BRIGHT LIGHT THERAPY

Sam Heaton
Senior Staff Nurse
Intensive Care
Bristol Royal Infirmary

University Hospitals Bristol
NHS Foundation Trust
Aims of session

• Discuss light and its role in regulation of the sleep/wake cycle.

• Discuss circadian rhythms and their importance

• Discuss benefits of light exposure

• Discuss current practice on BRI ICU
LIGHT

• Back when we were cave people, the sun was our only source of light.

• Incandescent was light invented 150 years ago

• Main environmental stimuli that has the ability to reset the sleep/wake

• Also effects quality of sleep (even low levels can change sleep architecture)
LUX

• Measure of light

• Moonlight – 0.5 to 1 LUX

• Typical indoor light – 200 LUX

• Sunlight on a grey day – 10,000 LUX

• Sunny bright day – 32,000 to 100,000 LUX

• Lumie Vit L Pro – 10,000 LUX
Circadian rhythms and melatonin

- Circadian rhythms are physical, mental and behavioural changes that follow a daily cycle.

- They respond primarily to the light and darkness in an organism’s environment.

- Sleeping at night and being awake during the day is an example of a light related circadian rhythm (aka The sleep/wake cycle).

- Melatonin is a hormone key in regulating these rhythms.

- It is released by the pineal gland and is inhibited by light.
Sleep/wake disruption

- Sleep disruption is one of many pre-disposing risk factors for developing delirium.

- It’s more pronounced in critically ill patients due to 24/7 interventions.

- <200 LUX at bedside during the day is not enough to provide melatonin suppression.

- Critically ill patients show disturbances, or even the complete lack, of a circadian melatonin secretion rhythm.
Disrupted circadian rhythms and its consequences

Critical illness
Stress
Artificial lights
Anesthetics
Sleep deprivation
Surgery
Pain
Shift work
Gene mutations

Dusk/dawn simulation
Intense daylight (>4000 LUX)
No light at night and noise reduction (eye covers/ear plugs)
Melatonin

Circadian rhythms

Myocardial Infarction
Sepsis
Hypertension
Arrhythmias
Diabetes
Obesity
Metabolic syndrome

Improve health & well-being
Reduce disease severity
Prevention or treatment of myocardial infarction, diabetes, obesity, sepsis, hypertension, arrhythmias & delirium
BENEFITS OF LIGHT EXPOSURE

• It regulates melatonin, which has paramount effects on:
  • Brain arousal
  • The immune system
  • Glycaemic control
  • Metabolism
  • Coagulation
  • Cardiovascular function

• Sunlight exposure improves cognitive function among depressed people in a dose-response relationship

• Absence of visible daylight in the room is significantly associated with delirium and higher risk of dementia in intensive care patients.
Light pathways

VISUAL EFFECTS OF LIGHT:
- Well-being sensation
- Better mood
- Less stress
- Satisfaction
- Better outcomes?

NON-VISUAL EFFECTS OF LIGHT:
- Circadian rhythms regulation
- Melatonin
- Cortisol
- Photoinmunomodulation
- Seasonal
- Photoperiodic
- Better outcomes?

NON-VISUAL EFFECTS OF LIGHT (skin-mediated):
- Local immunosuppression
- Synthesis of:
  - Vitamin D3
  - Antimicrobial peptides (cathelicidin LL37)
- Systemic immunosuppression?

Vagus nerve

The inflammatory reflex

The immune response
Bright Light Therapy (BLT)

- Originally designed to treat symptoms of Seasonal Affective Disorder (SAD) e.g. poor sleep, depression/low mood, low energy.

- Appropriately timed bright light exposure has been used to modify out of phase sleep patterns and improve alertness during the day.

- BLT in the morning (e.g. over breakfast) can advance your body clock, making you feel sleepy earlier.

- If the problem is interrupted sleep or waking too early, using BLT in the early evening can help to delay your sleep and wake times.
BRI ICU Current practice

• Using BLT as part of delirium care bundle

• Current light boxes not fit for purpose.

• Awaiting delivery of Lumie Vit L Pro – Light box in every bedsace.

• Audit - Sleep report pre and post introduction of new lights.
SOP FOR BRIGHT LIGHT THERAPY

Clinical Standard Operating Procedure (SCOP)
BRIGHT LIGHT THERAPY

SETTING  A600 – Adult Critical Care
FOR STAFF  Nursing and medical staff
PATIENTS  Only for use on the Adult Critical Care unit (A600).
Prioritised for long term patients, those suffering from delirium, altered sleep pattern or patients in bed spaces with limited daylight (7, 8, 9, 10, 17, 18, 19, 20).
To be used in conjunction with Delirium care bundle

STANDARD OPERATING PROCEDURE

Background

Light therapy is commonly used to treat symptoms of Seasonal Affective Disorder (SAD) or the ‘winter blues’. Light boxes can provide bright light that can help boost energy levels and make individuals feel more awake. Light affects the body through photoreceptors in the eye and in the skin. Light exposure is linked to a range of biological and behavioural effects including the circadian secretion of melatonin and cortisol levels which are abolished in critically ill patients.

Sleep deprivation is one of many contributing factors to delirium in the Intensive Care Unit. Bright light therapy as part of a multicomponent bundle has been shown to improve sleep and functional outcomes in older adults. There is some suggestion that using light boxes can also help to reset the sleep-wake cycle which means patients are more awake during the day when they are required to take part in vital rehabilitation.

Using Lumie Brightspark

- Position Brightspark at roughly arm’s length (50cm) with plastic screen angled towards patient’s face.
- Plug in and flick on switch on top of light.
- The light should reach patient’s eyes although they do not have to stare directly at it and it will also be effective through skin exposure.
- It has been shown to be most effective in the morning. Early evening light exposure can also be beneficial but not too close to bedtime as it may keep patient awake (light on no later than 6pm).
- DO NOT LEAVE LIGHTS ON ALL DAY
- Treatment should last between 40-120 mins although it should be stopped if patient complains of headaches, eye strain, nausea or hyperactivity.
- You do not have to turn off other lights in the room in order for it to be effective.

Precautions

Avoid in patients with evidence of photosensitivity
Dark therapy?

• Melatonin is inhibited by light.

• Virtual darkness - using amber lenses to filter out blue light.

• Creates clearer definition between night and day.

• Barriers – working in the dark!
In summary

• Light is vital in regulating our body’s circadian rhythms including the sleep wake/cycle.

• There is potential for BLT to help reset the sleep wake cycle.

• This in turn could impact upon the rate and duration patients suffer from delirium.
References

• Bellapart & Boots (2012) Potential use of melatonin in sleep and delirium in the critically ill, *British Journal of anaesthesia*


• Taguchi (2013) *Bright light treatment for prevention of perioperative delirium in elderly patients*, *Journal of nursing education and practice*

• Fann, Maas, Abbott, Reid, Zee (2017) Abnormal environmental light in the intensive care environment, *Journal of Critical Care*

• Weiss, Spies, Piazena, Penzel, Fietze an Luetz (2016) Exposure to light and darkness and its influence on physiological measures of intensive care unit patients – a systematic literature review, *Physiological measurement*
Questions?