

Health effects of shift work

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WCC Safety Workshop Monterrey
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Content

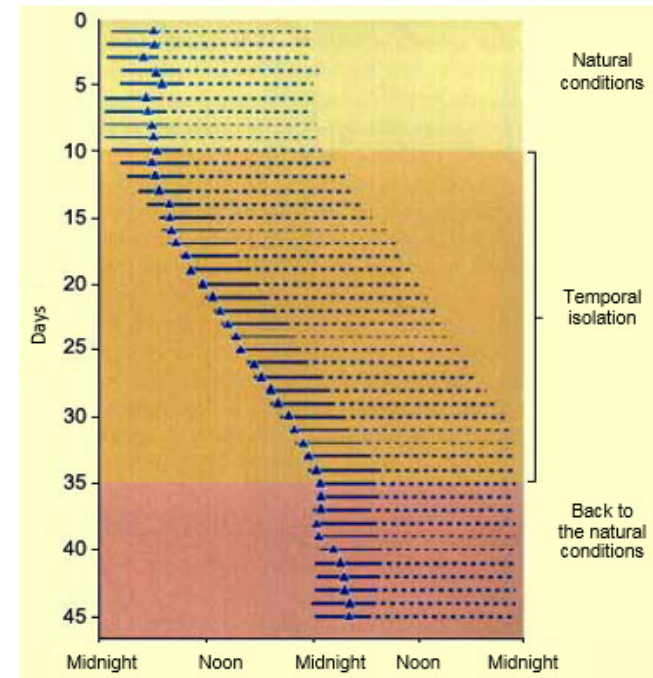
- Physiology of our body
- Health effects of chrono disruption
- Advises for best practices
- Conclusion & Question

chronobiology (1)

biological rhythms	time period	example
ultradian	< 24hrs	eating, heart rhythm, respiration
circadian	≈ 24hrs	sleep cycle, hormonal secretions
infradian	< 365 days	menstrual cycle

chronobiology (2)

- human, a day animal
- free running circadian rhythm:
 - **mean 24.2 hrs**
 - very individual:
 - 25% < 24 hrs
 - 75% > 24 hrs
- **> 24 hrs earth rotation:** correction is necessary



Chronobiology (3)

Phase correction

- Suprachiasmatic nucleus (SCN) in the hypothalamus:
 - **light-dark regulation** of sleep-wake cycle, body temperature, hormone production,...
- **melatonin** is most important driver
- secondary or peripheral clocks:
 - timing of meals, ambient temperatures,...
 - coordinated by SCN

(image from Psychology Continuing Education)

