally affected by the lack of supplies or incorrect storage. Therefore it is essential to design supply chain strategies, storage capacity as well as logistical flows and systems for hospital supplies correctly.

The planning of hospital logistics includes determination of the overall supply chain strategy, the most suitable transportation methods and available technical solutions.

When COWI carries out analyses of hospital logistics, we combine relevant logistics planning tools with updated knowledge of the legislation on medicine and food, hygiene and safety requirements.
FACILITIES ANALYSIS

Facilities analysis provides the basis for ensuring that buildings and organizational structures are designed in accordance with their future use and function.

From the initial planning phase to the actual construction of the building, COWI takes into account that the building must accommodate hospital activities not only now but also many years ahead. Synergy and efficiency improvements are expected but there is no gain in building new hospitals if the same working procedures and the same mindset are still applied. Innovation is essential.

Facilities analysis is used for improving patient and staff facilities as well as for eliminating inefficient hospital operation. By analyzing the hospital facilities, their interrelationship, the parties involved and the support systems used, the optimal flow of patients, staff and goods throughout the hospital can be established. Facilities analysis can be undertaken at all levels of planning and in connection with new-build as well as refurbishment projects, but in any case the analysis is a precondition for building programming and concept design.

PROCESS OPTIMIZATION

In connection with new-build or refurbishment projects, it is important to include new ways of organizing hospital work flows. The object of facilities analysis is to analyze and evaluate all work procedures and support systems that are required in order to diagnose and treat the patients in the best possible way. The hospital’s work processes must be optimized to ensure that the work of the staff is always supported by functional procedures and that resources are used in the best possible way. For this purpose, COWI carries out work flow analyses together with hospital staff and patients.

Work flow analyses are based on future ‘ideal’ working procedures and the desired functionality. From these analyses, a number of tangible action plans are derived for the organizational implementation of the new work procedures. A process simulation is carried out in order to test and further develop the procedures before their final implementation. The staff is involved early in the process. Close communication and relevant input from the staff contribute to a larger degree of involvement in and a greater sense of responsibility for the process and the final outcome. Through this, hospital staff and managers gain an overview of their individual work tasks and procedures.

FOCUS ON PATIENTS

Work procedures and support procedures are planned and established with focus on the patient’s needs and with the aim of establishing a coherent patient pathway. The majority of examinations and treatments should be provided close to the patient in order to reduce transfers between wards and treatment centers. Fewer changes in the care team will increase the patients’ sense of security and enhance patient safety.

COWI has comprehensive expertise within hygiene technologies as well as prevention of adverse events and near miss errors. In this way, we ensure the patients’ safety from their admission to hospital until they are discharged.
THE PHYSICAL STRUCTURE OF THE BUILDING

The design of the physical structure of the building must take place with focus on the best possible functionality as well as smooth and efficient operation. At the same time, the structure of the hospital must comply with the demands for quality and flexibility which are necessary in order for the building to be sustainable in relation to the continuous development in treatment technologies and future changes in demands.

COWI analyses the facilities in the buildings in close co-operation with hospital staff and patients by simulating patient pathways for relevant groups of patients (e.g., in-patients, emergency patients, walk-in patients, outpatients, day surgery patients). In this way, the patient flow through the respective diagnostic and treatment centers can be visualized, which will ensure the functionality of the architectural design throughout the planning process. If needed, room studies of rooms with specific functional, structural or technical requirements, for instance laboratories or operating theatres, are carried out. Our experience within quality assurance, risk assessment and international best practice enables us to construct the physical and organizational framework that complies with national and international standards.
USER INVOLVEMENT

Structured planning ensures the best result in the process of new-build or refurbishment. Input and ideas from the end users of the buildings should be incorporated as early as possible.

When planning healthcare facilities, all aspects must be considered in relation to current work procedures and methods of treatment, as well as in relation to the expected future developments in the field. Therefore it is important to include staff and patients in the process as they complement and enhance each other’s knowledge and understanding of their individual tasks and responsibilities.

New ways of organizing and structuring work tasks should be considered. In this way, routines and work procedures can be optimized resulting in better use of resources.

In the planning of new hospital projects, COWI strives for wide-ranging user participation. The techniques used for involving hospital staff and patients in the planning work are adapted to the actual stage of the project and can involve workshops, small work groups, interviews and focal groups. Thus we can direct attention to areas that provide value to patients and staff.

STAFF INVOLVEMENT

Staff members participate in user groups according to their professional responsibility or in interdisciplinary groups. This ensures that everyday knowledge is included in the process. At the same time it facilitates the staff’s commitment to the final result. It also ensures that the staff members have a comprehensive knowledge of the tasks and processes and understand the current way of working.

When planning healthcare facilities, we ensure clear lines of communication and a non ambiguous distribution of responsibility, which makes it possible to keep within the time limit and budget.

It is attractive to take part in a user involvement process because it offers responsibility and influence. Participants are expected to be creative and innovative. Responsibility for the final product is created through mutually committing agreements and synchronization of expectations.

