

Clinical evidence:

# The effect of Circadian Lighting

with apoplexy patients hospitalized for  
rehabilitation for more than 2 weeks

A research project at Rigshospitalet Glostrup, released in 2017,  
published PhD and articles in 2018-2019.

# Circadian Lighting has a significant effect on apoplexy patients

Approximately every third patient suffers from depression, fatigue and circadian rhythm disturbances after a blood clot or haemorrhage in the brain (apoplexy). This has consequences such as reduced daily activity level and increased mortality.

Since 2013, a Danish research project by the Apoplexy Unit, Department of Neurorehabilitation has studied the effect of Circadian Lighting on apoplexy patients hospitalized for rehabilitation.

"It can be a great challenge for hospitalized patients to maintain a natural circadian rhythm. Patients hospitalized for rehabilitation after a blood clot or a brain haemorrhage are often immobile and can therefore not go outside and get the light that the brain needs to obtain a steady circadian rhythm," explains Doctor Anders West, Rigshospitalet Glostrup.

"The research shows that circadian lighting prevents or efficiently treats depression developed in connection with a blood clot or a brain haemorrhage. In the future, circadian lighting should be considered as a part of the treatment environment in a rehabilitation process of two weeks."

Anders West, Doctor, PhD.

The research group and the operations department at Rigshospitalet Glostrup have in collaboration with lighting experts from Chromaviso developed a Circadian Lighting solution which is designed to maintain the natural circadian rhythm by emulating the sun's natural lighting during a day and thereby creating the necessary composition of light shifts and darkness during the day.

## Method

Doctor Anders West has in a PhD project researched the effect of the natural circadian lighting on the patients' health at the Apoplexy Unit for stroke rehabilitation. The project is the first international research project that measures the effect of circadian lighting on hospitalized patients.

It is a randomised clinical controlled research project which included 90 patients in total, where half of the patients were treated in a unit with circadian lighting

and the other half, the control group, were in a unit with standard lighting. Methods like the Hamilton Rating Scale for Depression and The Major Depression Inventory scale, Epworth Sleepiness Scale, Multi-dimensional Fatigue Inventory questionnaire and Rested Statement and Visual Analog Scala for fatigue were used.

## Results

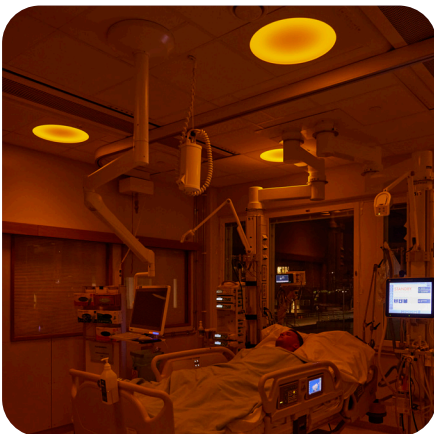
The research project shows a clinical effect with the following results:

- Depression reduced – significance
- Fatigue reduced – significance
- Anxiety reduced – significance
- Improved circadian rhythm according to the markers cortisol and melatonin – significance
- Improved well-being – significance

The results are published in the thesis of Anders West, PhD, at international conferences as well as being peer-reviewed published in scientific journals like International Journal of Medical Science (2019) and Chronobiology International (2017).

The research done to date has not been able to explain the fatigue that apoplexy patients experience. The fatigue is presumed to be caused by brain damage, and not just necessarily because of the bad sleep that most of the patients' experience. This research project about circadian lighting is the first non-pharmacologically randomised research project with a control group, that shows an effect by a non-medical stimulation in connection with the fatigue of apoplexy patients.

"We have in collaboration with Chromaviso developed a lighting protocol which is customised to the patients. The lighting protocol indicates the exact interaction between colour temperature, intensity, timing and duration of lighting during the day" explains Anders West.



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#### **Publications:**

European Stroke Conference, Prague 2017 • PhD thesis: The effects of Naturalistic Lighting in stroke patients, University of Copenhagen 2018 • Impact of Naturalistic light on hospitalized Stroke Patients in a Rehabilitation unit-Design and Measurement • The effects of Naturalistic light on melatonin and cortisol diurnal blood levels in Stroke patients during admission for Rehabilitation -a randomized controlled trial • The effects of Naturalistic light on Fatigue and Subjective sleep quality in Stroke patients during admission for Rehabilitation -a randomized controlled trial • The effects of Naturalistic light on Depression, Anxiety and Cognitive outcomes in Stroke patients during admission for Rehabilitation -a randomized controlled trial • International Stroke Conference, Houston, USA 2017

## Facts about the project

In 2013, Rigshospitalet Glostrup and Aarhus University hospital collaborated with the company Chromaviso to develop and document a research-based Circadian Lighting. It is an interdisciplinary public-private collaboration with funding from the Market Development Fund.

### About the Circadian Lighting

The lighting solution in the research project is named Chroma Zenit Circadian Lighting and is developed by the Danish health-technological company Chromaviso in collaboration with researchers and the clinical staff at Rigshospitalet Glostrup and Aarhus university hospital. It is based on the combination of insight into the clinical workday, knowledge about the lighting's effect on humans, and expertise in circadian rhythm products and technology..

The Circadian Lighting contains a lighting protocol that creates a natural and steady rhythm between light and darkness during the day to ensure a health-promoting physiological effect, the steady circadian rhythm, and the correct balance between sleeping and being awake. Furthermore, Circadian Lighting provides situational lighting settings to match different activities and needs. A blue-free night light ensures that everyone can move around safely and solve different tasks without a negative effect on the circadian rhythm.

### Learn more at

[www.chromaviso.com](http://www.chromaviso.com), [LinkedIn/Chromaviso](#) or [X/Chromaviso](#).

#### Partners

- Chromaviso (Industry), CEO Anders Kryger
- Operations department, Copenhagen University Hospital (Operation), Head of Centre Morten Christiansson
- Unit of Clinical Apoplexy research, Neurological dep. Copenhagen University Hospital (Clinic), Clinical research professor, chief physician, Doctor Helle K. Iversen n

#### Other partners

- Danish Center for Sleep Medicine (The Capital Region of Denmark), Professor and Chief Physician, Doctor Poul Jennum
- Clinical Biochemical Department (The Capital Region of Denmark), Chief physician, PhD Henriette Sennels
- Radiological Department (The Capital Region of Denmark), Chief Physician Frauke Wolfram
- Ophthalmology Department (The Capital Region of Denmark), Senior Researcher PhD Birgit Sander
- Physical and Occupational Therapy Department (The Capital Region of Denmark), Nora Holmegaard Beckman

#### Funding

- The Market Development Fund
- The Capital Region of Denmark
- All departments above from the Copenhagen University Hospital.