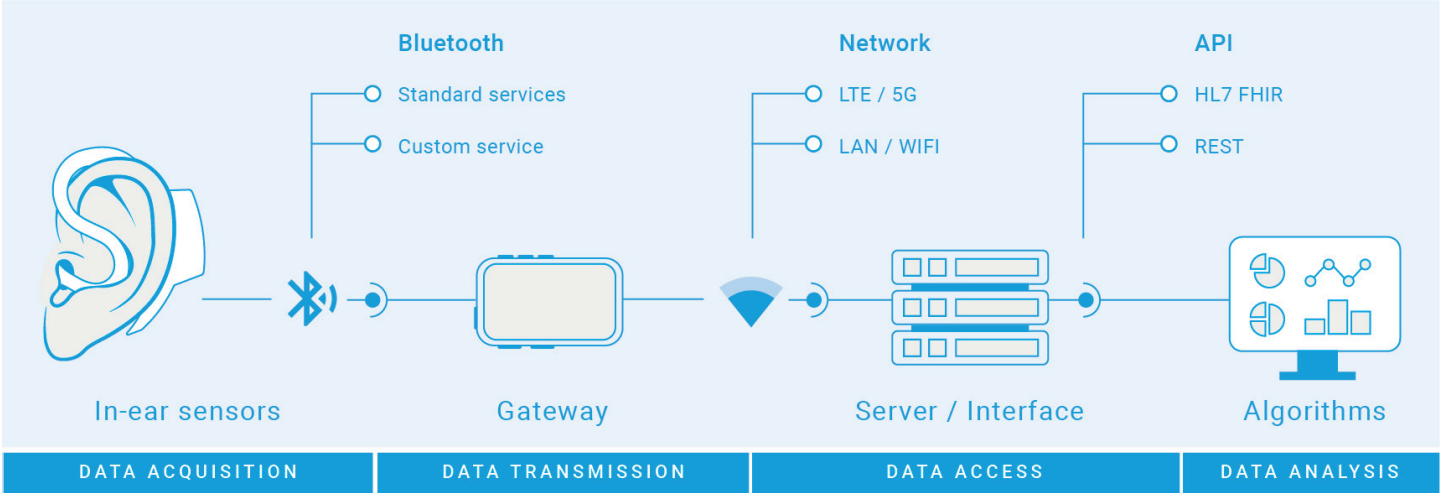
Remote Patient Monitoring

COSINUSS°

Technology



OPEN ARCHITECTURE. HIGHLY INTEROPERABLE.

Remote Vital Signs Monitoring System

cosinuss° offers a complete patient monitoring system starting from continuous data acquisition, through data transmission, data access and data analysis. The system can be accessed at arbitrary points via standardized or customizable interfaces to integrate parts of or the whole solution into existing third-party infrastructure.

cosinuss°' core competence hereby lies in the excellent data acquisition which is the essential basis for all further processing and the prerequisite for relevant health insights.

Remote monitoring of patients is the essential additional service of the health care of the future. Not only is there the need to cut healthcare costs on a large scale but also the fact that patients recover better in their home environments or the need for better care in case of chronic diseases.