INVolVEMENT OF PATIENTS AND RELATIVES

The needs and wishes of patients and their relatives are important aspects that must be included in the planning process.

Patients can be involved at different stages of the project. Patients can contribute significantly to the planning process, not only when general planning principles are established, but especially when decisions, for instance regarding the layout of bed wards, are to be made.

Interviews with patients can provide valid input as to how the layout of the ward affects the patient’s individual experience of being hospitalized. Focal groups with patients are especially used when projects reach their final stages.

The result is a welcoming environment for both patients and staff with optimal functionality and user friendliness.
We closely monitor the rapid development within IT, diagnostic and medical treatment equipment to continuously identify the most important trends, which we combine with our expertise within the field of building installations and construction technology.

**A TECHNICAL CHALLENGE**
The requirements for medical facilities in modern hospitals change all the time, thus it is necessary to keep the equipment and technical installations up-to-date to ensure the largest possible benefit to the hospitals from their investments. Hence COWI’s close co-operation with the manufacturing industry and constant dialogue with international specialists, our consultancy is based on the most recent knowledge in the field.

**POINT OF CARE**
COWI handles medical engineering solutions both on a large scale in centralized treatment units, and on a minor scale in the environment close to the patient (point of care modules).

**FLEXIBLE SOLUTIONS**
Flexibility in buildings and installations is the key. It is vital that replacements and upgrades can be done easily and without interrupting the operation. Flexible building solutions often reduce and eliminate the need for large, cost intensive renovations at a later stage.
QUALITY ASSURANCE IN THE HEALTHCARE SYSTEM

An accredited quality model can raise and ensure the quality in the healthcare system. The objective is to ensure that the patients receive the same quality in relation to healthcare services irrespective of the supplier of the services.

Homogeneous quality in relation to healthcare services does not only result in quality improvements within the individual sectors, it also improves the patients’ treatment across the sectors. Quality assurance of all the sub-processes in the hospital’s work is a wide-ranging task in which the quality of the patient’s treatment and the patient’s satisfaction are the main priorities.

Tightened requirements for efficiency and increasing expectations of what can be treated and how fast mean that management and assurance of quality in the healthcare sector are more important than ever before. Therefore, consultancy on quality assurance requires vast experience and knowledge of work routines, technology, procedures and processes. COWI’s healthcare employees have the particular competencies which are necessary to carry out specific quality measurements and to perform analyses or to create distinct quality management systems.

In COWI’s consultancy on accreditation and quality assurance, our focus is to:
- ensure proper patient care
- ensure the proper physical framework in relation to work routines and procedures
- optimize the safety of patients and staff by means of systematic risk assessment
- analyze the consequences of the different risk factors.

PRIORITIZATION OF QUALITY

COWI always includes the relevant decision makers and staff in the development of the quality systems to ensure that the acquired expertise stays in the hospital organization. A natural part of the development is the training of the hospital’s staff in quality assurance and quality development. COWI can assist with this training.

COWI also focuses on creating knowledge within the organization about how the healthcare provider optimally can meet the internal clinical requirements for hygiene, patient safety and work environment as well as external requirements, such as codes and standards, recommendations and international best practice. Our experience shows that a constant dialogue with the staff is a crucial factor in relation to having the desired quality level efficiently incorporated within the organisation. It also ensures that hospital staff prioritize quality assurance in their busy workdays.
CONSULTANCY SERVICES AND STRATEGIC HEALTHCARE PLANNING

COWI’s core expertise regarding consultancy services and strategic planning for the healthcare sector includes:
› Regional planning
› Feasibility studies
› Project and contract management
› Healthcare and process consultancy
› Physical planning of healthcare facilities
› Design and construction management
› Operation and maintenance.
Surveying and investigating our surroundings provides data which is essential to decision making and analyses of the implications of projected changes.

In the early stages of healthcare projects, COWI assists clients and local governments and healthcare authorities in regional planning and strategic analyses, such as:

- Development of strategic regional master plans for future hospitals and healthcare facilities
- Capacity forecasts based on population development and catchment area
- Regional planning regarding the distribution of acute care versus specialist care.
Feasibility studies behind every successful decision is a strong analysis based on knowledge and experience.

COWI performs analyses and assessments within all our areas of expertise, including:
› Analyses of traffic routes and population density to determine the logistically optimal location for a healthcare facility
› Development and assessment of building scenarios
› Estimation of building costs and future operational costs
› Development of funding schemes
› Cost-benefit analyses.

Our consulting services, analyses and assessments build on our wide range of in-depth professional competencies. Under COWI’s multi-disciplinary umbrella, the appropriate know-how is generally within immediate reach and able to be deployed quickly and effectively.
PROJECT AND CONTRACT MANAGEMENT

Project management and a close dialogue with the client are naturally given high priority. This ensures that deadlines are met and projects are completed in line with the budget. It is also the way to ensure the agreed standards of quality in the completed building.

When managing projects we set targets, lay down the frameworks for time, costs and resources and define criteria for success.

