MedStorm

Real-time Pain Management

Improved personalized pain management by tailoring the need of analgesia and hypnotics

Company highlights

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Real-time Pain Management

Oslo, Norway

Raised approx 8 mill Euro from investors and softfunding

Received grant on 2 million Euro with partners to develop new PainSensor

Developed **PainMonitoring Technology**

- Real-time painmonitoring
- Pure physiological response
- Not influenced by hemodynamic and respiratory instability
- Wireless, wearable

Strong and broad IP

- Technology and methods
- 9 approved patents
- 2 patents in process

More than **70 supportive validation studies** and **3 theses**

- All by independent reserachers
- More studies planned

CE certified technology, in the process of obtaining FDA approval

Strong team

- lead by professor and medical doctor Hanne Storm

Currently looking for distributors to further develop and expand the market with the new PainSensor

Our team

Professor Hanne Storm

Founder - CEO - Board member

MD.PhD. University of Oslo

Jens Gran

co-Founder - CFO - Chairman of the board

MSc. Civil engineer, Norwegian University of Science and Technology

NTNU, MSc Finance, LSE, UK

Rebecca Kaarem

CTO - Engineer

MSc. Eindhoven University of Technology, The Netherlands.

Henrik Auråen

CEO*In process

MD. PhD. University of Oslo. Specializing for surgery, Oslo University hospital

Mikkel Lager

Project and customer follow up

Biomedical Electronic Engineering, Oslo .

Mark Heuring

Sales manager Germany

MSc. Finance. Boston General management program

Professor Johan Ræder

Scientific Advisory board,

MD.PhD. University of Oslo

Kartik Karuna

Part time technical advisor

M. Sc Electronic System Engineer

Håkan Dahlqvist

Part time regulatory advisor

M Sc. Bio.engineer and previous quality assurance advisor (Intertek)

Thomas Velle

Advisor - Strategy and Business Development

MPH. International business

Professor Larisa Pushkarova

Clinical manager

MD.PhD. University of Minsk. Pediatrician and Anesthesiologist

Why is it important to improve personalized pain management?

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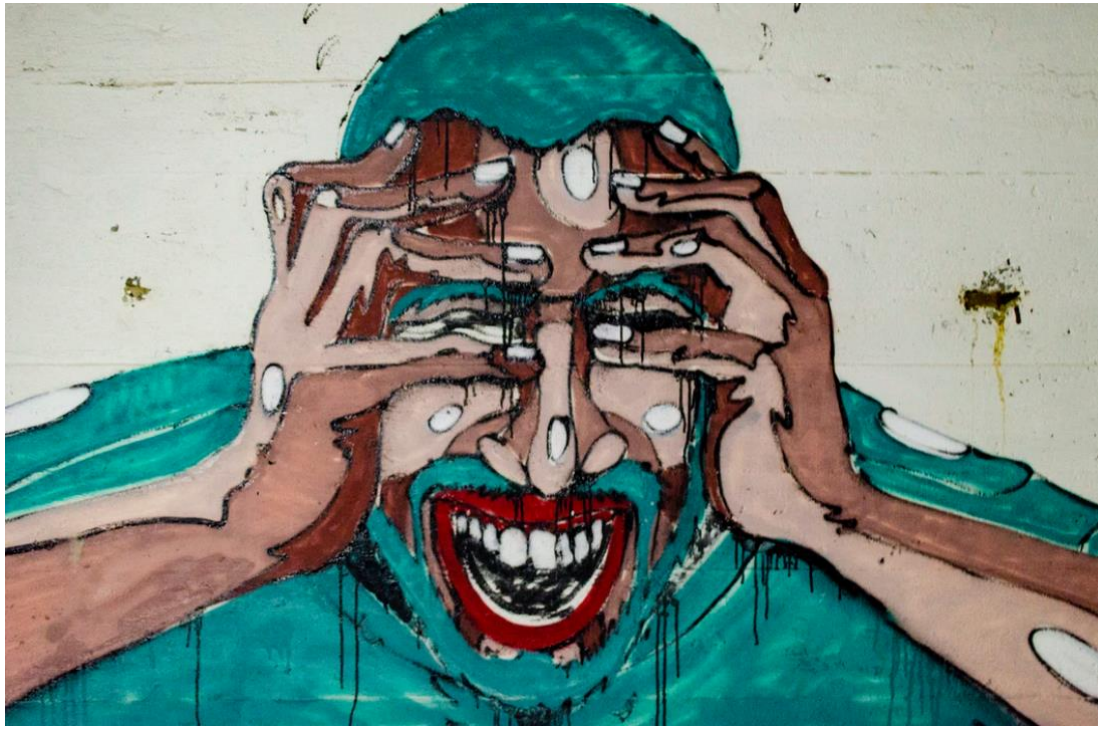
Pain is a worldwide problem



