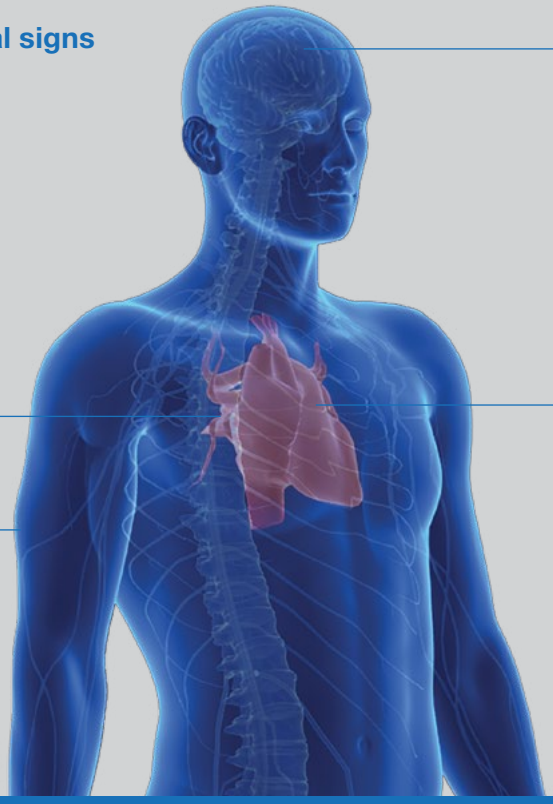
Enhancing patient care in the ICU – with NeuroMonitoring

NIHON KOHDEN

In the ICU, several patient vital signs are monitored continuously.



See more, act fast

Take a closer look at your patient's 'black box' – the brain.

In the intensive care unit physicians and nurses get real-time information about cardiopulmonary physiology. Shouldn't there be similar monitoring for the brain, a vital organ, as well?

Typically patients with an unclear mental state or suspicion of brain issues will be examined hourly for level of arousal, motor function and presence of brainstem reflexes. But this only provides a snapshot in time of their neurologic status, and creates only a small subset of important brain functions. If the patient is sedated or even paralyzed, providing the right information can be even more difficult.

The importance of NeuroMonitoring

When it comes to detecting abnormalities, diagnosing seizures and making informed treatment decisions, continuous NeuroMonitoring is a highly valuable tool on the ICU. The benefits have been recognized by the European Society of Intensive Care Medicine (ESICM) and the European Resuscitation Council (ERC), which have both issued recommendations and guidelines on the subject:

ESICM recommendations on the use of EEG monitoring in critically ill patients for:

- Non-convulsive status epilepticus
- Comatose patients with unexplained and persistent altered consciousness
- Comatose patients after cardiac arrest

Consensus statement from the neurointensive care section of the ESICM; Intensive Care Med (2013)

ERC recommendations for post-resuscitation care:

- Continuous electroencephalography (EEG) is recommended to detect seizures after cardiac arrest
- Consider continuous EEG to monitor patients with a diagnosed status epilepticus and effects of treatment

Section 5 of the European Resuscitation Council Guidelines for Resuscitation 2015

An-end-to-end approach

NeuroMonitoring can help to improve patient care and outcome, shorten hospital stay and have a positive impact on finances.[1] Nihon Kohden delivers a unique multi-modality approach, that combines continuous EEG monitoring (cEEG) – an important and easy-to-measure parameter for intensivists – and supports individualized, physiologically driven decision-making.

This helps you identify when the brain is at risk or when neuronal injury is occurring, and lets you intervene before there is irreversible damage.

Our NeuroMonitoring program is designed with the following aims in mind:

- Improve patient outcome
- Shorten patients' stay in the ICU
- Lower the mortality rate
- Decrease costs

Early detection

Gain visibility into your patient's pathway

Compared to a 30-minute routine examination using EEG, cEEG provides you with a dynamic assessment of reactivity, variability and sleep pattern integrity within the cortex. All of these parameters have a prognostic significance for coma patients. And analyzing them can help avoid misleading or wrong prognoses. NeuroMonitoring gives you a better indication of the state of the brain during coma, helping you better predict the outcome, and therefore directly influencing the management of patients.[5]

Evolve your NeuroMonitoring program to the level you need

When patients have an impaired level of consciousness, it is especially difficult to detect ongoing neurological issues. However, it is crucial to quickly identify seizures in those patients to ensure the right treatment. Based on our extensive expertise and a history rooted in neurology, Nihon Kohden delivers connected continuous EEG monitoring (cEEG) that meets both your and your patients' needs.