Throughout the project, we follow up at every stage and track outstanding work, so that we can recalibrate progress accordingly, if necessary.

Our project consultancy includes:

- Project development
- Risk management
- Time management
- Cost management
- Quality management
- Legal advice regarding tendering procedures, contracting, partnering etc.
- Due diligence.
HEALTHCARE AND PROCESS CONSULTANCY

As client advisers, we in COWI are the client’s partner. Our aim is to foster and promote the client’s interests throughout the whole process, ensuring that the result corresponds with the client’s expectations in terms of time, costs and quality.

We can offer tailor-made total consultancy services including:

- Analysis of functional, structural, organizational and work process-orientated aspects (e.g. work flow, logistics, hygiene, work environment)
- Development of process-orientated standard operating procedures (guidelines/instructions)
- Chairing of round-table discussions, work-shops and user meetings

- Health service evaluations
- Health technology assessment (HTA)
- Clean room technology and technical hygiene.
An accurate understanding of the client’s needs provides a sound platform to build on, and COWI is adept at asking the right questions to elicit the appropriate information and at sustaining clarity throughout the course of the project.

Our consultancy services regarding the physical planning of healthcare facilities include:
- Master planning
- Concept development
- Definition of general principles/standards for functionality, hospital logistics, infrastructure and space criteria
- Calculation of capacity and spatial requirements based on capacity forecasts
- Building programming
- Planning and execution of refurbishment projects
- Calculation of investment costs and future operational costs
- Technical review
- Facilities analysis.

DESIGN FROM START TO FINISH
Through close dialogue with the client, we establish a detailed building programme which specifies content and quality in regards to form, functionality, technology, costs, time span and environmental aspects. With the programme as a basis, we go through the design process from outline design to detailed design and ensure that all the strands of specialist input melt together: function, organization, building structures, logistics, installations and equipment, IT systems, finances, environmental and social aspects etc.
DESIGN AND CONSTRUCTION MANAGEMENT

When working on the basis of the design, we deal with the process from invitation to tender, contracting and management of contracts to supervision of the construction works, including management of the construction process.

Experience in the design process is invaluable in terms of reviewing projects, checking designs, auditing other designers’ work or such tasks as professional checks of tender documents.

Our services comprise all engineering disciplines:
- Advanced structural design
- Mechanical installations
- Indoor climate
- Building IT (e.g. security installations)
- Electrical installations
- Acoustics
- Fire engineering
- Building material technology
- Sustainable building services and energy consume reduction
- Value engineering.
COWI provides consultancy services on operation and maintenance to both public and private owners of hospitals and healthcare buildings.

Crucially, this service is independent of supplier interests. Our range of expertise extends across invitations to tender, management and planning of operational projects and the analysis and development of operational organisations.

The consultancy service we provide can also extend to supervising and running the client’s system on a day-to-day basis. In addition, we advise on the implementation of all IT systems for operation and maintenance.

COWI’s operational consultancy includes:
- Facility Management
- Operational optimization
- IT consultancy
- Calculation of future resources based on capacity data and functional layout
- Planning of organizational structures and processes (work flow)
- Determination and evaluation of life cycle costs.
SELECTED HOSPITAL AND HEALTHCARE PROJECTS
NEW AHUS, NORWAY

NEW UNIVERSITY HOSPITAL IN AKERSHUS

The new Akershus University Hospital, New Ahus, is a fully digital, state-of-the-art hospital. New work procedures and a functional layout ensure the best possible treatment for patients and optimal work conditions for the staff.

In collaboration with the client, Helse Oest, COWI has completed the IT systems that make New Ahus one of the most efficient hospitals in Norway.

PATIENT ORIENTATED CARE
Unlike traditional institutional buildings, the design and construction of the new hospital has been carried out with the patient in the centre of focus. Bed wards and treatment facilities are grouped in close proximity to enhance the contact between patients and staff. Shorter distances, efficient organization and the adequate use of modern technology leave the staff with more time for patient care. Furthermore, art work, architecture and access to Internet and TV have an encouraging and boosting effect on the patients’ recovery.

TECHNICAL SOLUTIONS
The hospital has been equipped with an efficient transport system (Automated Guided Vehicles) for transporting food, medicine and other supplies as well as waste.

The introduction of electronic medical records and telemedical applications allow doctors to send diagnostic images and reports and to share information with other departments in a quick and efficient way.

Patients can watch TV, listen to the radio, talk on the phone and access the Internet from their bedsides.

THE STRUCTURE OF THE HOSPITAL
New Ahus comprises a treatment wing, a ward wing and a reception building which are connected by a Glass Promenade. In addition, the newly renovated part of the existing hospital includes, among other facilities, a patient hotel.
ST. OLAV UNIVERSITY HOSPITAL, NORWAY

ALTERATION AND EXTENSION

St. Olav’s Hospital is the first hospital in Norway to completely integrate patient treatment, research and teaching facilities. COWI acts as consultant on the ambitious project, which is expected to be completed by 2015.