GAINS

DATA ACQUISITION

Excellent raw data acquisition

Certified algorithms

Edge computing

DATA TRANSMISSION

Enabling new use cases

Stable transmission

DATA ACCESS

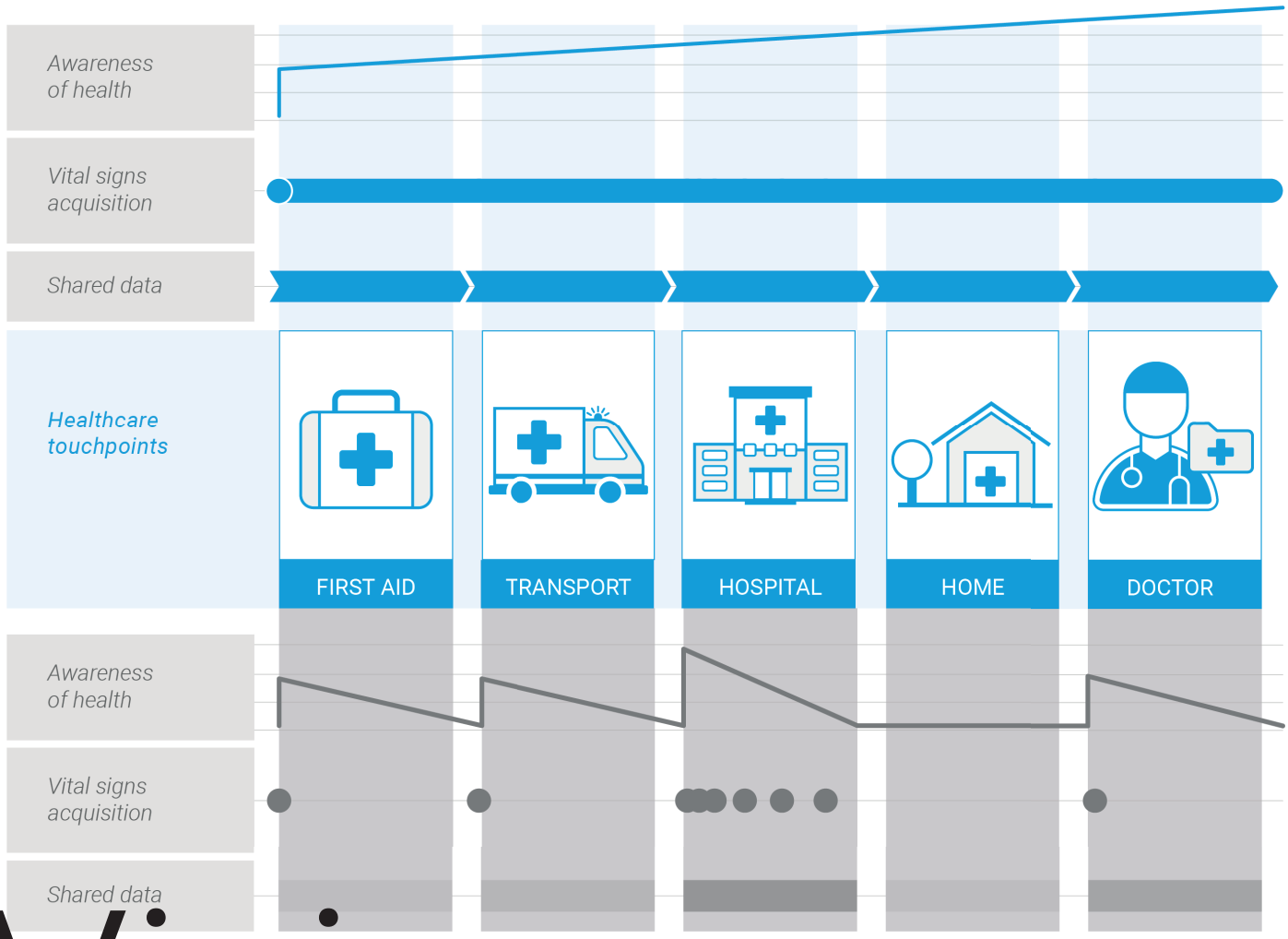
Safe server architecture

Access control

Standardized interfaces

DATA ANALYSIS

Indication specific algorithms



Vision

WITH COSINUSS°

Continuous availability and access to vital signs data.

Continuous monitoring and accessibility of all relevant vital signs from accident to arrival of emergency team and transport, during whole hospital stay until full recovery at home and potentially even longer.

INSTEAD OF:

- One-time measurements at only a few points of the patient journey and thus lack of awareness of health status and critical developments.
- Complicating things with interoperability issues between different stages of the patient journey and lack of data sharing.

GAINS

MEDICAL PERSONAL

Continuous awareness of health status of every patient. Taking care of critical patients.

PATIENT

Personalized healthcare. Increased safety.

PHYSICIAN

Better and faster decision making.

HEALTH INSURANCE

Significant cost reduction.

REMOTE MONITORING OF COVID-19 PATIENTS

Deciding on hospitalization remotely

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Within the framework of this clinical trial conducted by the university clinic of Technical University Munich, cosinuss° provided a highly cost-effective, easy to handle and fast to configure extended workbench for healthcare centers. The cosinuss° remote vital signs monitoring system allowed to remotely monitor high risk patients of COVID-19, who were in home isolation. Key vital parameters were measured day and night using the cosinuss° in-ear sensor technology.