Are nonconvulsive seizures a significant problem in the intensive care unit? Yes!

- 35% of NeuroICU patients have been found to have seizures[2]
- 22% of traumatic brain injured patients have seizures, half of which are nonconvulsive[1]
- 28% of intracerebral hemorrhage patients have seizures, half of which are nonconvulsive[3]
- 44% of pediatric ICU patients have seizures on cEEG; 39% are nonconvulsive[4]

EEG module

Connect to Life Scope monitors

- Simple interface with Life Scope monitors
- Just plug and play to monitors
- cEEG with up to eight channels
- Status at a glance via trend graphs

Our standalone EEG devices can be used directly at the point of care, and offer a comprehensive range of NeuroMonitoring capabilities. Our Neurofax EEG devices are highly scalable, with hardware and software options that cover everything from routine EEG recording to high-level brain function research. Our Vital Signs Interface integrates a variety of vital signs from the bedside monitor into the EEG. It also features trending software to give physicians and nurses the big picture, with priority information in one location. This multi-modality approach assists in identifying abnormal autonomic responses in pre-ictal or post-ictal states, particularly in patients with refractive epilepsy who may have high risk of sudden unexpected death from epilepsy (SUDEP).

Alternatively, simply connect our compact EEG module to our Life Scope monitors to examine up to eight channels in real time. Both solutions enable quick data review, with various trends including Density Spectral Array (DSA), Compressed Spectral Array (CSA) and amplitude-integrated EEG (aEEG).

Immediate action

Gain timely insight into changes

Neurological damage often does not occur at the moment of impact or in an event such as a stroke. Rather, it develops over hours and days. Delayed response to these significant changes can lead to secondary injury. Continuous EEG helps you identify impending secondary brain injury in time to control or reverse it.[7]

Neurofax EEG-1200/ICU

Universal EEG for all needs

- Space saving design with full 10-20 support
- Interface vital sign data from bedside monitors
- Easy review via trend graphs
- Audio and video recording
- Fan-less, all-in-one PC with touch screen

Get more than snapshots

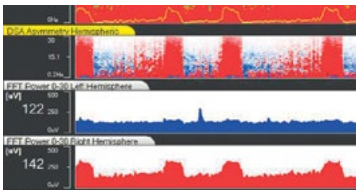
Neuroimaging provides information about the status quo and is the best way to identify new or enlarging mass lesions. However, it requires timely transport of patients out of the ICU and cannot reveal functional changes. cEEG detects new or increasing lesions, helping you make the right decision on moving a patient for cerebral imaging.

Master your data quickly and efficiently

Continuous EEG monitoring in the ICU is highly time consuming for clinicians. In response to this challenge, Nihon Kohden has developed EEG trending that simplifies review of large data volumes. This system helps you highlight and predict trends and changes over time.

Neurofax EEG trending software

Online seizure detection



- Visualize trends, such as FFT total power, DSA with spectral edge, Power Asymmetry, aEEG
- Electrode status indicator
- Vital sign integration

EEG trending is also useful to physicians or staff less experienced in EEG interpretation for correlating clinical events, tailoring therapies or deciding when to seek the expertise of an electroencephalographer. Moreover, our software allows you to quickly detect seizures or other clinically important changes in the EEG as they occur. And records and trends are processed and update in real time.

Channels are automatically monitored for electrode artifacts, which are removed from seizure and trend processing. Electrodes with persistent electrical artifacts are flagged up to staff for correction, resulting in cleaner recordings.

Does cEEG provide an accurate diagnosis of nonconvulsive seizures? Yes!

- Focal and generalized nonconvulsive seizures are accurately diagnosed by cEEG[1,3,6]
- The timing, duration and frequency of seizures are reliably seen

Diagnostic confidence

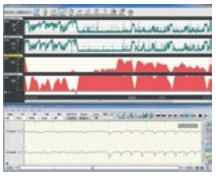
Improved outcome
With numerous mechanical sources of potential artifacts in the ICU such as vibrating beds and ventilators, as well as events that mimic seizures during EEG monitoring, our video and audio recording help to correctly interpret otherwise questionable patterns. They are precisely synchronized with the EEG with full motion video and audio at multiple, user selectable recording rates.