Worldwide
+1.5 billion
Individuals lives affected

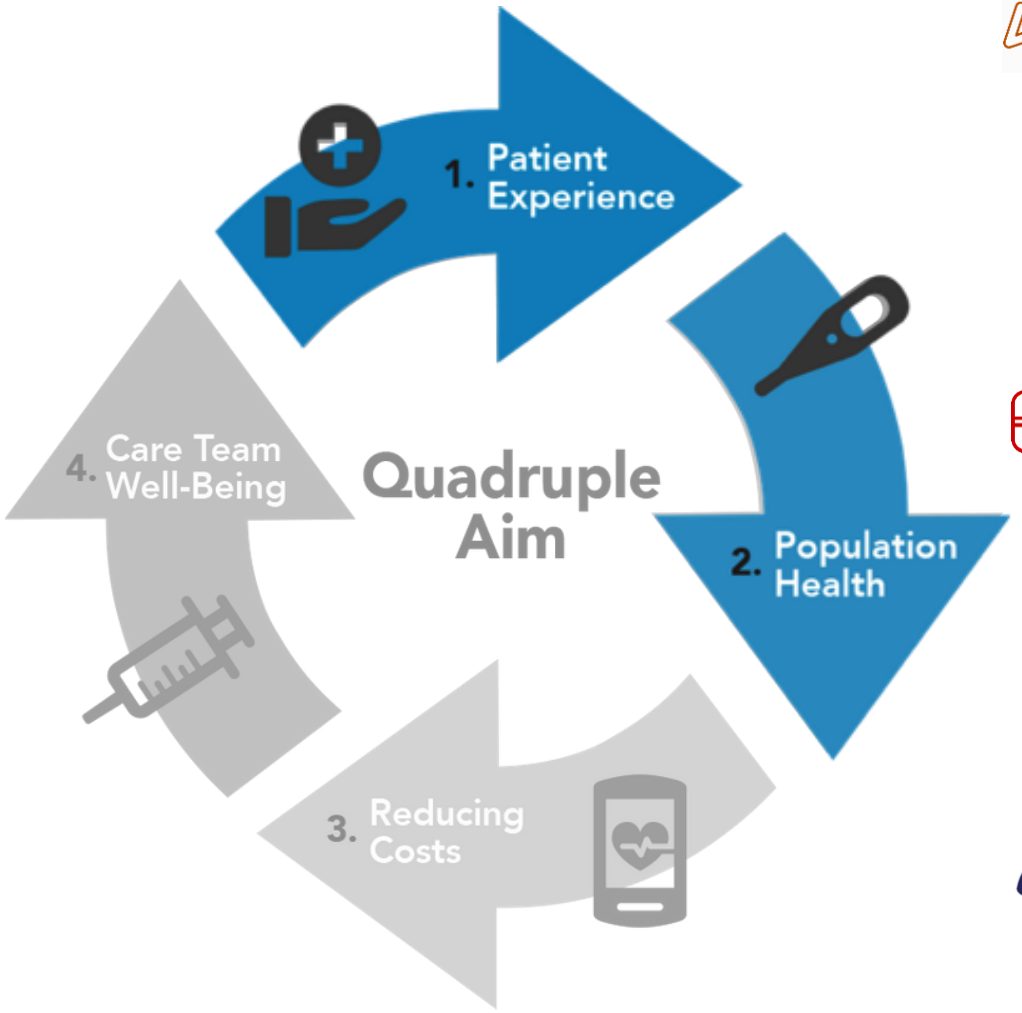
Focus in
50%
Of doctors visits

Present in
50%
of ICU patients[1]

Severe pain experienced by
63%
of surgical patients[2]

1. Barr J, Fraser GL, Puntillo K, et al. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Crit Care Med*. 2013;41(1):263–306.
2.Puntillo KA, Stannard D, Miaskowski C, Kehrle K, Gleeson S. Use of a pain assessment and intervention notation (P.A.I.N.) tool in critical care nursing practice: Nurses' evaluations. Heart Lung 2002;31:303-14.

