



mona

# The smart assistant for the intensive care unit



Clinomic Medical GmbH  
Jülicher Straße 306  
52070 Aachen

[www.clinomic.ai](http://www.clinomic.ai)  
E: [info@clinomic.ai](mailto:info@clinomic.ai)  
P: +49 241-89438737

Commercial register / Handelsregister  
Amtsgericht Aachen  
HRB 22667  
Tax-ID / Umsatzsteuer-ID  
DE815819181

Chief Executive Officer / Geschäftsführer  
Dr. med. Arne Peine  
PD Dr. med. Lukas Martin  
Dr. med. Thomas Wolfram

“Mona”, “Clinomic”, “MedicBI” are protected  
Trademarks under European law.  
The Mona design is protected under European law.





# Contents

04 | Our  
Story

05 | Status quo of  
Intensive Care

06 | Challenges of  
Intensive Care

07 | Who is  
Mona?

08 | Mona  
Hardware

10 | Artificial  
Intelligence

11 | Support  
for the ICU

12 | Features  
of Mona

16 | Mona System  
Architecture

17 | References

18 | Contact

# Our Story

Patients come first in everything we do.

In 2019, we founded the Clinomic Medical GmbH as a spin-off of RWTH Aachen University. In addition to the founders, intensive care physicians Dr. Arne Peine, Priv.-Doz. Dr. Lukas Martin and Univ.-Prof. Dr. Gernot Marx, Clinomic consists of a steadily growing, interdisciplinary and international team.

With Clinomic, we have succeeded in bringing artificial intelligence and machine learning directly to the patient's bedside. Our goal is to rethink intensive care medicine and radically simplify everyday life in the ICU. As an intelligent assistance system, Mona provides ICU staff with more time and safety in the treatment of critically ill patients, enabling them to receive the best possible care.



“We design products to make a real impact on the lives of critically ill patients”

Dr. Arne Peine, Dr. Lukas Martin



Bundesministerium  
für Bildung  
und Forschung

Die Landesregierung  
Nordrhein-Westfalen



KI BUNDESVERBAND



reddot winner 2021



reddot winner 2021  
smart product



# Status quo of Intensive Care Medicine



## Rising demand

The demand for intensive care medicine is expected to double by 2030.



## Growing data density

Non-medical activities take up to 50% of time. There is an exponential increase in the amount of data. 1.000 datapoints per patient per hour are generated, with a growth of 30% per year.



## Costly treatment mistakes

Avoidable treatment mistakes generate costs up to 40 billion € per year.

Intensive care medicine is the heart and critical component of a modern hospital. Many of surgical and non-surgical advances within the last four decades are rooted and closely connected to developments in intensive care medicine. Furthermore, providing high-quality intensive care ensures not only survival but also the quality of the saved life.

The ageing society and arising health-care crises, such as the 2020 coronavirus pandemic, are leading to a drastically increased demand for intensive care beds worldwide.

In addition, the number of qualified intensive care specialists often does not cover the demand, since the specialists are unevenly distributed between centres and peripheries.

The demand for intensive care medicine is expected to double by 2030. The quality of provided intensive care highly impacts the global health-care systems and the economy in general.

# Data is the biggest risk and the biggest opportunity for hospitals

The successful work of interdisciplinary health care teams is highly dependent on the quality of electronic health data. Today, this data is mostly collected in what are known as “patient data management systems.” Here, numerous laboratory values, vital signs and medical devices, as well as data from observations, treatments and diagnostic measurements are combined in a common database.

However, especially in intensive care units, relevant values are often hidden in a flood of irrelevant data points, so that physicians spend a lot of time distinguishing between important and unimportant parameters under high time pressure. In the fast-paced daily routine of the intensive care unit, this becomes a major challenge. Even small misjudgments can have enormous consequences.

Thus, the emerging high data density is both one of the greatest opportunities and one of the greatest threats to the current healthcare system. Innovative solutions are needed that take greater advantage of the opportunities while minimizing the risk factors. With the Mona system, Clinomic Medical GmbH addresses these challenges to enable data-driven, cost-controlled and evidence-based critical care medicine.

