Er min digitale løsning medicinsk udstyr?

Praksis implementering og overholdelse af regulatorisk forhold

Who are Treat Systems?

- Our dynamic team is focused on development and implementation of specialized healthcare IT solutions

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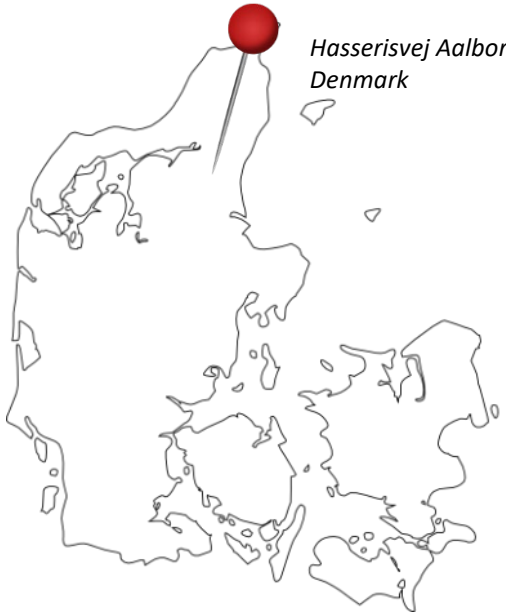


Hasserisvej Aalborg, Denmark

SERVICES AND QUALIFICATIONS

- High performance team

Treat Systems is a dynamic and innovative Danish SME focused on developing certified healthcare software solutions including decision support, machine learning (ML) and artificial intelligence (AI). Our current key clinical focus areas are within infectious diseases, microbiology, antibiotic therapy and antibiotic resistance.

Modelling

- Decision support
- Physiological models
- Machine learning
- Scientific connections to Universities
- Cost-benefit analysis
- Artificial intelligence
- Causal probabilistic (Bayesian) networks

Clinical understanding

- Infectious diseases
- Workflow analysis
- Microbiological and pathological understanding
- Clinical Trails
- Antimicrobial Stewardship
- Sepsis
- Infection control and surveillance

Regulatory compliance

- ISO 13485 – Quality Management System
- ISO 62304 – Software life-cycle processes
- ISO 14971 – Risk Management
- ISO 27001 – Information security
- ISO 27701 – Privacy
- ISO 62366 – Usability
- ISO 14155 – Clinical Investigation

Technologies

- Multi language programming (C#, Angular, C++, JAVA, VBA)
- Web based technologies
- SQL or InterSystems Caché database structure
- Integration to hospital systems e.g. HL7 or FHIR
- Statistical analysis (SPSS, R, Excel, Matlab)

Black box modelling

Tradeoff between performance and transparency

You should use visual graphic that supports interpretation of the algorithm's results

Clinical data

Black box

Input is converted into output

Decision support e.g. risk assessment

- The disadvantage of advanced AI models is that it can be difficult for humans to see how the model has arrived at a given outcome.

AI is a Tool

It is all about selecting the prober tool

Artificial intelligence (AI)

Machine Learning

Deep Learning

- Deep Neural Network (DNN)
- Convolutional Neural Network (CNN)

- Artificial neural networks
- Decision trees
- Support vector machines
- **Bayesian networks**
- Genetic algorithms

- Reasoning
- Knowledge representation
- Planning
- Learning
- Natural language processing
- Perception
- **Cost-benefit**

Regulations and legal

Is my software tool or App a medical device?

The answer to this question is all based on its intended use and the claims. It shall be for diagnostic, treatment, prognosis, prevention purposes for the individualized patient

Placing software medical device on the European market is a long and expensive journey with lots of obstacles and long detours.

Classification Rules - MDR

- Software is now classified as an “active device”
- The important rule for TREAT is Rule 11 (Annex VIII, Chapter 3 of MDR)

6.3. Rule 11

Software intended to provide information which is used to take decisions with diagnosis or therapeutic purposes is classified as class IIa, except if such decisions have an impact that may cause:

— death or an irreversible deterioration of a person’s state of health, in which case it is in class III; or

— a serious deterioration of a person’s state of health or a surgical intervention, in which case it is classified as class IIb.