All data was streamed to the university clinic in real time to provide the data basis for decision on hospitalization of the monitored patients. The aim of this study was to investigate how continuous remote monitoring of vital parameters can reduce the number of COVID-19 severe cases, by enabling timely and effective intervention for patients who are in need of it. It also showed the usability and reliability of the cosinuss° technology in remote applications and projected potentials to relieve the healthcare system with optimized hospitalizations.

Patients
153

Daily monitoring Ø
12.9 hours

Overall monitoring Ø
9.6 days

Overall RAW data points
11,800,000,000

Vital sign data points
145,300,000

PLOS ONE | Schmidt, Wurzer and Spielhagen et al 2021 - Remote Monitoring of COVID-19 Positive High-Risk Patients in Domestic Isolation: A feasibility study
IEEE Computer Society | TELECOVID: Remote Vital Signs Monitoring of COVID-19 Risk Patients in Home Isolation With an In-Ear Wearable

Klinikum rechts der Isar
Technical University Munich

Dr. med. Heike Jansen
(Polyclinic for Gynecology)

REMOTE MONITORING OF ONCOLOGY PATIENTS

Accompaniment of systemic cancer therapy

5

The team around Dr. Heike Jansen of the Clinic and Polyclinic for Gynecology at the Klinikum rechts der Isar of the Technical University of Munich has been conducting a feasibility study on the collection of self-report and vital data of patients undergoing systemic cancer therapy since September 2021. The aim was to find out to what extent the vital parameters measured with the cosinuss° in-ear sensor are suitable for telemonitoring in order to detect and treat infections at an early stage. Publications of the results are currently in preparation.