**1,000**

data points per  
patient per hour

**50%**

of workload in  
administration  
and review

# Who is Mona?

Mona, the „Medical-On-Site-Assistant“



## **Mona supports doctors with treatment decisions.**

Mona keeps track of all clinical measures and significantly reduces the documentation workload, giving doctors and nurses more time for the patients. Mona also enables telemedicine sessions with colleagues.



## **Mona is the first smart assistant at the patient bed.**

Mona is a smart bedside device for the intensive care unit, using state-of-the-art artificial intelligence to assist healthcare workers with rational, economic, medical, and organizational decisions.



## **Mona is secure.**

Mona connects seamlessly with the existing infrastructure. Data security and integrity are the most important design principles of our software, keeping the patient's data protected and on-premise at all time.



## **Mona speaks your language.**

Ask Mona for anything related to the treatment or patient. Mona understands natural language, there is no need to learn complex commands.

# Mona Hardware



High-Speed Artificial Intelligence chipset by NVIDIA

Enables ultra-low latency processing of algorithms on premise



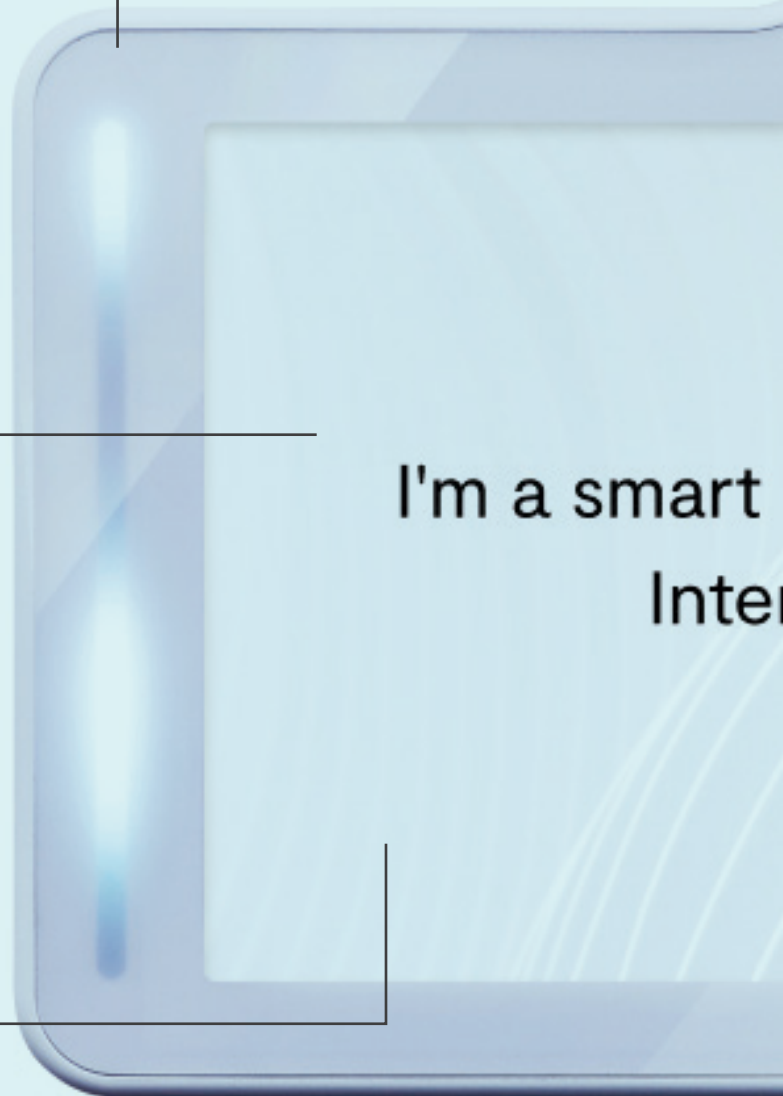
60 Ghz radar and localization chip by Infineon

For the best performance even in low lighting conditions



5G- und LTE-mobile connectivity

For excellent connectivity at all times







### 180-degree-4K-telemedicine camera

To provide the full view during telemedicine sessions

bedside device for the  
Intensive Care Unit



### Artificial Intelligence powered microphone arrays

Eight microphone arrays  
guarantee crystal clear  
audio without background  
noises during telemedicine

# Mona brings artificial intelligence to the patient bed

Medical knowledge and the volume of available health data double approximately every three years. The complexity of precise, evidence-based medicine is constantly increasing. Medical staff spend around half of their time in front of computer screens instead of attending to patients at the intensive care bedside. This is exacerbated by economic restrictions and increasing documentation requirements, which lead to a steadily increasing workload and rising costs for hospitals.