Pain is a worldwide problem - for the patient



Suffering and reduced quality of life

- Uncomfortable sensations
- Agitation and anxiety
- Undetected pain for those who are unable to communicate their pain

Issues related to over- and under-use of opioids

- Hemodynamic instability
- Delirium (confusion)
- Gut problems (constipation)
- Nausea
- Drowsiness / reduced consciousness

Risk of additional complications

- Physical injuries resulting drowsiness from over-use of opioids

Pain is a worldwide problem - For the economy

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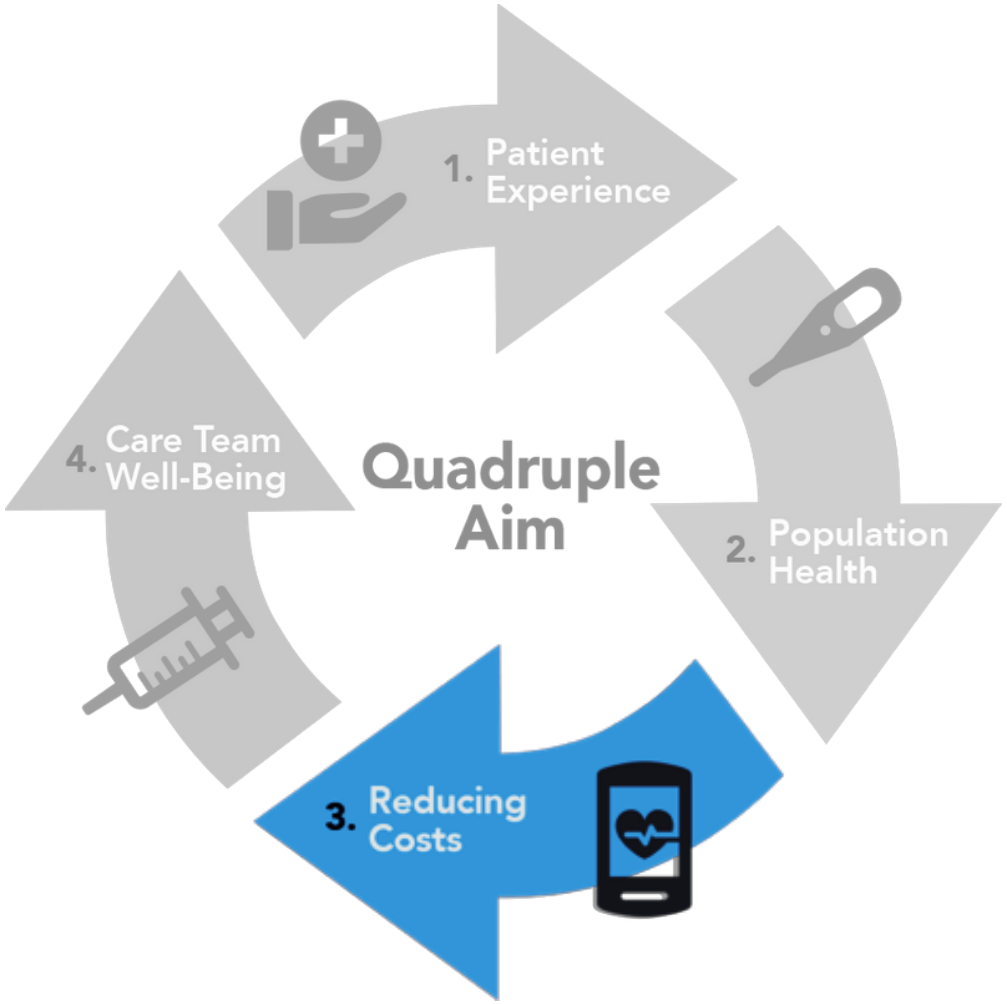

Low return on investment (ROI) (staff time)

- Increased **length of hospital stay** –> hospital expenses increases
- **Number of procedures** decreases –> revenue decreases
- Hemodynamics are **inaccurate**

600 billion

U.S. have reached 600 billion USD in pain associated healthcare costs anually.

