

Automation of Healthcare Processes





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Introduction

- **The strain on global healthcare systems and the crisis created by the spread of COVID-19 are unprecedented. Along with political action and established epidemics and protection measures, this situation also created an unprecedented awareness of the crucial role of innovative health technologies in managing such an extraordinary situation.**
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This catalogue contains examples of Danish companies and solutions that have stepped up to address the COVID-19 crisis in close cooperation with healthcare authorities and which have made a clear difference for patients and healthcare professionals.

While not an exhaustive list, this selection has been made with a few key considerations in mind:

- High quality and reliability of the solutions and companies
- Proven results
- Fast implementation time in a global setting
- High value in a 'regular' healthcare setting post COVID-19

As Denmark is constantly striving to improve our healthcare system to make it sustainable for the future, we rely on political action as well as on innovation and prioritization of the newest inventions and solutions.

Solutions that automate healthcare processes are essential to unburden and decrease the exposure risks of staff and to support healthcare authorities manage and control a crisis.

We believe that the companies presented here are not only relevant for Denmark but for all countries aiming to mitigate the effects of the crisis and striving for a sustainable health system.

We hope to inspire you,

Valentin Bejan, CInO
Health Tech Hub Copenhagen

Hans Erik Henriksen, CEO
Healthcare DENMARK

Categories and solution providers

Automation of oxygen management

Oxygen therapy is needed for most hospitalized COVID-19 patients and requires rigorous monitoring and adjustments.

Technologies that enable precision oxygen therapy, using automation, provide better treatment, free up personnel resources, and are more cost-effective.

Solution provider

O2matic - www.o2matic.com

Automation of screening and triage

Creating protocols that effectively segment critical COVID-19 patients is instrumental in both preventing unnecessary peaks in demand, but also in maintaining a well-functioning emergency department, emergency medical service and more.

Solution provider

Open Telehealth - www.opentelehealth.com

Automation of situational overview and capacity management

Situational overview and capacity management is about knowing the countrywide capacity of staff and needed COVID-19 equipment and next to be able to increase efficiency and utilization of this capacity.

Solution provider

Systematic - www.systematic.com

Automation of hygiene

Technology-driven hygiene solutions decreasing further spread of COVID-19 making it easier to comply to strict hygiene protocols ultimately protecting at-risk patients in hospital and healthcare personnel. There is equally a need for better hygiene practice outside the clinical context, in the homes of individuals, public spaces and more.

Solution provider

Sani Nudge - www.saninudge.com

UVD - www.uvd-robots.com

Automation of emergency services

To avoid a collapse of healthcare infrastructure, a key task during a pandemic is to manage population health and avoid drastic changes in demand for healthcare services.

Emergency medical services play a key part in this and automated solutions augment the capacity of this critical function.

Solution provider

Corti - www.corti.ai

Automation of oxygen management

O2matic



O₂Matic is based in Herlev, in the Capital Region of Denmark, and specializes in automated oxygen therapy. The company has developed a system that ensures higher compliance for appropriate blood oxygen levels. The O₂Matic system is widely used in Denmark and in 13 other countries, including Italy.

Value during the COVID crisis?

Oxygen therapy is a critical element in the treatment being provided to hospitalized COVID-19 patients. O2Matic offers a clear benefit in automating this aspect of treatment, both in terms of clinical outcome, but also in reducing infection risk for staff, as oxygen therapy typically requires manual operation. In addition, the solution frees up hands in a time of severe staff shortages. The system also complies with WHO's recommendations for treating COVID-19.

Value parallel/post COVID crisis?

The O2Matic system automates a therapy that is common for all respiratory patients and can be used for other respiratory patients. As a result, the value described above is just as relevant parallel to COVID-19 and post-crisis.

Customers (selection)

Clients

The system is used in more than 10 hospitals in Denmark, and deployed in 13 other countries, including several hospitals in Italy. **Please follow this link about its use in the Capital Region.**

Testimonial

"For treating COVID-19 and other respiratory conditions such as COPD, O2matic makes oxygen titration safe and simple."
- HCP from Denmark

Certifications

The O₂Matic System is CE Marked as a class II B medical device
The company is ISO-13845 certified.