Most of today's medical software relies on static rules instead of dynamic, case-specific algorithms. This leads to alert fatigue among treating staff.

We have assembled an interdisciplinary team of physicians, researchers and medical IT experts to develop Mona, the intelligent assistance and telemedicine system. It helps with documentation, patient data viewing and precise treatment. Mona communicates in straightforward language and frees up time for what matters most: time for patients and their families.



# Support from admission to discharge

SmartPDMS



SmartDocumentation



SmartLabs



TeleICU



# Integrated: The patient data management of the future

Developed by medical experts for medical experts

## Connects all data

The intelligent Patient Data Management System (PDMS) enables the display, preparation and documentation of patient data in order to support clinical staff in their daily workflow.

## Supports the treatment optimally

Using Artificial Intelligence, Mona significantly reduces patient data density, such as lab data, vital signs and lab values, enabling doctors and nurses to focus on relevant data to their workflows.

## Checklists with artificial intelligence

Clinical checklists, such as FAST-HUG or other relevant guidelines, are automatically pre-filled by the system on the basis of data already entered. This enables doctors and nurses to focus more on clinical pathways instead of extracting data from databases.







## Speaks your language: documentation with AI

The “SmartDocumentation” module enables a complete and comprehensive documentation of all medical findings and procedures in an intuitive and understandable way.

The module allows clinicians to accurately document patient data using natural language. If something has been unclear or forgotten: Mona knows, which information is necessary. Mona asks questions, in case of unclear or incomplete information, ensuring a complete and accurate treatment. For example, a doctor can say “document 500 mg of paracetamol”. The system will analyze the voice command and understand its intent, checking various fields of the request. With the help of AI, Mona is able to provide qualified answers to questions and to store relevant information in the patients history.

# Sets a focus on the relevant data: SmartLabs

SmartLabs suggests which lab values are most important to monitor, taking into account the clinical course, pre-existing conditions and the individual disease progression.

A typical ICU patient generates up to 100 laboratory values per day. This results in the challenge of monitoring and responding to changes in these values. In many cases, however, only a few laboratory values are relevant for the current treatment. Filtering these out is cost-intensive and error-prone.

The relevant data (laboratory values, vital signs and demographic data) are extracted from the patient's past data points. Mona uses artificial intelligence and a complete view of all available data (the so-called "patient data fingerprint") to predict how lab values will behave in the future.

This allows the treating staff to focus on relevant laboratory data at an early stage and spend less time in processing the "data jungle".





“Hey Mona, connect me with an ICU consultant”



## Connects to experts around the globe: safe telemedicine

The formation of “telemedical excellence centers” is an efficient and fast way to provide telemedical specialist care to large populations. This is especially true for the reaction to global crises, such as the coronavirus pandemic.

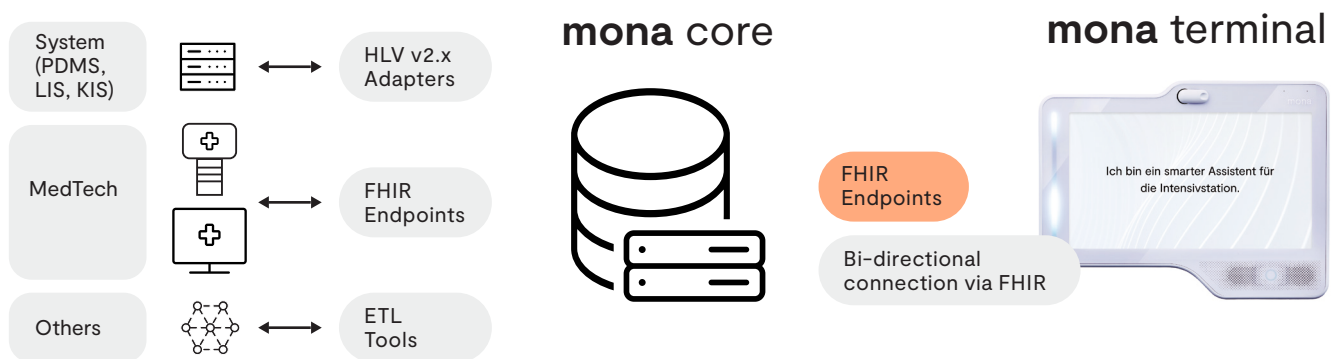
Mona TeleICU is a safe telemedicine platform, that enables clinicians to securely perform telemedicine through an encrypted audio-video connection, enabling specialist care at the patient bed. The implementation of telemedicine as a structural innovation improves the quality of treatment and the efficiency of patient care.