Pain is a worldwide problem
- For the caregivers

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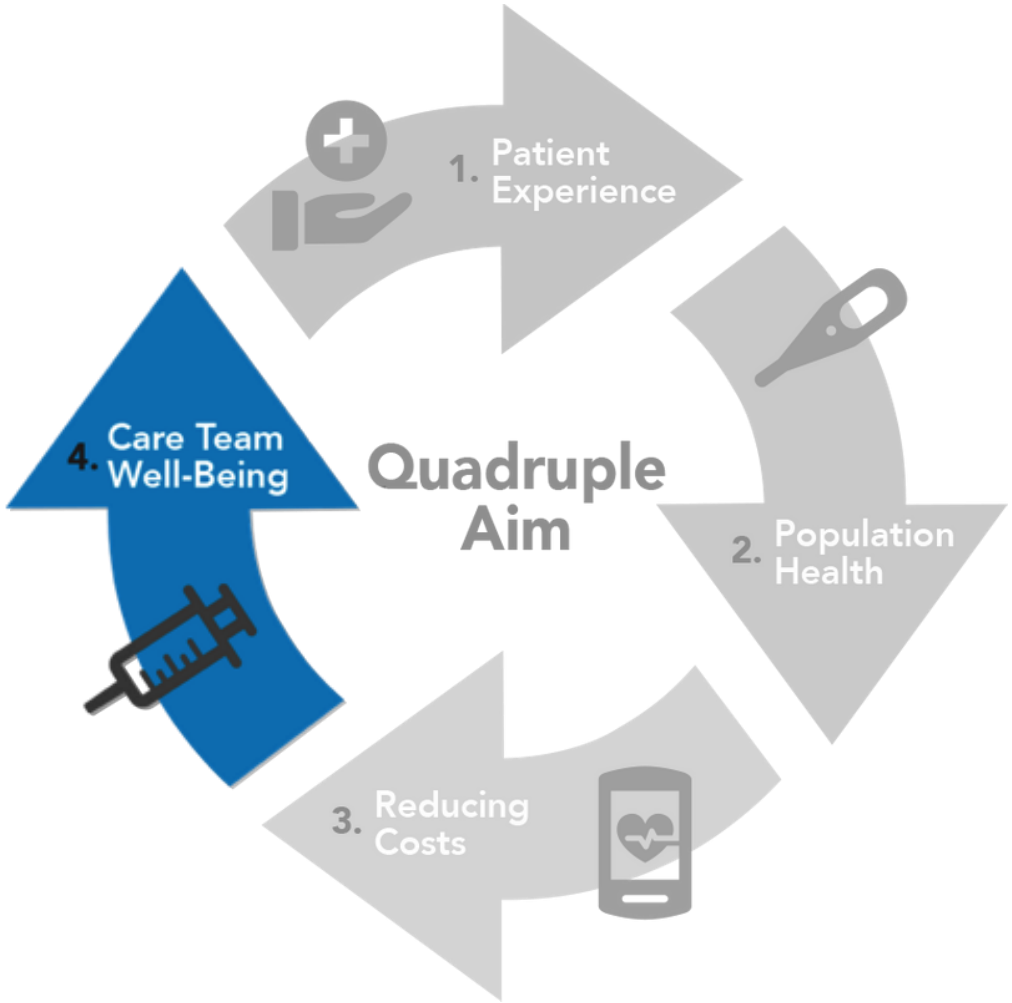


Pain detection relies on spot checks:

- It is infeasible for health care professionals to constantly observe the patient to detect pain

Pain detection is based on observational pain assessment:

- Time consuming
- Complex
- Based on subjective validation

Pain detection is based on self-reported pain levels

- Many patients are unable to communicate
- Subjective, unspecific

The Solution:

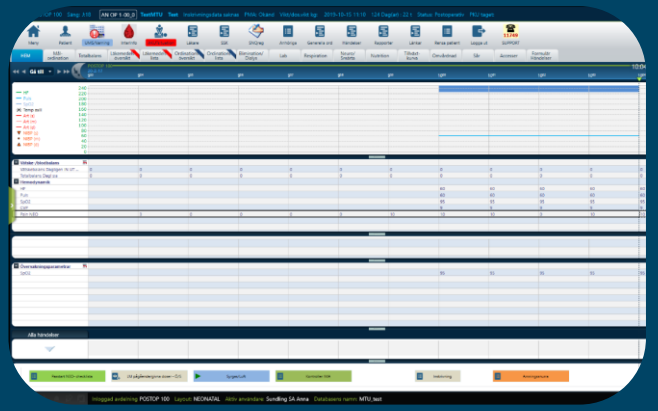
Continuous, real-time pain monitoring with the PainSensor

- Continuous, real-time
- Wireless, wearable
- Low-cost

Connects to a tablet with MedStorm's PSS software

PSM connectivity box to integrate indices with existing patient monitors

*or directly to the new generation Philips monitors



The Pain index is sampled at patient data monitoring systems
e.g. Metavision with other vital signs

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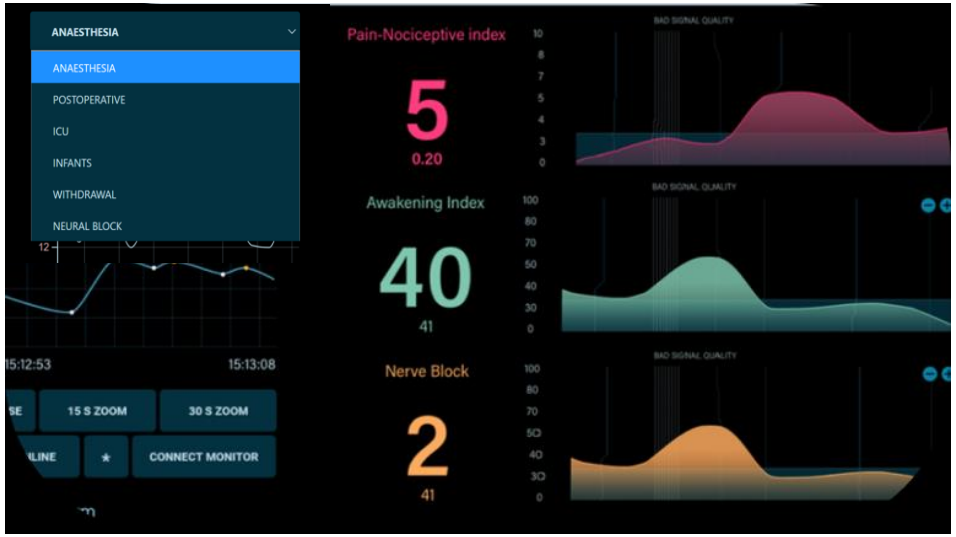
The PainSensor has different indices and application areas