Patients
84

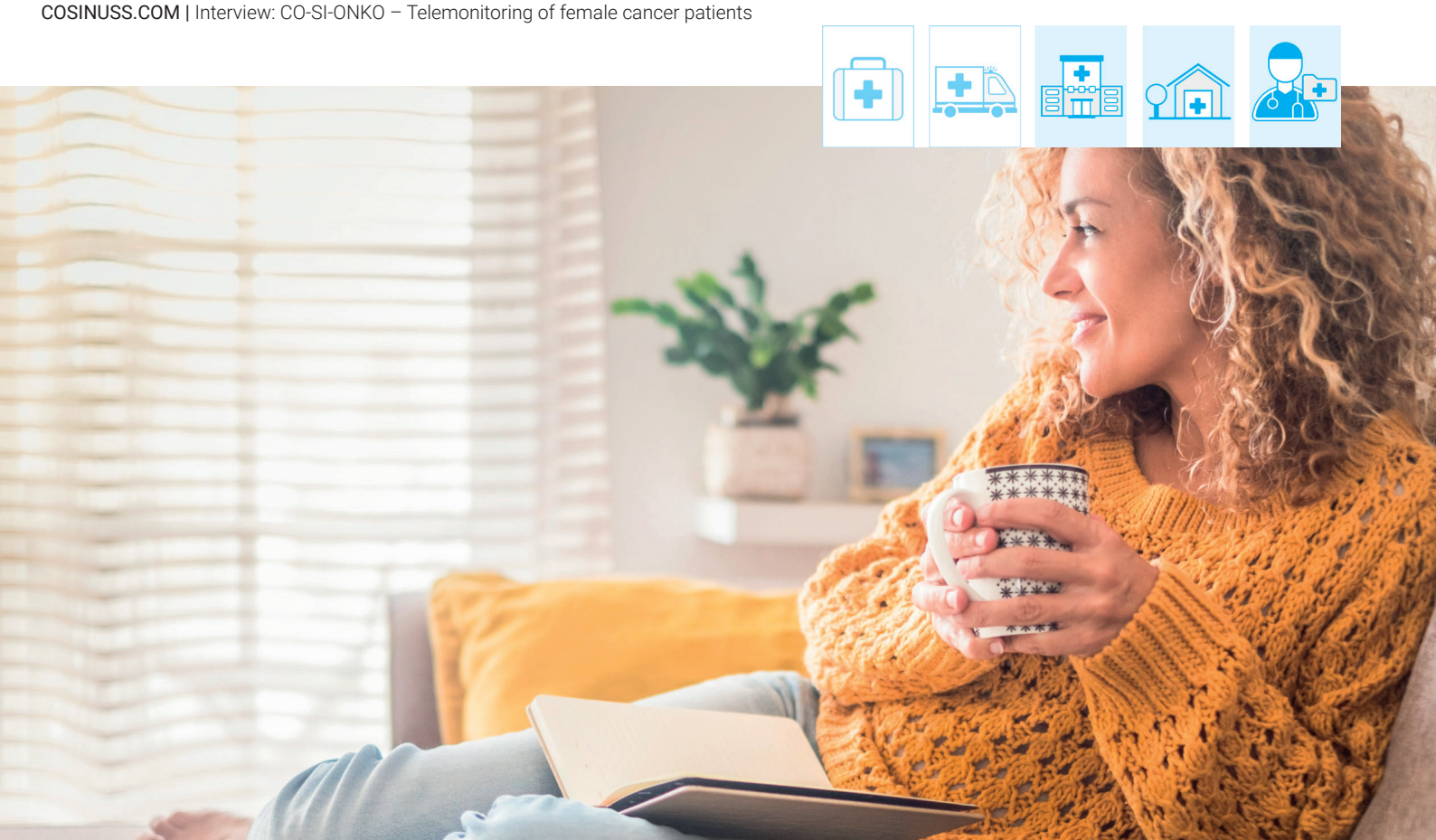
Daily monitoring Ø
2.64 hours

Overall monitoring Ø
8.2 days

Overall RAW data points
14,200,000,000

Vital sign data points
89,300,000

CLINICALTRIALS.GOV | Covid-19 Predictors: Safety of Gynecological Oncology Patients Undergoing Systemic Cancer Therapy (CO-SI-ONKO)
COSINUSS.COM | Covid-19 predictors: safety of gynecologic oncology patients receiving systemic cancer therapy.
COSINUSS.COM | Interview: CO-SI-ONKO – Telemonitoring of female cancer patients



LMU University Munich
Martin Air Rescue

PD Dr. R. Schniepp (Department of Neurology)
Dr. Boris Buck (Medical Coordinator of
Martin Air Rescue)

EMERGENCY MEDICINE AND ALPINE RESCUE

First aid in difficult-to-access accidents

6

In a technical feasibility study carried out by research teams from the Ludwig Maximilian University in Munich together with the Bavarian Mountain Rescue Service and Martin Air Rescue (Scharnstein, Hochgurgl, AUS), the cosinuss° in-ear sensor technology is being field tested in helicopter flights to validate its usage in emergency rescue operations.

At this year's congress of the International Commission for Alpine Rescue, the ‚ICAR', in Montreux, the results were presented to mountain rescue services from all over the world. Particularly noteworthy are the results of usage in the areas of resuscitation, hypothermia and transport capability, which promise a paradigm shift in first aid in difficult-to-access situations.

Recently, an interdisciplinary team from the Technical University of Munich has been evaluating the full potential for holistic integration of the service into the special infrastructure of emergency rescue and its professional requirements and influencing factors in usability studies.

All-in-one device

Professional patient monitoring view

Field-tested in extreme outdoor scenarios

ICAR-Congress 2022 | Keynote-Speech by PD Dr. R. Schniepp and Dr. Boris Buck
Annual Report Mountain Rescue Bavaria 2021 | MoReTech: Mountain RescueTechnology Study
COSINUSS.COM | Study: In-Ear Sensor Technology in Mountain Rescue

LMU University
Hospital of Munich (Großhadern)

PD Dr. med. Roman Schniepp

HEART SURGERY

Temperature validation against Gold Standard

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At the University Hospital of Munich in Großhadern, a validation study for core body temperature measurements of the c-med° alpha against gold standard temperature probes is currently ongoing. During heart surgery, patients are continuously monitored with the c-med° alpha in both ears and with four additional temperature probes: nasopharyngeal, vesical, esophageal and rectal. For the duration of the surgery, patients are cooled down to as low as 22°C and afterwards heated up again to normal body temperature. The data of the temperature probes and the two c-med° alphas during the whole process is compared afterwards and conclusions are drawn.