Software intended to monitor physiological processes is classified as class IIa, except if it is intended for monitoring of vital physiological parameters, where the nature of variations of those parameters is such that it could result in immediate danger to the patient, in which case it is classified as class IIb.

All other software is classified as class I.

TREAT-ESSENTIAL

- THE CLINICIAN DECIDES THE DIAGNOSE(S) AND CAN GET HELP WITH PATHOGEN DISTRBUTION, LOCAL SUSCEPTIBILITIES AND ANTIBIOTIC TREATMENT

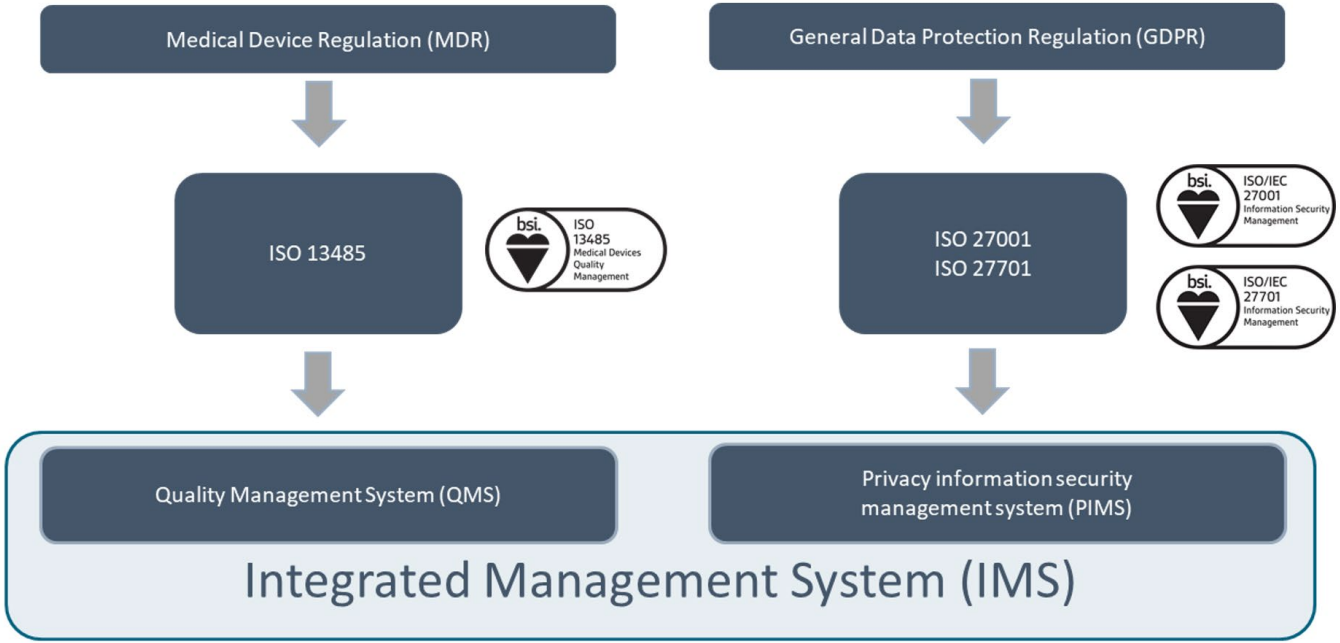
- TREAT Essential is a system that can generate personalized antimicrobial advice bedside within a minute.
- The solution provides a great overview of infection relevant information
- The solution automatically calculates the severity of the infection
- It only requires the diagnosis to be input by the clinician, along with some intelligent follow up questions about symptoms and findings and background information.
- If the doctor wants to see the reasoning behind the personalized and rational antibiotic advice the “Advanced decision support” can be expanded