Operating theathres
- Pain Index
- Awakening index
- Nerveblock index

Intensive care units
- Pain Index
- Awakening index

Post-operatively
- Pain Index

Neonatal intensive care units (NICUs) and **pediatric intensive care units (PICUs)**
- Pain Index

The sensor detects skin conductance peaks, correlating with firing in the skin sympathetic nervous system

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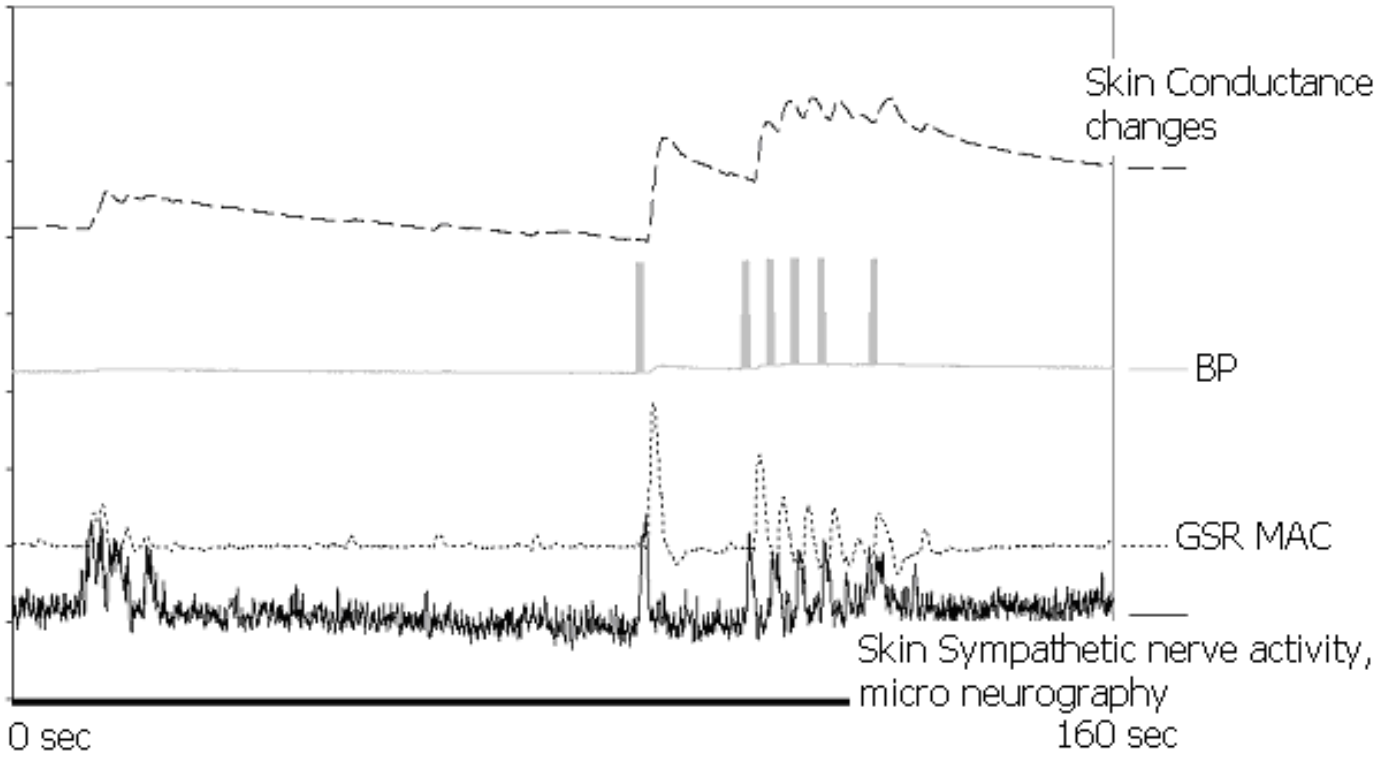
Based on the fight / flight response: Primitive nociceptive spinal reflex results in Palmar and plantar emotional sweating

- Painful stimulus elicits a **skin sympathetic response** by the sweat glands, increasing secretion.
- The skin sympathetic responses are detected by measuring changes (peaks) in skin conductance mirroring skin sympathetic nerve activity



Small bursts in the sympathetic nerves give small skin conductance peaks and huge bursts in the sympathetic nerves give huge skin conductance peaks.