Localization

Requires little or no localization. User manual in local language is available, and the user interface follows standardized clinical terminology.

Implementation and resources necessary**Resources needed from the party implementing (e.g. access to data, staff)**

Minimal resources are required to adapt to the system. Training for the system can be done remotely and requires as little as one hour to be up and running.

Beyond considerations on resources, the company is currently in position to react to surge demand and can deliver the system close to immediately.

Time for implementation

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Automation of hygiene

Sani Nudge



sani nudge

Sani Nudge is based in Taastrup, in the Capital Region of Denmark, and specializes in hand hygiene. The company has developed a plug-and-play automated hand hygiene monitoring system that provides intelligent nudging. Sani Nudge is currently deployed in ten hospitals and several nursing homes in Scandinavia.

Value during the COVID crisis?

Sani Nudge has proven to increase hand hygiene compliance, and subsequently lowering infection rates and staff short-term sick leave. This is of value during the COVID-19 crisis, where hygiene protocols may be skipped due to the distress imposed on the healthcare staff. The consequence of this has been apparent, as healthcare staff has been severely exposed to infection, which has led to staff shortage.

Value parallel/post COVID crisis?

Over the course of 12 months at a university hospital in Denmark, Sani Nudge increased hand hygiene compliance by 252%. As a result, a reduction in infections of 64% was achieved, and short-term sick leave dropped by 72%. Hand hygiene remain an important part of a successful hygiene protocol during normal operation, as well as crisis situations.

Customers (selection)

Clients

- Bispebjerg and Frederiksberg Hospitals
- Aarhus University Hospital

Testimonial

"I can mention that prior to the intervention, hand hygiene compliance around the staff toilet was less than 40%; this is now at a steady 90%. Hand hygiene compliance after patient contact also drastically improved." - Clinical Nursing Specialist, Department of Oncology, Aarhus University Hospital

Certifications

Sani Nudge's system is based on WHO's 5 Moments for Hand Hygiene

Localization

Hardware requires no localization. Software requires minimal or no localization.

Implementation and resources necessary**Resources needed from the party implementing (e.g. access to data, staff)**

The Sani Nudge solution uses plug-and-play sensors that work with all existing hand sanitizing products. The sensors have an expected battery life of two years.

Time for implementation

The system takes about three hours to install in each ward and can be done on a day-to-day basis using local implementation partners.

UVD Robots



UVD-Robots is based in Odense, in the Southern Region of Denmark, and specialized in robotic disinfection. The company has developed the UVD Robot, which is a mobile robot for disinfection. It is used as part of the regular cleaning cycle and aims at preventing and reducing the spread of infectious diseases, vira, bacteria, and other types of harmful organic microorganisms in the environment by breaking down their DNA-structure using the technology of UV-C light. The robot is safe, reliable and eliminates human error. Furthermore, it is user friendly and is designed to be operated by every-day cleaning staff.

Value during the COVID crisis?

Automated disinfection decreases the risk of infectious spread among healthcare staff and patients. During crisis care, hygiene and cleaning protocols are under immense pressure, which increases the risk of spread.

Value parallel/post COVID crisis?

Use-case is equally important post-COVID.

Customers (selection)

Clients

More than 50 hospitals have deployed the UVD Robot. Among these are:

- Al Qassimi Hospital
- Odense University Hospital
- Hamburg Hospital
- Rome Private Hospital Group
- Ospedale di Civitavecchia
- Ospedale di Ancona
- Policlinico Umberto I Roma
- Ospedale di Cremona
- Brasov County Hospital
- Oncology Institute Ljubljana
- Belgrade Hospital
- Tungs' Metro Harbor Hospital
- Major Bangkok Hospital,
- Wuhan Xiehe Hospital
- Xiangya Hospital of Central South University
- Castium
- Glan Clywd
- Wrexham Hospital (NHS).