Statement of intended use

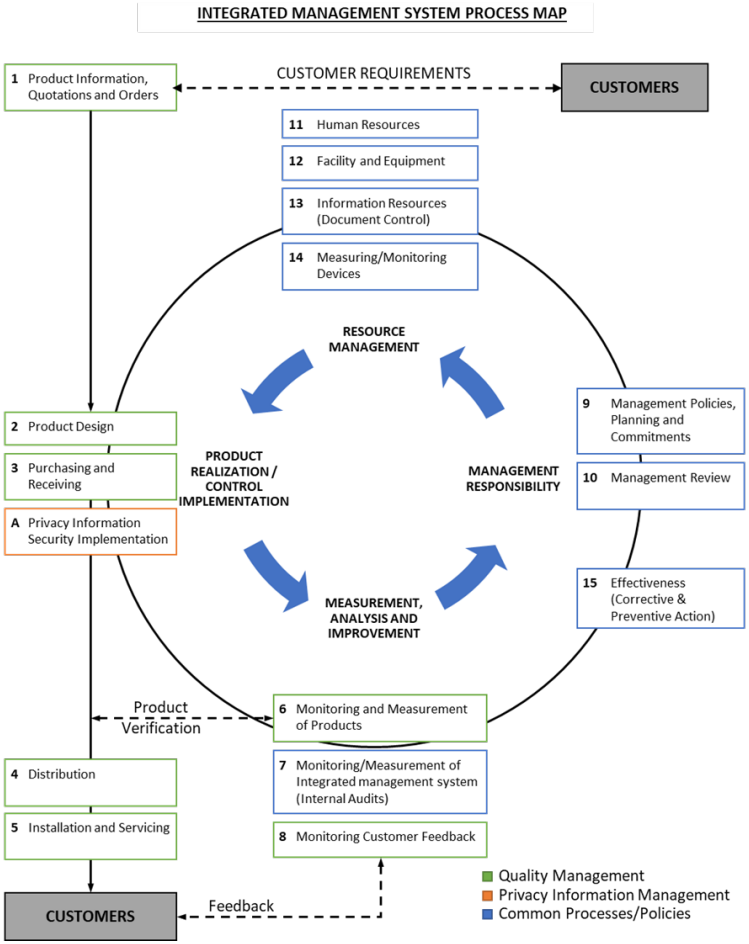
- TREAT-Essential is a stand-alone software product intended to be used to **provide decision support** for guiding hospital physicians on severity of illness, diagnosis, presence of pathogens and choice of antibiotic treatment for bacterial infections. Guidance is provided on the basis of patient demographics, background conditions, vital signs, laboratory test results, symptoms and signs relevant to infection, radiological and microbiological results.
- TREAT-Essential is also intended to be used to **provide advice** on the optimal dosage of antibiotic treatments, based on patient-specific factors such as demographics, renal and hepatic function.
- TREAT-Essential is also intended to be used to generate **personalised** antibiograms to show an estimate of the in-vivo susceptibilities for given antibiotic-bacteria combinations, based on patient-specific factors.

Quality Management and Privacy Information Security

- Treat Systems has designed and implemented an integrated management system (IMS), covering both quality- and privacy information management (QMS and PIMS), in order to better satisfy our customer's needs, to ensure product quality, and to improve the management of our company. The IMS is designed to fulfil the requirements of the international standards ISO 13485, ISO 27001 and ISO 27701, and to ensure compliance with the Medical Device Regulation (EU) 2017/745 (MDR), the General Data Protection Regulation (EU) 2016/679 (GDPR) and local jurisdictional requirements.