Gjerstad AC, Storm H, Wallin G. Evaluation of the skin conductance method by using microneurographi, abstract, ISAP, Chicago 2006. Presentation of skin sympathetic nervous system.

Milestones reached, business model, investment needs

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Milestones reached

Achieved with EU grant with partners of 2 million Euro [2018 – 2021]

- Transformed PainMonitor into miniutarized, wireless and wearable PainSensor
- 9 approved patents and 2 in process
- Connectivity to Patient monitors, tablets, and PCs
- More than 70 supportive validation studies and 3 theses
- Connectivity to Philips, Masimo and Mindray monitors
- CE-certified technology and FDA approval in process
- Worldwide sales of the PainMonitor
- Won a tender together with Philips in Switzerland

- Preorders of the PainSensor (60.000 Euro)
- Established distributor agreements with partners for sales to hospitals in Europe (more in process):
  - Lueag, Switzerland (sales 60.000 Euro 2021 and 400.000 Euros 2022)
  - Eumedics, Austria, in process.
  - IMI, Japan approval in process
  - Hongkong, Philips in process
  - Kina, Philips in process
  - Norway, Vingmed in process
  - Germany, Mark Heruing – home care marked and palliative care

Growth potential, business model, and investment needs

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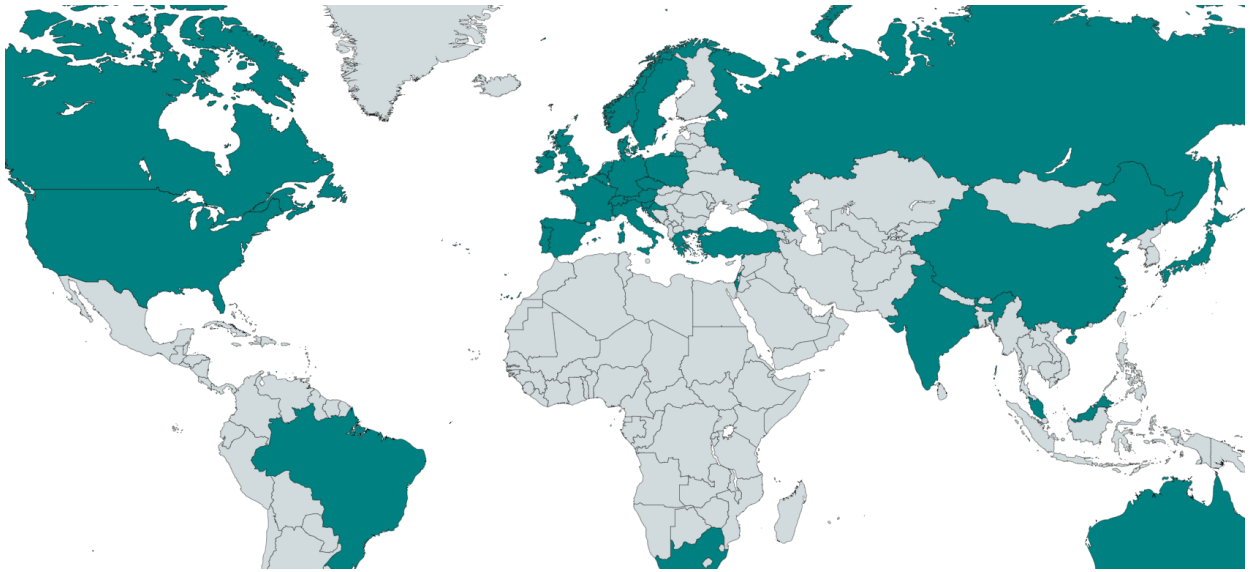
Worldwide sales of the PainMonitor

- Mainly for reserach purposes
- The miniutarized PainSensor for clinical use was developed as a result of several requests from customers



Strong growth expected after launch of the PainSensor

Business model

Hardware sales

- PainSenor
- Disposables
- Connectivity (PSM or tablet with software)

Databases and cloud system

- Vision of creating our own system.

Service agreements

- Ensuring software is always up-to-date, software upgrades, hardware checks.

Reimbursement

- Based on legislation in each area, as pain is mandatory to treat, we are investigating the various reimbursment opportunities.