Mona enables clinical partners to discuss patient cases with other clinical experts, i.e. in the field of infectiology or pharmacology, adding specialized expertise to the treatment.

The system works independently from the hospital infrastructure and ensures highly encrypted telemedicine. For TeleICU, no specialized hardware is required. Every modern internet-browser (WebRTC technology) can be used.



# System architecture of Mona





# References

- [1] Andel, C. "The economics of health care quality and medical errors." PMID: 23155743, National Center for Biotechnology Information – PubMed, Fall 2012, <https://www.ncbi.nlm.nih.gov/pubmed/23155743>.
- [2] A Review of Early Warning Systems for Prompt Detection of Patients at Risk for Clinical Decline, J Trauma Acute Care Surg, January 2019. <https://www.ncbi.nlm.nih.gov/pubmed/30633094> Accessed December 22, 2019.
- [3] A Real-Time Early Warning System for Monitoring Inpatient Mortality Risk: Prospective Study Using Electronic Medical Record Data, J Med Internet Res 2019. [https://cdn.journals.lww.com/jtrauma/Abstract/2019/07001/A\\_review\\_of\\_early\\_warning\\_systems\\_for\\_prompt.12.aspx](https://cdn.journals.lww.com/jtrauma/Abstract/2019/07001/A_review_of_early_warning_systems_for_prompt.12.aspx) Accessed December 22, 2019.
- [4] To Catch A Killer: Electronic Sepsis Alert Tools Reaching A Fever Pitch? BMJ Quality and Safety, September 2019. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6702042/> Accessed December 23, 2019
- [5] Identifying Patients with Sepsis on the Hospital Wards, Chest, April 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5472513/> Accessed December 22, 2019.
- [6] Prevalence, Underlying Causes, and Preventability of Sepsis-Associated Mortality in US Acute Care Hospitals, JAMA Network Open, Critical Care Medicine, February 2019. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2724768> Accessed December 23, 2019.
- [7] Tele-ICU: Efficacy and Cost-Effectiveness Approach of Remotely Managing the Critical Care, The Open Medical Informatics Journal, 2013. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3785036/> Accessed December 23, 2019
- [8] Levinson, Daniel. "Adverse Events in Hospitals: National Incidence Among Medicare Beneficiaries." OEI-06-09-00090, Page 50 Table G-1, Department of Health and Human Services – Office of Inspector General, Nov. 2010, <https://oig.hhs.gov/oei/reports/oei-06-09-00090.pdf>
- [9] Rothschild, JM. "The Critical Care Safety Study: The incidence and nature of adverse events and serious medical errors in intensive care." PMID: 160943, National Center for Biotechnology Information – PubMed, Aug. 2015, <https://www.ncbi.nlm.nih.gov/pubmed/16096443>



# Patients come first. In everything we do.

We create groundbreaking solutions for the critically ill by combining translational medical research, data science and computational intelligence. With a patient-centric view, we combine state-of the-art research with modern technologies to enable an optimal treatment for every patient.

## Any questions?

[www.clinomic.ai](http://www.clinomic.ai) / [info@clinomic.ai](mailto:info@clinomic.ai)



**PD Dr. med. Lukas Martin, MHBA CEO**  
[lmartin@clinomic.ai](mailto:lmartin@clinomic.ai)



**Dr. med. Arne Peine, MHBA CEO**  
[aphine@clinomic.ai](mailto:aphine@clinomic.ai)



**Dr. med. Thomas Wolfram, MBA CEO**  
[twolfram@clinomic.ai](mailto:twolfram@clinomic.ai)

---

# Notes

---



**clinomic**  
[www.clinomic.ai](http://www.clinomic.ai)



reddot winner 2021