The objective of integrating patient treatment, research and teaching facilities has made the project particularly demanding. COWI’s solution therefore seeks to plan and design every building as an individual organizational unit including bed wards, day treatment facilities, operating theatres and support functions.

A SUSTAINABLE SOLUTION
COWI’s solution anticipates rapid and unpredictable development in diagnostics, treatment, research and medical technology and therefore enhances a continuous reorganization of the hospital operations and includes sketch designs for possible future extensions. The new hospital is built in Oeya, in the centre of Trondheim. The first sections were completed in 2006. The entire project is expected to be completed by 2015.

PHASE 1: 2002-2006
- Laboratory Centre
- Women and Children’s Centre
- Centre for Neurotherapy

PHASE 2: 2006-2015
- Emergency department and Heart-Lung Centre
- Mobility Centre
- Abdominal Centre
- Supply Centre - Part 2
- Psychiatric Centre
- Knowledge Centre.
- Supply Centre - Part 1
- Patient Hotel
- Technical Infrastructure.

PROJECT SCOPE
New-build of St. Olav Hospital in Trondheim with a total floor area of 197,000 m².

COWI’S SERVICES
COWI is responsible for all engineering disciplines including technical master plan, indoor climate, acoustics and fire safety.

CLIENT
Helsebygg Midt-Norge, Norway

ARCHITECTS
Arsted Architects
Narud Stokke Wiig Architects
Medplan Architects

PROJECT PERIOD
1996-2015
In 2015, a large new hospital will be completed in Kalnes in Norway. COWI is responsible for the planning and design of the new hospital and refurbishment of the old Moss Hospital.

In Oestfold in Norway it has been decided to construct a brand new hospital in the geographical centre of the region, approximately 100 kilometres southeast of Oslo. The new Oestfold Hospital unites four existing hospitals in the area as well as the psychiatric hospital functions. As a part of the project, the hospital in Moss, approximately ten kilometres north of the new hospital, will be expanded and converted to approximately 24,000 m².

HEALING ARCHITECTURE
With the design of Oestfold Hospital a major step is taken towards developing a ‘health care house’ of the future where design and layout supports patient recovery and wellbeing. The goal of the architecture has been to create a framework of trust where patients, visitors and staff feel highly prioritised.

It is emphasized that the hospital must appear clear, and that visitors be able to quickly perceive the main components.

LOGISTICS ANALYSIS ENSURES EFFICIENT OPERATION
The new hospital incorporates optimal logistics and flexibility. COWI has been specialist advisor on logistics during the pre-design phase. The logistics analysis outlined potential bottlenecks in the current design proposals and proposed a new logical structure which would allow for a smoother flow of goods and appropriate sizing of logistical and technical areas.

Definition of logical principles and detailed workflow descriptions for the different hospital goods (consumer goods, sterile supplies, food, beds, medicine, samples and blood products, waste management, etc.) resulted in an improved workflow which reduces idle time and optimizes the use of technological and human resources. The result of the patient flow studies as well as work flow descriptions and assessment of optimal transportation systems is an improved flow of patients and goods and thus a more efficient operation with less waiting and less waste time.

PROJECT STAGES
The project has been through the outline and concept phase, and it is COWI’s task to continue and finalize the project, as well as carry out tasks in the supervision phase.

Building Information Modeling (BIM) will be used in all phases of the project. The work started in January 2010 and the preliminary project was completed in February 2011. The entire building is expected to be completed in 2015.
Central Denmark Region aims to centralize hospital services from Herning, Holstebro, Tarm, Ringkøbing and Lemvig hospitals in a new facility located between Herning and Holstebro. The ambitious project includes ambulatory and inpatient somatic and psychiatric services as well as an interdisciplinary emergency department.

COWI has been client advisor since the early stages of the project, from the initial analysis of the hospital's optimal location to the comparison between new construction and expansion, and the preparation of tender documents during the competition stage. Since then, COWI has assisted the client in the evaluation of tenders and selection of the winning design team, and is now responsible for the third-eye project supervision in relation to all parties involved in the project. This way, COWI helps to ensure that the project is realized within the agreed quality, time and budget.

In connection with the two initial assignments regarding the location of the new hospital and the comparison of new construction and expansion of the existing Regional Hospital in Herning, COWI has performed numerous analyses and assessments on, for instance, demographics and population density, travel times, traffic conditions, supply options and economic implications of the various locations.

In the feasibility study of the two alternative building models (new construction and expansion) COWI compared the different solutions in regard to their impact on local environment (traffic, parking and noise emission), consequences for patients and their relatives (service and safety) and consequences for employees (health and transportation). The feasibility study formed the basis for the regional council's decision to build a new hospital facility at the new location and covered the following aspects:

- Calculation of bed capacity and spatial requirements
- Volume and viability studies (including evaluation of capacity and condition of existing buildings and their adaptability to different types of clinical functions)
- Proposal of construction stages and time schedules
- Estimation of construction costs

Estimation of operating costs, including potential savings generated through improved efficiency. In the following healthcare facility planning assignment, COWI has been responsible for the design and implementation of an extensive staff engagement process including representatives from hospital management, project management team and clinical departments, which resulted in the definition of an overall vision for the New Hospital in Goedstrup. This vision formed the basis for further stakeholder meetings where seven key issues were discussed during one-day workshops. These key issues had the following headings: technical infrastructure, logistics, patient flow and physical environment, clinical support services, work environment, teaching and research hospital, and psychiatric services.