Plan for future investment to further develop and expand the market with the new PainSensor:

65% Sales and marketing investment
5% Regulatory and IP
10% Business and organization
10% Technology development
10% Overhead

The market

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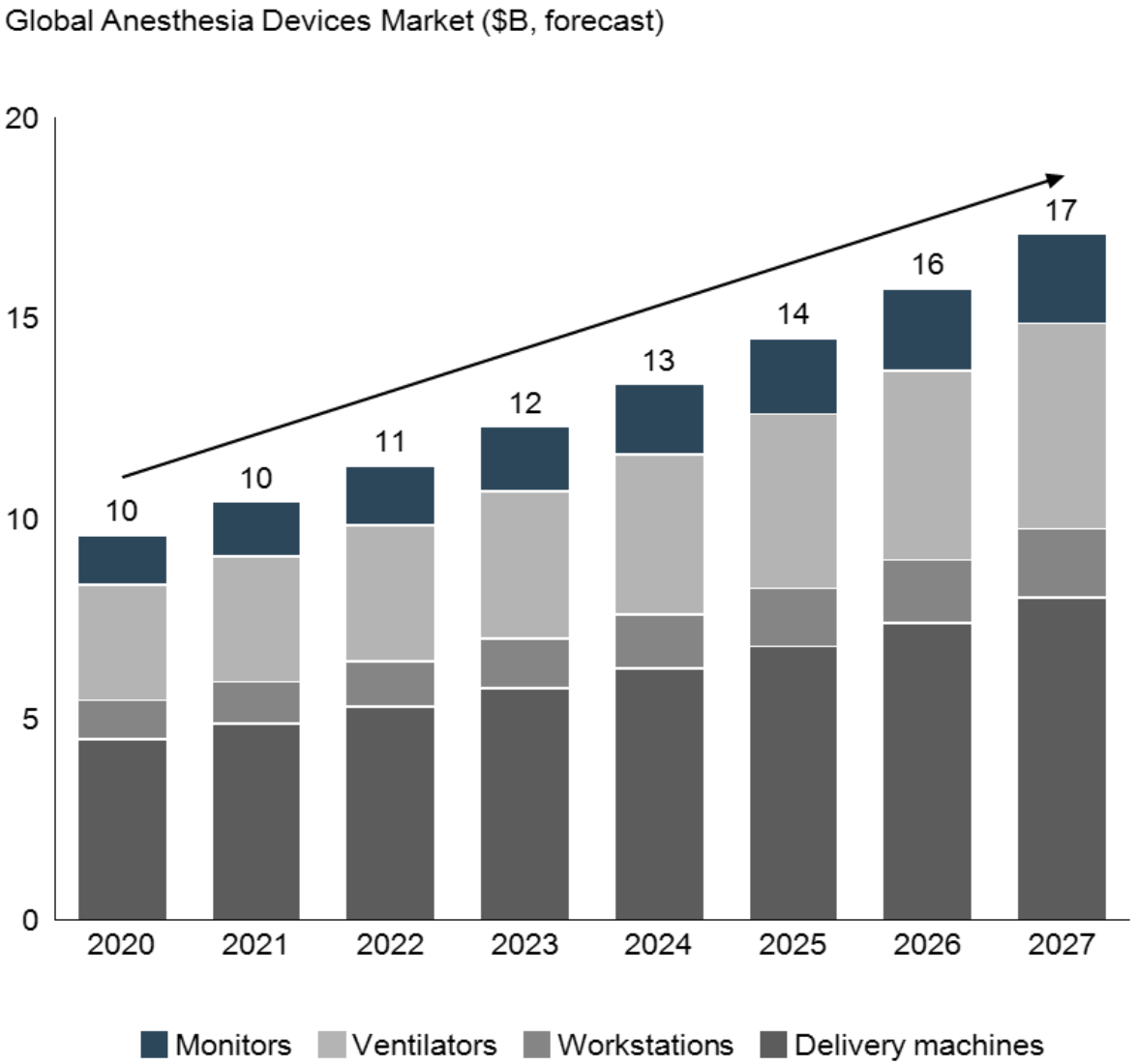
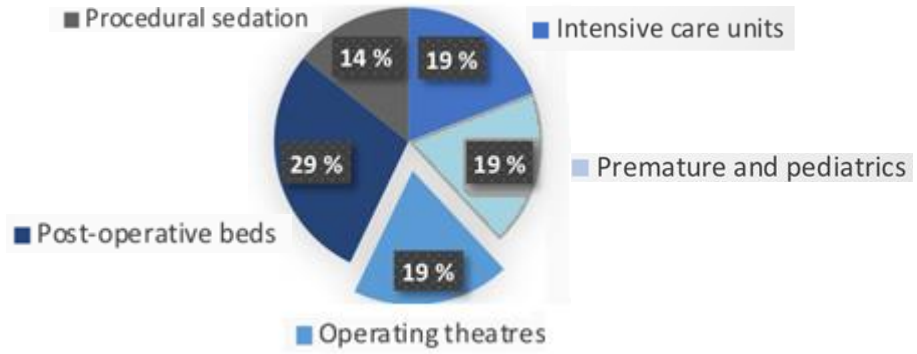
The market is growing

