PAM technology

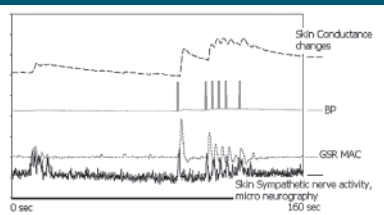
The PAM sensor detects skin conductance peaks, correlating with firing in the skin sympathetic nervous system.
Due to the fact that no other indices are measured the feed-back time is extraordinary short.

BASED ON THE FIGHT/FLIGHT RESPONSE:

Primitive nociceptive spinal reflex results in palmar and plantar emotional sweating

- Painful stimuli elicit a sympathetic response in the skin through sweat glands, causing increased secretion and eruptions in the skin Sympathetic nerves acetyl choline acting on muscaranic receptors.
- 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 give huge skin conductance peaks.

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



EXAMPLE OF ONE SKIN CONDUCTANCE PEAK:

Skin sympathetic nervous system fires ↓
Sweat released within 1-2 sec ↓
Conductance increases ↓
Conductance decreases when sweat reabsorbs into skin

- Skin conductance peaks reacts immediately to a painful stimulus (1-2 sec).
- Not influenced by environmental temperature.
- Can be used for all patients age > 23 weeks.
- Not influenced by:
  - Haemodynamic instability
  - Respiratory distress
  - Medications (adrenergic, beta-blockers, alpha-2 agonists, neuromuscular blockers, atropin (in clinical doses).

MEDSTORM PROVIDES THE ANSWER TO YOUR QUESTION

- **MedStorm PainSensor PAM** is the first solution offering pain-monitoring based on the pure physiological signal (skin-conductance).
- **MedStorm PainSensor PAM** works accurately during haemodynamic and respiratory instability and reacts within 1-2 seconds.
- **MedStorm PainSensor PAM** is proven to be more specific compared to technologies relying on haemodynamic indicators.

"We found that the annual cost of pain was greater than the annual costs in 2010 dollars of heart disease ($309 billion), cancer ($243 billion), and diabetes ($188 billion) and nearly 30 percent higher than the combined cost of cancer and diabetes."*

*Darrell J. Gaskin, Ph.D. and Patrick Richard, Ph.D., M.A (2011): The Economic Costs of Pain in the United States, Institute of Medicine (US) Committee on Advancing Pain Research, Care, and Education.Washington (DC): National Academies Press (US); 2011.

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PAIN ASSESSMENT AND TREATMENT STARTS WITH A PROPER PAIN MEASURING/ MONITORING

MedStorm
Real-time Pain Management

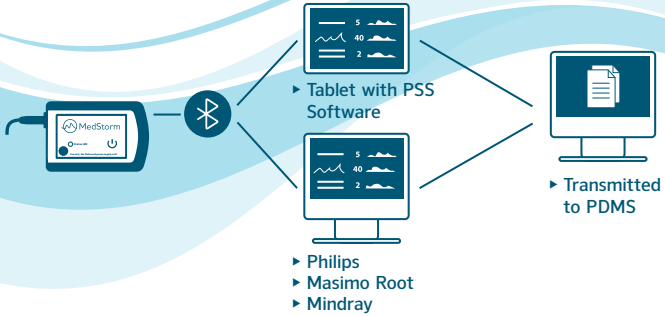
PAM by MedStorm

MedStorm faces the challenges of pain management by offering a unique PainSensor (PAM) for precise measurement of real-time pain assessment. PAM measures pure changes in skin conductance and is therefore not influenced by haemodynamic and respiratory instability. The technology can be used to tailor the need for analgesia and sedatives, to reduce side effects from over- and under-medication, which may lead to reducing the length of stay and therefore costs for the hospitals.

PAM

PAM is a wearable pain monitor, which can easy placed to patients like a bracelet or simply positioned close to the measurement point of the patient.

The unique electrodes are placed under the foot or the palm of the hand, depending on the area of application or need. The electrodes are single patient and up to 48 hours use.



The special advantage of PAM is its Bluetooth technology, which allows wireless transmission of the measurement data to different displays such as common Vital Signs or to common notebooks or tablets Microsoft based and finally also being used with PDMS. That enable a maximum of flexibility and usability.

PAM indices

PAM has different indices and application areas. MedStorm's real-time, IP-protected PainSensor is based on skin conductance changes during anaesthesia, intensive care, postoperatively and in preterm infants. Additionally, the device has indices for assessing awakening, withdrawal symptoms, and the effect of regional nerve block within seconds.

Operating theaters
- Pain Index
- Awakening Index
- Nerve block Index

Intensive Care Units
- Pain Index
- Awakening Index

Post-operative
- Pain Index

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

PAIN is a worldwide problem

- Pain detection is based on observational pain assessment (e.g. spot checks)
  - Time consuming
  - Complex
  - Based on subjective validation
- Pain detection is based on self-reported pain levels
  - Some patients are unable to communicate
  - Subjective, unspecific

Lack and ineffective Pain Assessment and therefore Pain Management affects Patient Recovery Time which leads to negative economical effects by various facts.

The Pain Index is based on the frequency of the peaks.
The Awakening Index is based on how forceful these peaks are.

The indices are validated by Visual Analog pain Score (VAS), Numeric rating score (NRS), Sedation score (MAAS), and COMFORT sedation scale.

Patient needs more analgesia

Pain Index	Indication
0	No more analgesia needed
1	No more analgesia needed
2–3	More analgesia may be needed
4–5	More analgesia is possibly needed
6–7	More analgesia is probably needed
8–9	More analgesia is needed
10	More analgesia is needed

Patient is about to wake up from stimulus more analgetics and hypnotics needed

Awakening Index	Indication
0	No more hypnotics is needed
40	More hypnotics is possibly needed
100	More hypnotics /analgesia is probably needed

The regional Nerve block Index can detect whether the nerve is blocked faster than the traditional methods

- Assess within seconds when regional anaesthesia acts on the skin sympathetic nerves without myelin.
- The regional nerve block application may secure that the nerve-block is still active.
- Currently possible to assess peripheral nerve block at the extremities.