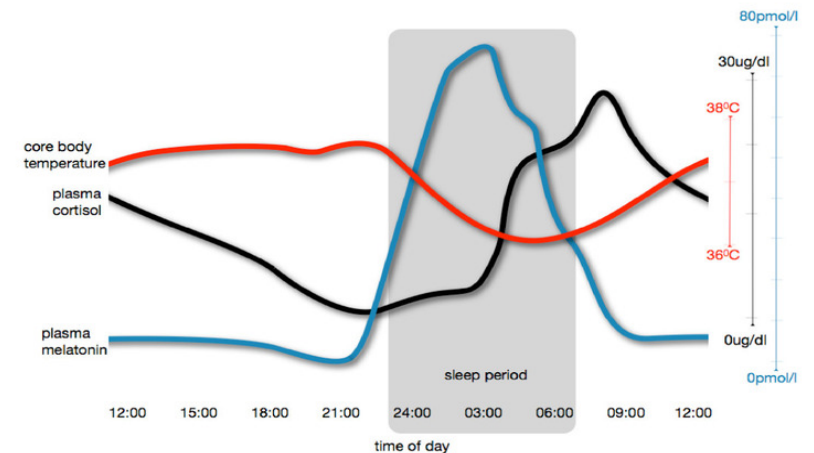
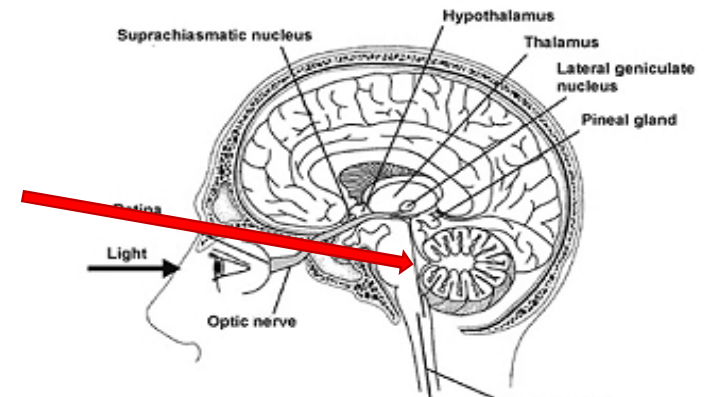
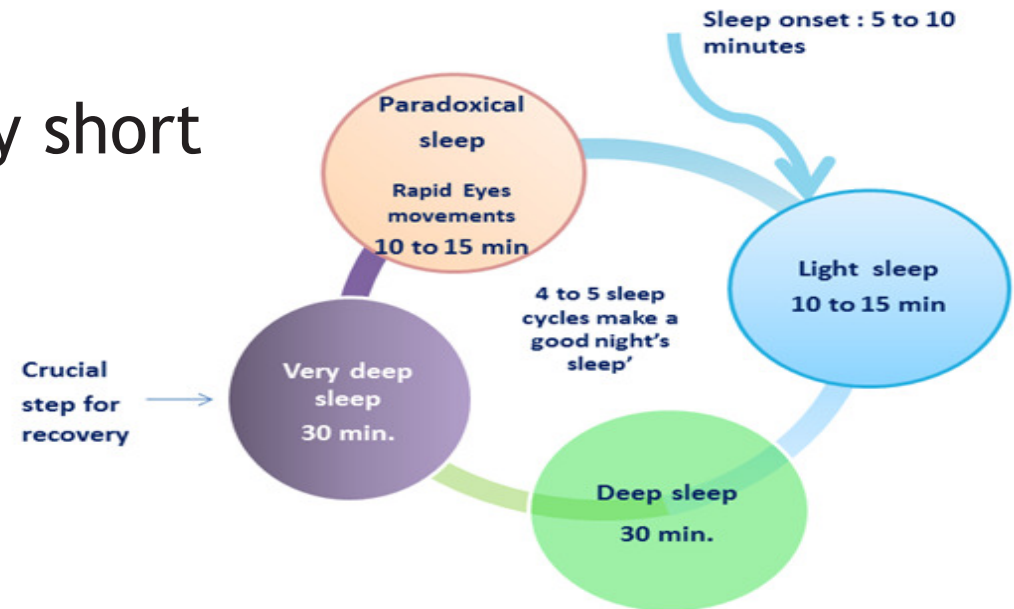
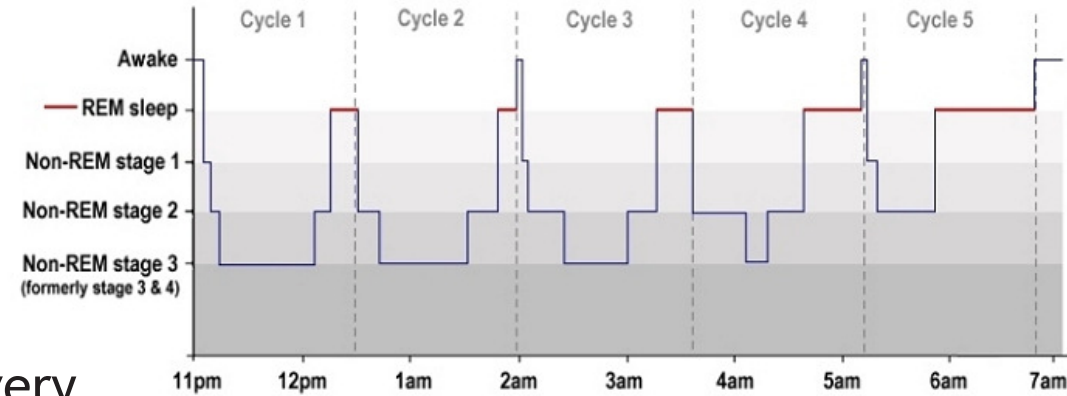