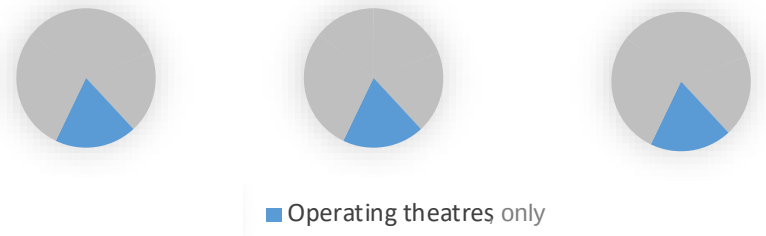


- The market for anesthesia devices is expected to grow at 8-10% p.a. to 2027, reaching a market value of ~$17B globally.
- 21000 depth of anaesthesia monitoring solutions (e.g. BIS) in 2023 (up from 12600 in 2017), at an ASP of USDK 29 (US numbers), in Europe an ASP of 10-15 000 €.

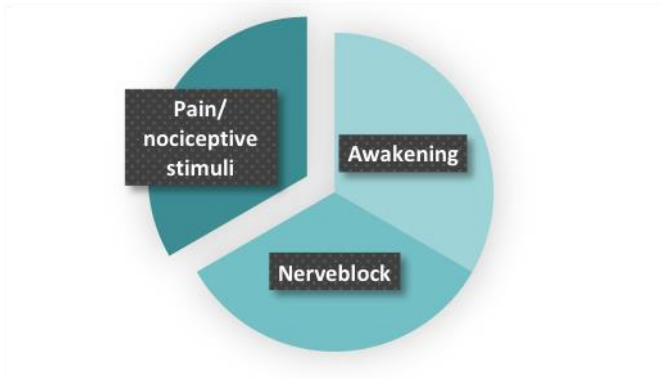
The market

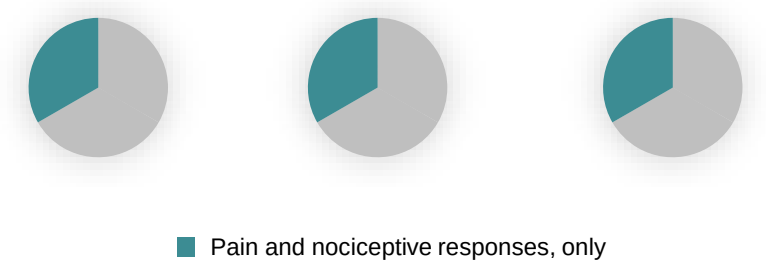
1. Core use-cases:





2. Application in operathing theatres:





	MedStorm	MDoloris Medical Systems	MEDASENSE	Surgical Stress Index
3. Reaction time after stimulus:	**1-2 s**	**68 s**	**~30 sec**	**N/A**
4. Works accurate during hemodynamic and respiratory instabillity:	**Yes**	**No**	**No**	**No**

Future potential and milestones

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There are various use-areas for the PainSensor, both in the hospitals and for home-monitoring (veterinary medicine in progress)

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Hospitals

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Home-market / Out-patient clinics

Child diseases and injuries

Elderly

Post-operative / ICU at home

Cancer Patients

Ketamine infusion clinics

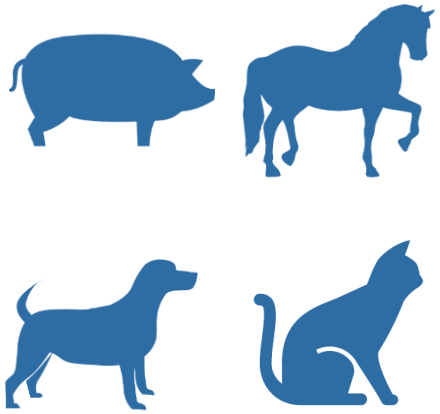
Palliative care

Intellectual disability

Military injuries

Veterinary medicine

Under development
- already tested and validated on pigs, cats and dogs (horses in process)
- Sales confirmed



New products – road map

2021 **2022**

Telemedicine – the wireless, miniaturized and wearable PainSensor for home market and hospitals. Communication and applications in process with Dignio (Norway) and Caretakermedical (US and Europe) – EC grant with Amsterdam Medical Centre – The palliative pain team.

The PainSensor as **consumer product** connected to smart phones, available for **pharmacies and groceries** shops.

In veterinary medicine: **5 million** pets/year in the US are anesthetized.

Monitoring chronic pain: **200 million** procedures/year need chronic pain monitoring in the US.

10 million patients/year need objective chronic pain diagnosis in US.

Thank you for your attention!

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