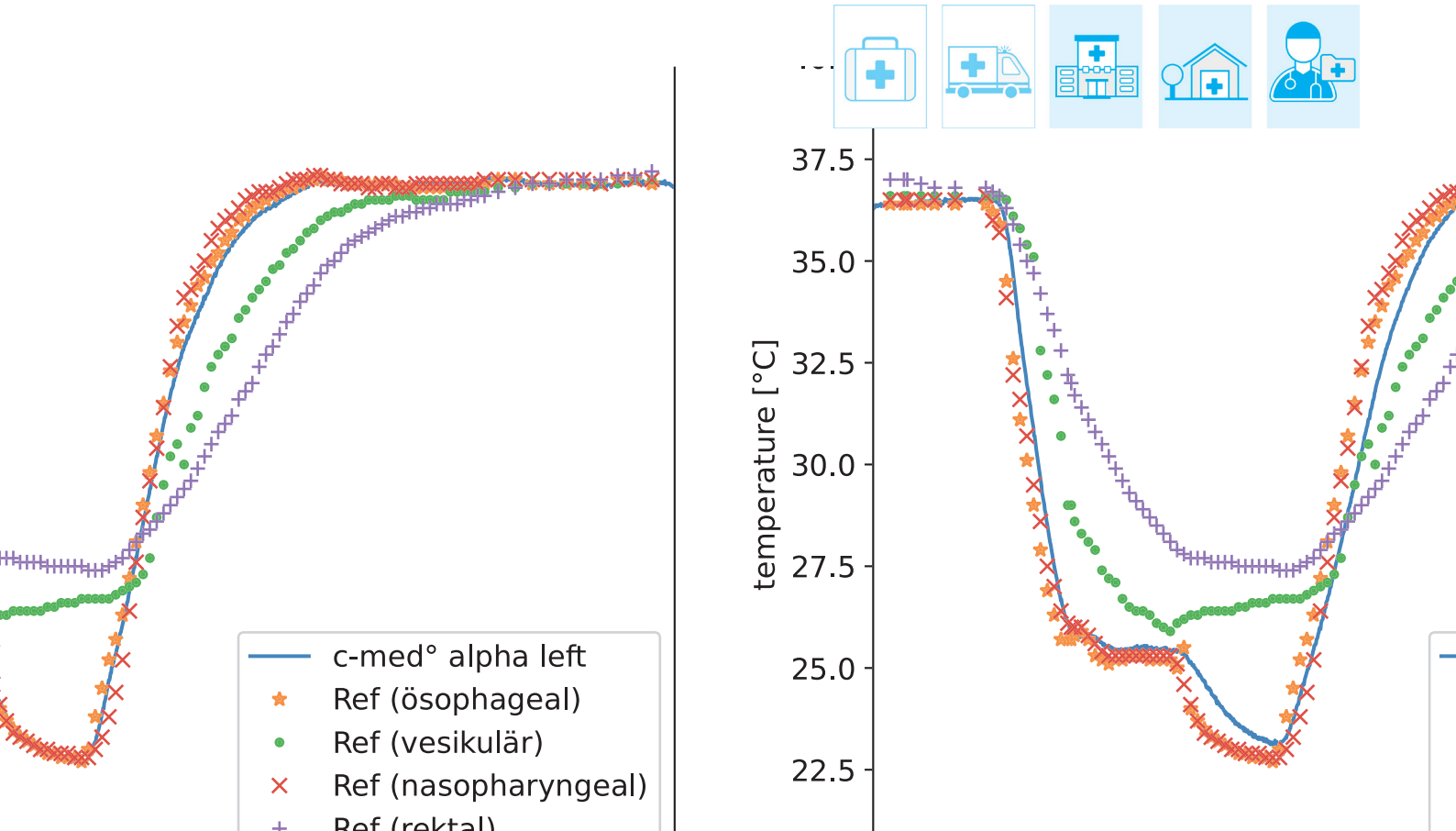
Intermediate data implies that the c-med° alpha can accurately track core body temperature not only at near normal body temperature ranges but also during hypothermia. Results will be published in a peer-reviewed journal.