With management involvement as well as input from representatives from the clinical departments COWI formulated guiding principles for the future building layout, which proved to be a useful guideline throughout the entire project. COWI has compiled these core requirements in a building program, which formed part of the tender documents that were sent out to the bidding teams during the project competition. COWI has also been responsible for the preparation of the preliminary application to the Danish Government's Quality Fund regarding financial commitment to the project.

In the competition phase, COWI has participated in the evaluation of the incoming proposals in relation to the previously defined spatial, functional, logistical and technical requirements.

Most recently, COWI acts as third-eye project supervisor to the client, continuously monitoring and assessing the project status in relation to the four selected key parameters quality, time, costs, and organization and collaboration.
INSPI HEALTHCAMPUS, MALMO, SWEDEN

COMPETITION PROPOSAL

INSPI AB (International Scientific Preventive Health Institute), a Swedish project development company, plans to construct a Health Campus in Malmo City, Sweden.

The INSPI Health Campus is intended as a pilot project, the first in northern Europe, drawing on the synergies between health care, leisure and lifestyle. The concept aims for a unique facility which thrives on the interrelationships between the diverse aspects of health and lifestyle. The Health Campus will provide healthcare through its sports medicine centre, hotel and wellness facilities, research and education, and will bring the highest standards of innovative services to people, caring for their optimal health and personal wellbeing.

INSPI Health Campus is a combination of urban hotel, health, treatment and research facility. The building is centrally located in Malmo, Sweden, closely connected to Malmo’s University Hospital UMÅS and MEDEON Science Park. The building program ranges from specialized facilities for one-to-one treatment and therapy, operating theatres through to large auditoria, spas and fitness facilities.

The Health Campus houses a range of stimulating indoor and outdoor environments in an open form of urban landscape with the main functions arranged around a central, publicly accessible courtyard. Internally, the four main functions, hotel, clinic, wellness and research centre are arranged in a manner which allows for the sharing of certain facilities, generating synergy among the functions and users of the buildings.

PROJECT SCOPE
Health Campus comprising healthcare, treatment and research facilities. Built-up area approx. 25,000 m²

COWI’S SERVICES
Consultancy on all engineering services

CLIENT
INSPI AB

PARTNERS
Behnisch Architects,
Samarck Architecture & Design
Esbensen Engineers
Schmidt Hammer Lassen Landscape Architects
Transsolar Climate Engineering

PROJECT PERIOD
2007

STATUS
Design proposal

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Schmidt Hammer Lassen Landscape Architects
Transsolar Climate Engineering

PROJECT PERIOD
2007

STATUS
Design proposal
King Abdulaziz Medical City, Saudi Arabia

Extension of King Khaled University Hospital in Riyadh

Saudi Arabia is systematically strengthening its healthcare sector and has now commissioned a significant extension to the King Khaled University Hospital at King Saud University, the oldest and most prestigious university in Riyadh.

COWI works as consultants to Samark Architecture & Design, Malmo, who are currently working on several projects at King Saud University for the client ABV Rock Group. The three projects, in which COWI has been involved include:

- National Diabetes Center, proposed as six storey building with a total area of 15,600 m²
- Dental College Extension, a twelve storey building with a total area of 39,600 m²
- Medical College Expansion Building, proposed as three storey building with a total area of 28,800 m²

The new National Diabetes Center will become a true national institution for diabetes including a research centre and specific treatment facilities for the complications linked with the disease. The project includes three wings (bed wards, treatment, laboratories) and optimizes use of natural light and protection from heat.

The full-fledged Dental College will be affiliated with the King Saud bin Abdulaziz University of Health Sciences, which is part of the King Abdulaziz Medical City (KAAMC) in Riyadh. The new dental college will offer an advanced curriculum as well as state-of-the-art teaching and training facilities.

The extension of the Medical College, which operates under the umbrella of King Saud bin Abdulaziz University of Health Sciences, includes dormitories for 500 students, classrooms, lecture halls and laboratories. The college will admit 300 students in each academic term.

Project Scope
Three extension buildings to King Khaled University Hospital, Riyadh with a total built-up area of approx. 90,000 m²

COWI’s Services
Consultancy on conceptual and detailed design, civil and structural building works, electrical installations, plumbing and mechanical services, site work.

Client
Samark Architecture & Design as subcontractor to ABV Rock Group Ltd.

Architects
C.F. Moeller (National Diabetes Center)

Project Period
2009-2012
NEW HOSPITAL HVIDOVRE, DENMARK
EXTENSION AND REFURBISHMENT

PROJECT SCOPE
New extension building comprising 30,000 m², and refurbishment and modernization of approx. 13,000 m².