Integrated Management System Process Map



Procedures, Work instructions and Templates/Records

- Inspection by the notified body

QUALITY SYSTEM PROCESS MAP

CUSTOMER REQUIREMENTS

CUSTOMERS

1 Product Information, Quotations and Orders

SOP-72-01 Order Processing and review

MANAGEMENT RESPONSIBILITY

9 Management Policies, Planning and Commitments

10 Management Review

15 Effectiveness (Corrective & Preventive Action)

FRM-71-01-01 Risk Management File

FRM-71-01-02 Risk Management Plan

FRM-73-01-01 Design and Development Plan

FRM-73-01-02 Software Development Plan

FRM-73-01-03 Quality and Regulatory Plan

FRM-73-01-04 Product Requirements Document

FRM-73-01-05 Software Requirements Specification

FRM-73-01-06 Detailed Design

FRM-73-01-07 Verification/ Validation Test Plan

FRM-73-01-08 Verification/ Validation Test Protocol

FRM-73-01-09 Software Release Notes

FRM-73-01-10 Software Code Review Document

FRM-73-01-11 Change Notice

FRM-73-01-12 Declaration of Conformity

FRM-73-01-13 Design History File Index

FRM-73-01-14 Device Master Record Index

FRM-73-01-15 ISO Label

FRM-73-01-16 Traceability Matrix

FRM-73-01-17 Software Release Plan

FRM-73-01-18 Software Change Request

FRM-73-01-19 Verification/ Validation Test Report

WI-73-01-01 Design an Development Planning

WI-73-01-03 Software Verification and Validation

WI-73-01-04 Software Coding Standard

WI-73-01-05 Software Code Review

WI-73-01-02 Software Development

WI-73-01-08 Software Update Process

WI-73-01-07 Media Creation and Labelling

WI-73-01-06 Traceability Matrix

FRM-85-01-0 Record

FRM-85-01-0 Report

SOP-62-01 Competence, Awareness & Training

SOP-42-01 Control of Documents

SOP-42-03 Control of Records

SOP-76-01 Measuring & Monitoring Equipment

SOP-56-01 Management Review

SOP-56-02 Quality Objectives

SOP-84-01 Analysis of Data

SOP-85-02 Corrective & Preventive Actions

SOP-83-01 Control of Nonconforming Products

SOP-82-01 Post-production Feedback

SOP-82-02 Internal Quality Audit

SOP-82-03 Monitoring and Control of QMS

SOP-85-03 Adverse Event Reporting

SOP-73-05 Clinical Evaluation

FRM-62-01-01 Individual Training for Name

FRM-62-01-02 Competence Requirements Matrix

WI-42-01-01 Document Numbering System

FRM-42-01-01 Generic Document

FRM-42-01-02 Review Record

FRM-42-01-03 Generic Excel Document

FRM-56-01-01 Agenda for Management Review Meetings

FRM-56-02-01 Quality Objectives Record

FRM-85-02-01 Corrective Action Request

FRM-82-01-01 PMS Plan

FRM-82-01-02 PMCF Plan

FRM-82-01-03 PSUR

FRM-82-01-04 PMS Report

FRM-82-01-05 PMCF Report

FRM-82-02-01 QMS Audit Questionnaire

FRM-82-02-02 Internal Audit Plan

FRM-73-05-01 Clinical Evaluation Plan

FRM-73-05-02 Literature Search Report

FRM-73-05-03 Clinical Evaluation Report

FRM-73-05-04 Declaration of Interest

Overview of the Technical Documentation

Technical file

Design history file (DHF)

- **Planning** (Quality/Regulatory planning and rationale, design/dev planning)
- **Design Input** (Customer/Product Requirements)
- **Design Output** (Design and detailed design documents, IFU etc)
- **Design Review** (Review docs)
- **Design Verification** (Test plans, protocols, reports for each release)
- **Design Validation** (Test plan, protocol for customer site validation)
- **Design Transfer** (Process for creating device master record, DMR index)
- **Design Changes** (Release history and release plans, notes for each release)
- **Risk Management** (Risk management plan, risk file and risk mitigation/fallback procedures for communication to the customer, as appropriate)

Device master record (DMR)