Quick response to temperature changes

Small and wireless temperature monitoring

Excellent convergence to core body temperature

ICAR-Congress 2022 | Keynote-Speech by PD Dr. R. Schniepp and Dr. Boris Buck, Intermediate results Publication in process.



cosinuss°

Health


POKL29
54%
00:00:43
5
111
21
82
95
37.6
0.8
NL2D
MN34GY
75%
00:00:24
4
91
18
85
97
38.4
1.2
FHG4
ZTBV4D
74%
00:00:22
3
120
16
98
96
38.1
1.8
5HKJ
JXGH40
23%
00:01:19
3
98
18
67
95
37.3
0.7
HDG4
LAKS3V
56%
00:00:54
1
64
15
87
95
37.0
0.8
9HK0
BG3680
44%
00:00:16
0
71
17
79
98
37.8
1.5
DHFB
45TGBW
00:00:00
5B60
39FV09
00:00:00
c-med° alpha
degree°

cosinuss° Health

Platform solution

10

DATA ACQUISITION

One to replace them all

Current solutions for remote patient monitoring leave the patient with highly complex tasks alone. The home operation of multiple measuring devices such as thermometers, pulse oximeters and blood pressure monitors without professional help is not easy, but time-consuming and error-prone. Additional effort is required to collect data manually and technical knowledge is needed to transmit it successfully.

Incomplete data, data arriving too late or false alarms are only the smaller problems, patients dropping out of the remote monitoring procedure completely due to complexity the bigger one. This makes remote patient monitoring cumbersome and frustrates both patients and health care providers.

The remote patient monitoring solution, cosinuss° Health, reduces the complexity on the side of the patient to a minimum. With the c-med° alpha, it replaces three devices with one accurate in-ear sensor. After the application of the sensor in the ear, measurements start and end in an automated manner which is configured by the health care provider. Data is transmitted seamlessly and saved in a safe location. Patients have thus significantly less effort and stay motivated. Reliability and interoperability of the data acquisition is increasing immensely.

DATA TRANSMISSION

Connecting the dots

The connection between patient and healthcare provider must meet many requirements, as it must virtually replace the bedside assessment. Loss of data, delays, safety issues or unreliable data lead to unnecessary problems, a flood of false alarms or even worse consequences. The real added value of improving quality of care goes unrealized. The time, duration, scope, vital sign values and above all the quality of the data are recorded on cosinuss° Health for each patient. In this way, the reliability of every data point is made transparent, even from a distance, by means of different quality indicators. The quality of the connection, the quality of the measurement and a combined general health status help to efficiently assess a large number of patients regardless of time and place. This way, both the technical infrastructure and the medical assistance specifically address and increase the quality of care.

DATA ACCESS

Interoperability instead of breaking points

The data streams from a patient to the healthcare provider in a hospital passes through many interfaces. The cosinuss° Health Platform relies on common standards to ensure integration and data security. The goal is a future-proof and traceable infrastructure.

The c-med° alpha transmits measured values via Bluetooth to the Gateway which enables flexible forwarding of data via multiple networks such as LAN or Wifi and via mobile services such as LTE or 5G to the server. All connections in the cosinuss° Health solution are bidirectional, so that adjustments, updates or support can also be carried out from inside the healthcare facility.

INTEGRATION INTO THE HOSPITAL INFORMATION SYSTEM (HIS)

Since investment cycles are significantly longer than in the private sector, healthcare facilities usually use several generations of IT products in parallel. With the new standard „FHIR“® cosinuss° Health focuses on simple implementation and thus combines the advantages of established HL7 standard protocols with those of current web standards.

Unlike other solutions, the data is not trapped in a black box that is difficult to view or encrypted in a protected format. cosinuss° Health offers uncomplicated access for authorized health care workers to all vital signs data and even to the respective wavelengths data from the photopletysmogram (PPG), 3-axis acceleration (ACC) and usage information on the Gateway and the in-ear sensor in common file formats. This additional information helps greatly in closing the existing gap in location between health care provider and patient a bit more. Additionally, the evaluation for research purposes becomes much more user-friendly.

The c-med° alpha transforms thermometer and pulse oximeter into one portable device.

cosinuss° Health Platform Features

Data visualization

DASHBOARD

Especially in the case of remote patient monitoring, there is a need to keep track of several patients in parallel. The Dashboard shows for each connected patient a separate tile with the compressed information about the current vital signs status including measurement quality and device information. The view can be dynamically configured as needed and, for example, filtered according to exceeded limits.