CLIENTS
Capital Region of Denmark

ARCHITECTS
Design team to be selected in October 2013.

PROJECT PERIOD
2011 - 2020

In addition to an extensive refurbishment and modernization of the existing Hvidovre Hospital on the outskirts of Copenhagen, the Capital Region of Denmark is planning a new extension building comprising 30,000 m².

The project is one of eight publically funded hospital projects in the Capital Region and will ensure that Hvidovre Hospital remains an attractive hospital and work place for the region’s citizens also in the future. In 2008, Hvidovre Hospital was given prior commitment to a payment of DKK 1.45 billion from the Danish Government’s Quality Fund. The funds will be used to cover the expenses in connection with a new 30,000 m² extension building, which will accommodate a new emergency department, cardiology department and women and children’s centre, and a number of reconstruction projects in the existing hospital comprising approx. 13,000 m².

The project aims to establish a safe and efficient hospital that provides an outstanding patient experience and a pleasant working environment for hospital staff.

COWI acts as client consultant to the Capital Region in connection with the entire project and assists the hospital’s project management team throughout all project stages, covering the following key tasks:
› Advise regarding project planning and process management
› Time management
› Cost planning, cost and risk management
› Quality management
› Advise on tender and procurement strategies
› Contracting
› Planning and facilitating of staff engagement processes

As one of the first tasks, COWI has assisted the client in planning and facilitating a staff engagement process with hospital representatives in spring 2012. Through workshops, interviews and dialogue meetings, the hospital staff provided useful insights into their needs and expectations in relation with the new extension building, which formed a significant contribution to the tender documents.

The design competition for the new extension building was launched in December 2012 and it is expected to announce a winner in October 2013, after which the detailed planning works will be commenced in close collaboration with the design team and other key stakeholders.

Photo: Hvidovre Hospital
MOLDE HOSPITAL, NORWAY

NEW COMMUNITY HOSPITAL

The new Community Hospital in Molde will be located on a site on the outskirts of Molde and will include somatic wards as well as psychiatric departments. The hospital will be completed in 2013.

The hospital is designed to be compact and easily read, with all functions located close to each other. The intention is to create an optimally functional organization and physical environment which will support the general focus on the patient and the aim for efficient and rational working procedures. Focus is on the psychiatric, geriatric and chronically ill patients, as well as accessibility for emergency treatment.

The project comprises somatic wards and integrated psychiatric departments. A multidisciplinary A&E department is being planned including doctor on call services, laboratories, radiology unit with CT, ultrasound and X-ray as well as short-term observation facilities. The bed wards will be configured as single patient rooms only. The patient will gain from this concept in two ways - by having more privacy and comfort and by having the opportunity to have examinations and treatments done bedside. In total there will be 147 somatic beds, 36 psychiatric beds, 8 short-term observation beds and 34 beds in the patient hotel.

COWI is providing consultancy on all technical installations as well as construction supervision during the construction phase.

PROJECT SCOPE
New community hospital in Molde.
Built-up area approx. 50,000 m²

COWI’S SERVICES
Consultancy on all technical installations and construction supervision.

CLIENT
Helse Nordmøre and Romsdal HF

ARCHITECTS
A consortium of architects including Arkitema, Arstad Architects and Narud Stokke Wig Architects and Planners

PROJECT PERIOD
2007-
AARHUS UNIVERSITY HOSPITAL, SKEJBY, DENMARK

NEW ISOLATION WARDS

Aarhus University Hospital in Skejby, Denmark, has added four isolation wards to the existing hospital with a total number of sixteen beds. The isolation wards are standby facilities in case of an outbreak of an infectious disease such as influenza A (H1N1), tuberculosis, SARS or EBOLA.

The four isolation wards are located in a new extension building and will be part of the nationwide emergency preparedness plan for highly communicable diseases.

As something new, the isolation wards are designed and constructed with a dual function, so they can be used as patient’s rooms for semi-intensive care in every day use. In this way, the hospital can make use of the beds in periods without patients requiring isolation.

BASEMENT WITH VITAL TECHNICAL INSTALLATIONS

The basement has been fitted with a number of important technical installations, some of which are intended to prevent spreading of potentially dangerous infections.

The ventilating system ensures negative pressure, which in turn prevents the transmission of infections to the adjoining rooms. In addition, access control systems ensure that only specially trained staff have access to the rooms when there is a risk of infection. Likewise only specially trained staff can collect waste from the wards. In addition, the basement holds depots and facilities for disinfection and purification of, for instance, waste water which cannot be discharged directly to the public sewer because of a possible contamination risk.

ESSENTIAL KNOW-HOW

COWI has extensive knowledge of the construction of isolation rooms as well as solid experience within clean room technology, sterile production, validation and environmental issues.

The total financial budget of the project was 27.5 mill. DKK, not including electro medical equipment.

PROJECT SCOPE

New extension to Aarhus University Hospital in Skejby with four isolation wards and 16 beds in total. Basement with technical supply rooms, depots, sewage treatment facilities. In total 1,080 m².