- **Device specifications** - software, database architecture, software configuration items, description of external interfaces
- **Location/specification** of software source code/binaries
- **Installation files** - maintenance and servicing information including IFU, installation instructions, installer files, configurations/settings
- **Risk management** - documentation for the customer

Clinical evaluation

- **Clinical evaluation plan** - General safety and performance requirements, Intended target groups, Intended clinical benefit, Clinical safety, determination of benefit-risk ratio, clinical investigation plan
- **Literature search report -** Research questions, literature search methodology, data source, analysis and appraisal plan, search results
- **Clinical evaluation report -** Clinical background, state of the art, device under evaluation and conclusion

Post marked surveillance

- **Post market surveillance plan** – when completed, forms the basis of the PMSS for the device
- **Periodic safety update report (PSUR)** – required for Class IIa+, frequency of 2 years for IIa, 1 year for IIb+
- **Post market surveillance report** – equivalent of PSUR but for Class I devices, fewer requirements
- **Post market clinical follow up plan** – describes the ongoing data collection and analysis process
- **Post market clinical follow up report** – included in updates to the clinical evaluation
- **Risk management plan** – describes the extent of risk management activities
- **Risk management file** – compilation of all risks, mitigations etc.

Implementation of the QMS

Visual Studio

Azure DevOps

SharePoint

Requirements

Tests cases

Risks

Backlog items

Developer tasks

Releases

Defects/ Bugs

Change request

Other tasks handled in DevOps:

Automatic code review

Manual code review

Automatic code coverage/unit tests

Automatic vulnerability and security tests

REGULATIONS ABOUT FOR IN-HOUSE MANUFACTURING

(MDR Article 5(5))

Article 5

Placing on the market and putting into service

1. A device may be placed on the market or put into service only if it complies with this Regulation when duly supplied and properly installed, maintained and used in accordance with its intended purpose.

2. A device shall meet the general safety and performance requirements set out in Annex I which apply to it, taking into account its intended purpose.

3. Demonstration of conformity with the general safety and performance requirements shall include a clinical evaluation in accordance with Article 61.

4. Devices that are manufactured and used within health institutions shall be considered as having been put into service.

5. With the exception of the relevant general safety and performance requirements set out in Annex I, the requirements of this Regulation shall not apply to devices, manufactured and used only within health institutions established in the Union, provided that all of the following conditions are met:

(a) the devices are not transferred to another legal entity,

(b) manufacture and use of the devices occur under appropriate quality management systems,

(c) the health institution justifies in its documentation that the target patient group's specific needs cannot be met, or cannot be met at the appropriate level of performance by an equivalent device available on the market,

(d) the health institution provides information upon request on the use of such devices to its competent authority, which shall include a justification of their manufacturing, modification and use;

(e) the health institution draws up a declaration which it shall make publicly available, including:

(i) the name and address of the manufacturing health institution;

(ii) the details necessary to identify the devices;

(iii) a declaration that the devices meet the general safety and performance requirements set out in Annex I to this Regulation and, where applicable, information on which requirements are not fully met with a reasoned justification therefor,

(f) the health institution draws up documentation that makes it possible to have an understanding of the manufacturing facility, the manufacturing process, the design and performance data of the devices, including the intended purpose, and that is sufficiently detailed to enable the competent authority to ascertain that the general safety and performance requirements set out in Annex I to this Regulation are met;

(g) the health institution takes all necessary measures to ensure that all devices are manufactured in accordance with the documentation referred to in point (f), and

(h) the health institution reviews experience gained from clinical use of the devices and takes all necessary corrective actions.

Member States may require that such health institutions submit to the competent authority any further relevant information about such devices which have been manufactured and used on their territory. Member States shall retain the right to restrict the manufacture and the use of any specific type of such devices and shall be permitted access to inspect the activities of the health institutions.

This paragraph shall not apply to devices that are manufactured on an industrial scale.

Quality management system + Full technical file inclusive Post Marked Surveilance

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