SIDEBAR

If a patient becomes conspicuous, it is possible to view the measurement and its course in detail without losing the overview of all other patients. In the sidebar you can immediately start a high-resolution LIVE measurement. Thus, the current photoplethysmogram as well as the trend of all parameters are quickly visible. Especially from a distance, the patient and device information can provide information about possible deviations.

SINGLE VIEW

The entire history is automatically documented. The data of all continuous measurements are displayed in the patient‘s single view. Each individual parameter can be viewed over the entire period of a monitoring session via interactive history displays with a high level of detail.

Recording settings

CYCLE

The cosinuss° Health Platform is set to allow for automated, cycling monitoring of patients. In this way, interaction needed by the patient is minimized and data acquisition automated. The time between individual vital signs measurement intervals can vary greatly depending on the application, as this is depending on the individual use case and affects both the amount of data and the battery runtime of the sensor. However, both can be optimized for many needs by adjusting the measurement intervals - for example, in some cases, a 10-minute measurement once per hour is sufficient for assessment, which may mean patients need to wear the sensor less often, rest less often, and recharge the sensor less often, in this case only every 3 days. This approach can also be a labor saver in daily clinical practice and care.

LIVE

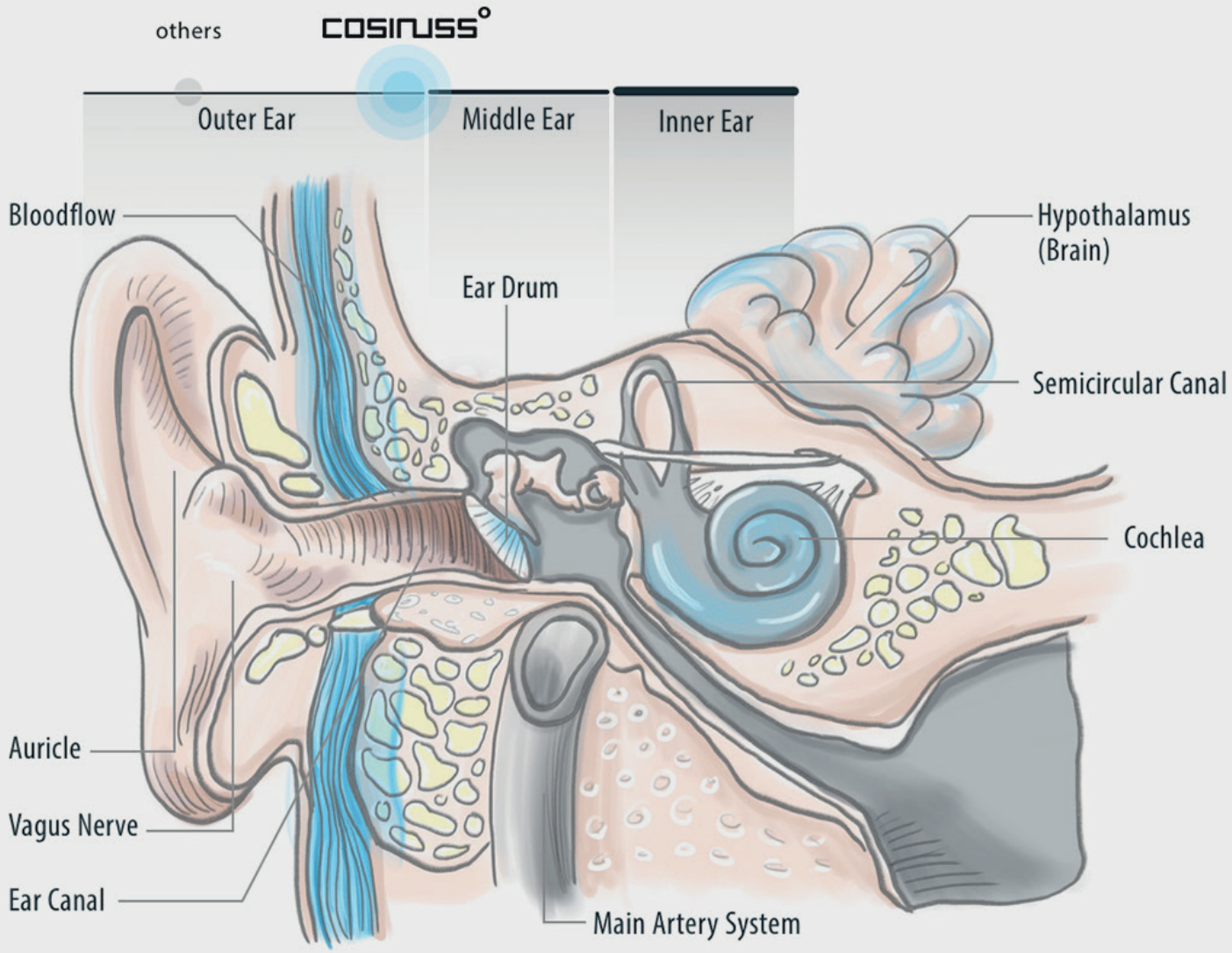
There are situations where an evidence-based decision needs to be made immediately. For this purpose, monitoring can easily be set to LIVE mode, which records and visualizes all data in the highest possible resolution in real time. This mode is essential for the care of a patient in the event of a deterioration in health and has proved particularly useful in teleconsultation. It can also be useful for technical support or in case of user errors.