COWI’S SERVICES

Design
Client consultancy
Medical technology

ARCHITECTS

Aarhus Architects

PROJECT PERIOD

2007-2009
Automated Production Facility for Cytotoxics and Antibiotics, Denmark

Feasibility Study

Currently a number of pharmaceutical drug products are either prepared locally in the hospital pharmacies or need to be manipulated and dispensed in the clinical departments before they are ready to use. With an automated production facility robots could replace some of the manual processes mainly involved in the preparation of cytotoxic and antibiotic drug products.

COWI has completed a feasibility study for the Danish pharmaceutical wholesaler Amgros, who are responsible for the procurement of drugs and other pharmaceutical supplies in behalf of the Danish hospital pharmacists. Amgros is also involved in research and development activities as well as the legal registration of pharmaceutical products that are produced in hospital pharmacies throughout the country.

The feasibility study analyzes the parameters which indicate the need to establish an automated production facility as a countrywide service. The production facility will either consist of one or several national production units, where robots will replace the manual work processes that currently take place in hospital pharmacies or clinical departments.

Advantages of an Automated Production Facility

It is expected that automation technology will imply many advantages when handling cytotoxic and antibiotic drugs to prevent harm to personnel and contamination of the environment. Cytotoxic drug formulations for chemotherapy treatment, for example, are prepared under sterile conditions and some of the drugs can be hazardous and can cause a wide range of adverse effects to staff handling the drugs. An automated production process will ensure that cytotoxic drugs are prepared in a way that maximizes product quality, and that related waste is handled safely to ensure the safety of personnel and the environment.

At the same time an automated production facility will ensure production and supply of cytotoxic and antibiotic drug products in a quantity that corresponds to the expected increase in demand. Many hospital pharmacies do not dispose of adequate production capacity to meet their own consumption needs, and currently the only alternative is outsourcing to international suppliers.

Project Scope

Feasibility study including a business case which analyzes the need for an automated production facility for cytotoxic and antibiotic drug products in relation to organizational and strategic considerations. The business case also includes a risk-benefit analysis and an estimation of the expected investment costs and future operational costs.

COWI’s Services

Status report for all 11 hospital pharmacies in Denmark
Calculation of future capacities
Development of building scenarios
Analysis and evaluation of future organizational structures

Client

Amgros

Project Period

2009
EARLY INTERVENTION CENTRE, OMAN

DIAGNOSTIC AND REHABILITATION CENTRE FOR CHILDREN WITH SPECIAL NEEDS

COWI is developing the master plan and concept building design for the new Early Intervention Centre for children with special needs in Oman.

The centre caters for children with all kinds of mental and physical disabilities from newborn to age six. Providing a comprehensive early intervention program, which educates the children and their families to handle the child’s disability, it is the objective of the centre to help the children maximize their potential and rise to the daily challenges of life. The program aims at enrolling the children in regular schools at the age of six or to minimize their disability and ensure a better quality of life.

STATE OF THE ART FACILITIES
The centre currently resides in a small, converted villa but the demand for intake far exceeds the capacity of the small premises. 100 children are currently on a waiting list and it has been decided to expand.

COWI has been asked to develop a state of the art master plan for the new facilities. The client has requested for multi purpose spaces and open plans. The centre has to also represent international best practice and allow for future expansion. It will be the first centre of its kind in the Gulf and one of few purpose built centers worldwide. The centre will provide day care facilities, an assessment and therapy unit, portage home visiting education services as well as a training and research centre.

Part of the master planning was to prepare a cost estimate for the whole project as well as the marketing material needed for raising the funds that will finance the new facilities.

LOCAL PRESENCE, GLOBAL EXPERIENCE
COWI was chosen for this project because we have a local presence here in Oman, which the client can interact with on a regular basis, combined with specific health care experience in Denmark and Norway.
HAUKELAND UNIVERSITY HOSPITAL, NORWAY

NEW CHILD AND YOUTH CENTRE

The new centre for children, youth and psychosomatic medicine will function as regional hospital for children in the Health Region West.

The centre will hold all the usual hospital facilities such as operating facilities, recovery unit, diagnostic imaging, emergency department and bed wards. Furthermore plans exist for a new physiotherapy centre with a gym and swimming pool as well as a school unit for the hospitalized children.

The new centre will combine psychiatric (project phase 1) and somatic facilities (project phase 2) for Haukeland University Hospital, and research and teaching facilities for the University of Bergen.

The research and teaching section will have two lecture rooms and several laboratories. COWI acts as design group co-ordinator and as consultant for the technical installations that include fire safety, acoustics, electrical installations, heating and sanitary installations. COWI has recently completed a detailed logistics analysis for phase 2 of the project.

The first phase of the project has been started up in 2009 with construction well under way. Detailed design of the second phase will be commenced in autumn 2013.

PROJECT SCOPE

New centre for children, youth and psychosomatic medicine in total approx. 63,000m², with approx. 26,600 m² in phase 1 and 36,300 m² in phase 2.