Certifications

CE-Marked according to machinery directive. TÜV/UL 61010-1

Localization

Requires no localization

Implementation and resources necessary**Resources needed from the party implementing (e.g. access to data, staff)**

Technical Engineer is needed for an allocation of 5-30 hours depending on the scope of the installation.

Time for implementation

From half a day to five days. Depends on how much of hospitals needs to be mapped for the automated operation of the robot. If use-case is for one operating theatre, approximately one hour.

Automation of screening and triage

OpenTeleHealth



The COVID-19 product for remote patient monitoring is a specialized version of the proven OTH platform, that through more than 6 years documented its worth, monitoring COPD patients and various other patient groups. The platform provides individual home monitoring alerting clinical staff when symptoms are outside accepted parameters. With real time statistics for screening - surges are immediately visible.

Value during the COVID crisis?

Save healthcare resources, and utilise quarantined healthcare staff. Having symptoms in the screening will trigger automated enrolment in @home monitoring system. This is web-based and runs on any device, and after a short while native APPs are available with device integration. Citizens are automatically processed so ONLY those with severe symptoms are flagged for intervention. 200 nurses can monitor 100.000 citizens (<https://vimeo.com/398166847>).

Value parallel/post COVID crisis?

Protocols and questionnaires can be updated and pushed out dynamically, so new inclusion criterias can be added ad hoc (i.e. loss of taste/smell etc). Vulnerable groups can be preemptively monitored.

Protocol can be completely replaced so system can be applied to other diseases and pandemics. Change done within a day.

Customers (selection)

Clients

- Danish Regions
- 29 Municipalities (NK)
- SVS insurance (Austria)

Testimonial

More than 6 years COPD/CHF/Diabetes/etc experience with proven results, and clinical trials performed. Documented result.

Certifications

- CE mark,
- ISO13485-2016

Localization

Localization has already been done in most major languages but will take 3 days for any new.

Implementation and resources necessary

Resources needed from the party implementing (e.g. access to data, staff)

Clinicians to monitor citizens. Need list of clinicians to preload. Screening access point need to be embedded in public portal.

Time for implementation

2-5 days depending on resource availability and localization needs.

Automation of emergency services

Corti



Corti provides artificial intelligence (AI) and machine learning (ML) solutions for the global healthcare sector, starting with emergency services. The most significant achievement to date has been the development of a Machine Learning model capable of detecting Out-of-Hospital Cardiac Arrests (OHCA) during emergency calls. This model has reduced misdiagnoses of OHCA's by at least 43%, potentially saving thousands of lives a year. The software is designed to be highly scalable: performance improves as the amount of data and the number of users grow.

Value during the COVID crisis?

At Corti, we are uniquely positioned to help Emergency Service Departments and public and private health advice lines battle the COVID-19 pandemic through our artificial intelligence (AI) technology.

Corti Triage (real-time AI decision support): Corti Triage is a software platform based on advanced machine learning and powerful natural language processing. It provides real-time decision support for emergency call-takers, to accurately and swiftly triage and diagnose a range of critical diseases such as cardiac arrest, stroke and COVID-19. It is exceptionally useful in reducing over-triage and under-triage and provides the medical professionals with best-in-class real-time medical decision support. The technology is trained on 100,000's of emergency calls and is able to recognize specific indicators, breathing patterns, keywords and other significant markers and will flag appropriate actions for the healthcare professional to guide the patient towards the next-best action in their treatment. Features include reminding first-responders to wear personal protective equipment if detecting a high-risk COVID-19 patient. It helps medical staff triage faster, more accurately, avoid lengthier calls, and protect first responders.

Corti Pandemic Map: Utilizing the same powerful natural language processing capabilities and advanced medical machine learning healthcare models, combined with formidable location tracking features, we are able to provide healthcare organizations with a real-time overview of the population that is or may be infected. The insights provided by the AI will enable resource planning, interventions, and regulations more precisely than any other tool.

Value parallel/post COVID crisis?