Live View Panel

Intuitive real-time management monitoring system

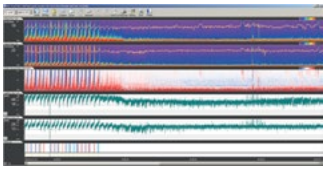
- View and monitor patients from: Multiple locations within the facility or Multiple locations from wherever you choose
- Get all key information in one place

The power of NeuroMonitoring trends

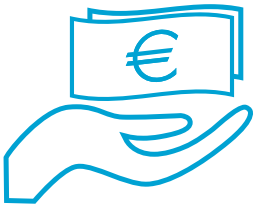


aEEG with burst suppression trend (67 year old patient after head injury)

Patient with seizures clearly shown in the trend, as well as in the raw EEG



Easy pattern recognition of compressed data and seizure detection



Cost effectiveness

Efficient use of resources

Though cost effectiveness of hospital equipment is often difficult to calculate, a recent study over a four-year period discovered a reduction of 44% in costs when using the NeuroMonitoring program, and equally a 44% decrease in hospital stays. There was also an increase of 50% in the relative improvement of patients' outcomes.[8] Early detection also helps reduce the number of secondary brain injuries and avoid subsequent treatment.

Your challenge – our mission

There is a clear need for a comprehensive NeuroMonitoring program in the modern ICU. Nihon Kohden provides a broad range of software and hardware solutions for EEG recording and data analysis that can help you meet this need and master some of today's healthcare challenges.

Does cEEG avoid risky testing to rule out other diagnoses? Yes!

- cEEG is noninvasive
- If seizures are detected, then other invasive testing is not required (provided that noninvasive testing (i.e. imaging) is completed)

Whatever the challenge within your hospital, our NeuroMonitoring solutions allow for better evaluation of cerebral functions, faster ability to treat your patient and better prognostic information. Consult our experts to tap into our vast resources and experience on this critical issue.

For more information, visit www.nihonkohden.com and get in touch.

Since foundation in 1951, Nihon Kohden's mission has been to improve the quality of life with advanced technology.

We provide solutions for diagnosis, critical care, clinical information, and in vitro diagnostics – and we are dedicated to collaborating with you to confront the challenges of healthcare today and tomorrow.

Improving Healthcare with Advanced Technology

[1] Increased incidence and impact of nonconvulsive and convulsive seizures after traumatic brain injury as detected by continuous electroencephalographic monitoring. (Vespa et al 1999)

[2] Neurophysiologic monitoring in the neuroscience intensive care unit (Jordan 1992)

[3] Acute seizures after intracerebral hemorrhage: a factor in progressive midline shift and outcome (Vespa et al 2003)

[4] Nonconvulsive status epilepticus in children: clinical and EEG characteristics (Hirsch et al 2006)

[5] Continuous EEG Monitoring in the Intensive Care Unit (Marc L. Scheur, 2002)
[6] Detection of electrographic seizures with continuous EEG monitoring in critically ill patients. (Claassen J, Mayer SA, Kowalski RG, Emerson RG & Hirsch LJ 2004)

[7] Continuous EEG Monitoring for the Detection of Seizures in Traumatic Brain Injury, Infarction, and Intracerebral Hemorrhage: “To Detect and Protect.” (Paul Vespa & J Clin, 2005)

[8] Continuous EEG Monitoring in the intensive care unit (Vespa et al 2009)

EC REP

NIHON KOHDEN EUROPE GmbH
Raiffeisenstr. 10, 61191 Rosbach, Germany
Phone: +49 6003 827 0, Fax: +49 6003 827 599
Internet: www.nihonkohden.com, E-mail: info@nke.de

NIHON KOHDEN CORPORATION
1-31-4 Nishiochiai, Shinjuku-ku, Tokyo 161-8560, Japan
Phone: +81 (3) 59 96-80 36, Fax: +81 (3) 59 96-81 00
Internet: www.nihonkohden.com

NIHON KOHDEN

E/BR-NEUROMON-EN01