COWI’S SERVICES

COWI is responsible for the design of the electrical installations, plumbing, heating, fire safety and acoustics. Through our sub-consultant, Myklebust, we are also responsible for the building technology. The contract includes all stages from appraisal to operational consultancy.

CLIENT

Helse Bergen, Norway

ARCHITECTS

KHR Architects
Studio 4 Architects

SUB-CONSULTANTS

Myklebust AS

PROJECT PERIOD

2010-2023
NEW NORTH ZEALAND HOSPITAL, DENMARK
GREEN FIELD PROJECT

The Capital Region of Denmark is planning a new cutting edge acute hospital in North Zealand. COWI is client consultant on the ambitious project.

The new hospital is to be the primary care resource for people in need of acute care. The new 136,000 m² hospital will be built on a greenfield site outside the town of Hillerod and is expected to be completed by 2020.

The new building will replace the existing hospitals in Hillerod, Elsinore and Frederikssund.

As client consultant COWI will be supplying the following services:

› Advice concerning the organization of the project
› Schedule development and control
› Budget preparation and financial management
› Risk and quality management

› Competition advice
› Procurement consultancy.

HEALING ARCHITECTURE
Recent research has shown that the environment has implications for patient recovery. Therefore, there will be a strong focus on the architecture of the new hospital.

The new hospital will offer the most contemporary, efficient and welcoming environment for patients as well as offering the best working conditions for the employees.

THE HOSPITAL FACILITIES
When the New North Zealand Hospital is completed, it will, among other things handle provide emergency care, woman-child facilities, surgery, orthopedic surgery, internal medicine, neurology, oncology, palliative care in relation to both acute and planned treatments, treatment of ear-nose-throat disorders and audiology.
SHUANGYANG LAKE, CHINA
INTERNATIONAL NURSING HOME

In collaboration with Danish RH Architects and freelance medical consultant Claus Hyldahl, COWI is client advisor on the ambitious project, which comprises a gross floor area of approx. 137,500 m².

Through the integration of Chinese culture, modern western architecture and engineering and the latest medical and nursing expertise, the project aims to develop a unique nursing home and a living environment that creates a community where life is worth living. Traditionally, nursing homes in China have been organized around the efficient provision of physical care to impaired individuals. The primary focus of this nursing home concept is not on the provision of care services but on the quality of life of the residents.

The project is based on the many years of experience in the nursing care industry in Denmark and integrates modern standards for medical treatment and preventive programmes for the elderly.

Embedded in this nursing home model is the respect for individualized needs and desires of each person and the concept that people, including impaired residents, have the right to control decisions that are made about their lives. Shuangyang Lake International Nursing Home is designed for elderly people, who are mainly independent and self-catered, and therefore offers a number of facilities that support physical and mental activity and wellbeing. The following elements will be included in the nursing home:

- Sanatorium area including residential units, medical centre and leisure facilities
- Nursing area including living area, health activity area and medical treatment area (rehab, preventive health care, physiotherapy)

COWI has been chosen for this project because of our local knowledge and local representatives in China, combined with international medical and nursing expertise.

PROJECT SCOPE
Conceptual design of the Shuangyang Lake International Nursing Home project in Changchun

COWIS SERVICES
Conceptual design

CLIENT
Changchun, College of H & S of Nenu

ARCHITECTS
RH Architects

PROJECT PERIOD
2010-2016
PSYCHIATRIC UNIT IN MIDDELFART, DENMARK

EXTENSION AND REFURBISHMENT

COWI is designing an extension to the psychiatric unit at Middelfart Hospital on Funen. The new psychiatric unit will house facilities for forensic psychiatry as well as general psychiatry.

When the psychiatric unit is ready for use in 2013, it will function as a care environment for general psychiatric patients. At the same time it will accommodate a high security unit for mentally ill who have committed crimes.

A CHALLENGING CONSTRUCTION
The target group for the forensic psychiatric ward is mentally ill offenders, and for several reasons, it is particularly challenging to design this section. The challenge, among other things, is that the patients who are sentenced to treatment often are hospitalized for several years and therefore need more space, both indoors and outdoors and need suitable activity options, for example through sport and exercise.

In addition, special security requirements apply to forensic psychiatry. The department must be secured against escape attempts without looking like a prison. At the same time it must function as a therapeutic environment that will enable patients to return to a normal life outside the walls.

COWI’s SERVICES
COWI and Land+ are sub-consultants to Creo Architects, the same team that some years back was responsible for the construction of the existing psychiatric unit at Middelfart Hospital.

Besides the design, COWI is also responsible for construction management and user involvement as well as logistics planning.

PROJECT SCOPE
New psychiatric unit of approximately 8,000 m², and the refurbishment of existing buildings.

COWI’s SERVICES
COWI is responsible for design, construction management and user involvement.

CLIENT
Central Denmark Region

ARCHITECTS
COWI and Land+ landscape architects are sub-consultants to Creo Architects on the project.

PROJECT PERIOD
2010-2013
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