PROTOCOL

In some use cases, it may even be necessary to perform a specific measurement protocol for each patient for assessment. This is also possible with the cosinuss° Health Platform. It is possible to create the steps of the needed protocol and to run through them in one session. The individual protocol steps are noted in the recorded data thus making subsequent evaluation more efficient. Furthermore, in special cases, manual entries or reference measuring devices can be additionally integrated. Especially in the field of clinical studies, this recording behavior has become established.


Dashboard
Subjects
Receivers
Devices
SCOPE
MASTER
PROJECT
0001
BH3V
DH5FGD
56%
00:00:08
6
Score
131
HR (bpm)
19
RR (1/min)
77
Quality
99
SpO2 (%)
36.9
Temp. (°C)
2.0
Perfusion
VNDH
12WQAS
87%
00:00:12
5
Score
91
HR (bpm)
21
RR (1/min)
95
SpO2 (%)
38.2
Temp. (°C)
NL2D
MN34GY
75%
00:00:24
4
Score
91
HR (bpm)
18
RR (1/min)
85
Quality
97
SpO2 (%)
38.4
Temp. (°C)
1.2
Perfusion
DEHS
BVHG4F
86%
00:01:34
4
Score
100
HR (bpm)
15
RR (1/min)
98
SpO2 (%)
38.1
Temp. (°C)
5HKJ
JXGH40
23%
00:01:19
3
Score
98
HR (bpm)
18
RR (1/min)
67
Quality
95
SpO2 (%)
37.3
Temp. (°C)
0.7
Perfusion
JFH6
BBVG54
99%
00:00:03
2
Score
80
HR (bpm)
15
RR (1/min)
98
SpO2 (%)
36.9
Temp. (°C)
9HK0
BG3680
44%
00:00:16
0
Score
71
HR (bpm)
17
RR (1/min)
79
Quality
98
SpO2 (%)
37.8
Temp. (°C)
1.5
Perfusion
DJ96
TTZ504
77%
00:00:50
0
Score
73
HR (bpm)
14
RR (1/min)
99
SpO2 (%)
37.0
Temp. (°C)
5B60
39FV09
00:00:00
H3P7
DHFB40
00:00:00

single view



THE SINGLE MOST IMPORTANT MEASURE
IN CRITICAL SITUATIONS

SpO2 from the arterial blood supply of the brain

The outer ear canal has critical advantages over other measuring places:

- Oxygen saturation is measured at the arterial supply to the brain, whose supply is highly relevant.
- Core body temperature is measured at the place where the body's own temperature control system is located. (Hypothalamus)
- Measurements are even possible when patients are under shock in contrast to finger, wrist devices.
- Perfusion measurements during reanimation directly at the brain.
- All relevant vital signs from one place with one device.
- performed them are stored in a virtual patient file, known as a log file.

Company profile

Cosinuss GmbH is a certified medical devices manufacturer based in Munich specializing in mobile and continuous monitoring of several vital parameters. With more than 15 years of research and development, numerous patents and medically certified products, cosinuss° is a pioneer in the field of mobile and continuous monitoring. Following the vision to contribute to the change of health care into a flexible and extended organization by improving the diagnosis, treatment and rehabilitation of patients.

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