Prior to COVID-19, Corti has already established itself in the pre-hospital sector as well as in hospitals, by proving its ability to develop and implement AI technology for augmenting patient triage performed by medical professionals, such as emergency call-takers and midwives at hospitals. Corti’s machine learning algorithms have proven to significantly enhance and optimize recognition of out-of-hospital cardiac arrests and other critical diseases, more quickly and accurately when used by medical professionals.

Customers (selection)

Clients

- Seattle Fire Department (Medic-One)
- Copenhagen Emergency Medical Services
- SOS Alarm Sweden
- Wellington Free Ambulance
- SDIS/SAMU in France
- Region Nordjylland - Emergency Medical Service

Testimonial

“AI can help dispatchers reach up to 92% accuracy when detecting out-of-hospital cardiac arrests. What an opportunity to partner with Corti to help save lives across Europe.” – EUROPEAN EMERGENCY NUMBER ASSOCIATION (EENA)

“This is an innovation with the potential to change the way Emergency Medical Services handle emergency calls.” – F. Lippert, MD | CEO - EMS Copenhagen & Corti customer

Certifications

We comply fully with both GDPR and HIPAA

Localization

Corti Triage is fluent in English, French, Italian, Danish and Swedish. New languages can be developed and supported within 12 months.

Implementation and resources necessary

Resources needed from the party implementing

- Access to audio data
- Access to existing IT infrastructure for integration purposes

Time for implementation

1 week

Automation of situational overview and capacity management

Systematic

SYSTEMATIC

Systematic A/S develops solutions to various domains including the healthcare sector. Our solutions are developed in close collaboration with our customers to ensure that they are built for the everyday tasks of doctors, nurses, and many more. The Columna product suite covers everything from logistics and overview of patients, procedures, and things to medical device integration, an electronic health record, and a citizen record for home care professionals. Among others, our customers include Central Denmark Region, North Denmark Region, and Region of Southern Denmark, 34 Danish municipalities, hospitals in Sweden, Norway and Finland, several Scottish hospitals, and an Australian hospital. Our goal is to ensure a higher quality of life.

Value during the COVID crisis?

Systematic Situational Overview provides users with a complete overview of COVID-19 patients and protective gear in real time – across wards, departments, hospitals, municipalities, regions and countries. By incorporating COVID-19 data from e.g. Johns Hopkins University into the Systematic solution, it is possible to get a complete overview of where patients with COVID-19 are hospitalized, how many beds are available at various hospitals, what protective gear is available or missing where, and much more. The individual hospital can update its data manually or choose to integrate the solution with the hospital's electronic health record, thereby automatically transferring relevant data to the solution where it is presented in real time.

Value parallel/post COVID crisis?

The solution is equally valuable in post COVID-19 scenarios, as the solution provides overview and capacity management to any healthcare organization, region or country in any relevant situation. E.g. on a regular day-to-day basis, the solution helps doctors and nurses get an overview and distribute patients optimally so every patient is cared for by the relevant clinicians, at the relevant facility, and without fear of being "lost in the crowd" of other patients, as the solution helps minimize overcrowding.

Customers (selection)

Parts of the solution is currently implemented and running in all hospitals in the North Denmark Region and at Randers Regional Hospital in Denmark.

Certifications

As a supplier to both the healthcare sector and the defense sector, Systematic is certified at CMMI level 5 (highest)

Localization

The solution is currently available in Danish and English and can be translated into any language needed.

Implementation and resources necessary**Resources needed from the party implementing (e.g. access to data, staff)**

A bare minimum for cloud implementation and if Systematic is doing the configuration, then a list of e.g. hospital departments and wards is needed. For more complex implementations more resources are needed.

Time for implementation

From a few hours to a few days and maybe more depending on the need for integration to the electronic health record. It also depends on what kind of installation is chosen and whether Systematic or the hospital is doing the configuration.



HEALTH TECH HUB
COPENHAGEN 

Valentin Bejan
CInO
valentin@healthtechhub.org

Jesper Grønbæk
CEO
jesper@healthtechhub.org

 **Healthcare**
DENMARK

Hans Erik Henriksen
CEO
heh@hcd.dk