Figure 3: The normal synchronous relationships between sleep and daytime activity and varying levels of cortisol, melatonin and body temperature

Chronobiology (4) sleep stages

- Quality and types of sleep change during the night :
 - deep sleep (Non-REM): → physical recovery
 - paradoxical (REM) sleep: → dreams
- 4 - 6 cycles of 90 minutes, very short awakenings



Health effects of chrono disruption sleep

Proven effects

- reduction in quantity and quality of sleep
- working at night provokes drowsiness
- decreased vigilance

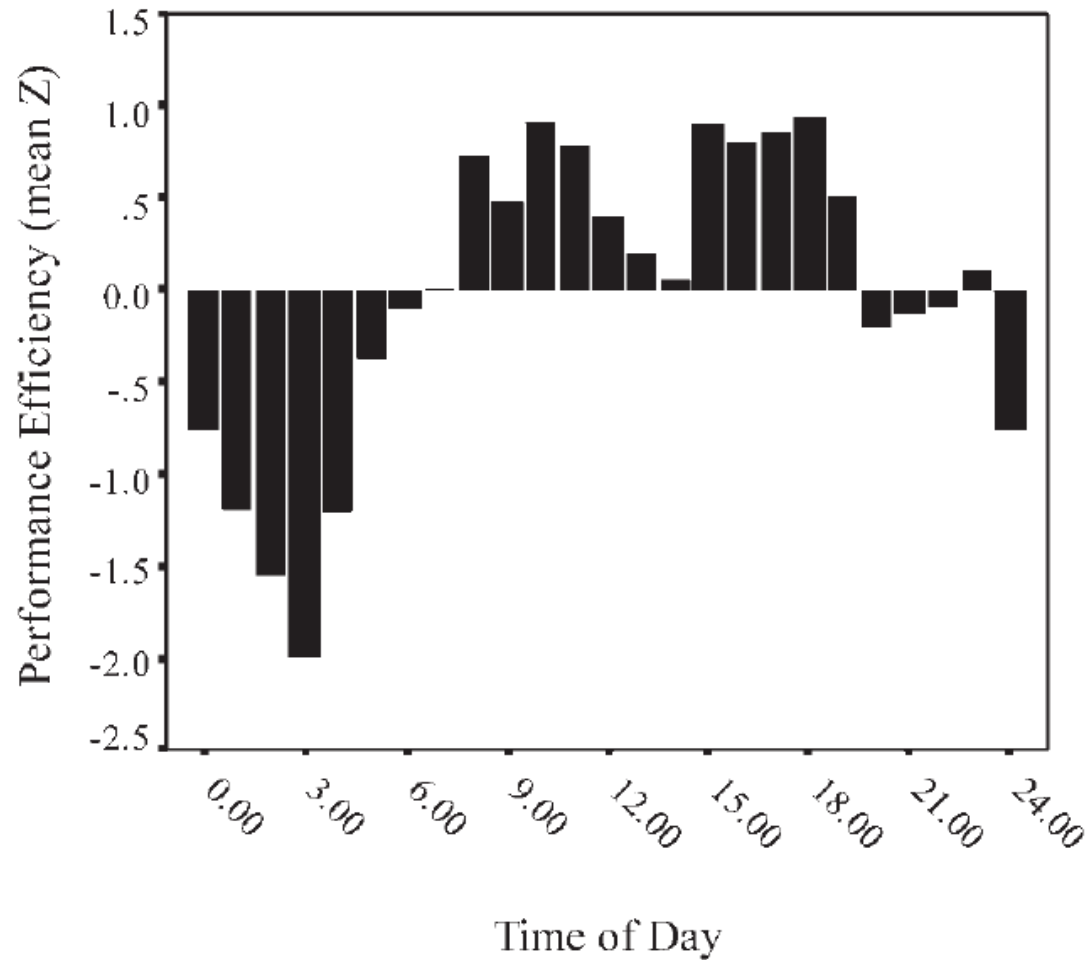
Probable effects

- reduced cognitive performances (age differences)

Other

- addiction problems (alcohol, sleeping pills)

Sleep and performance efficiency



Shift work, safety and productivity. Simon Folkard and Philip Tucker.

Occupational Medicine 2003.

Relative risk during night shift

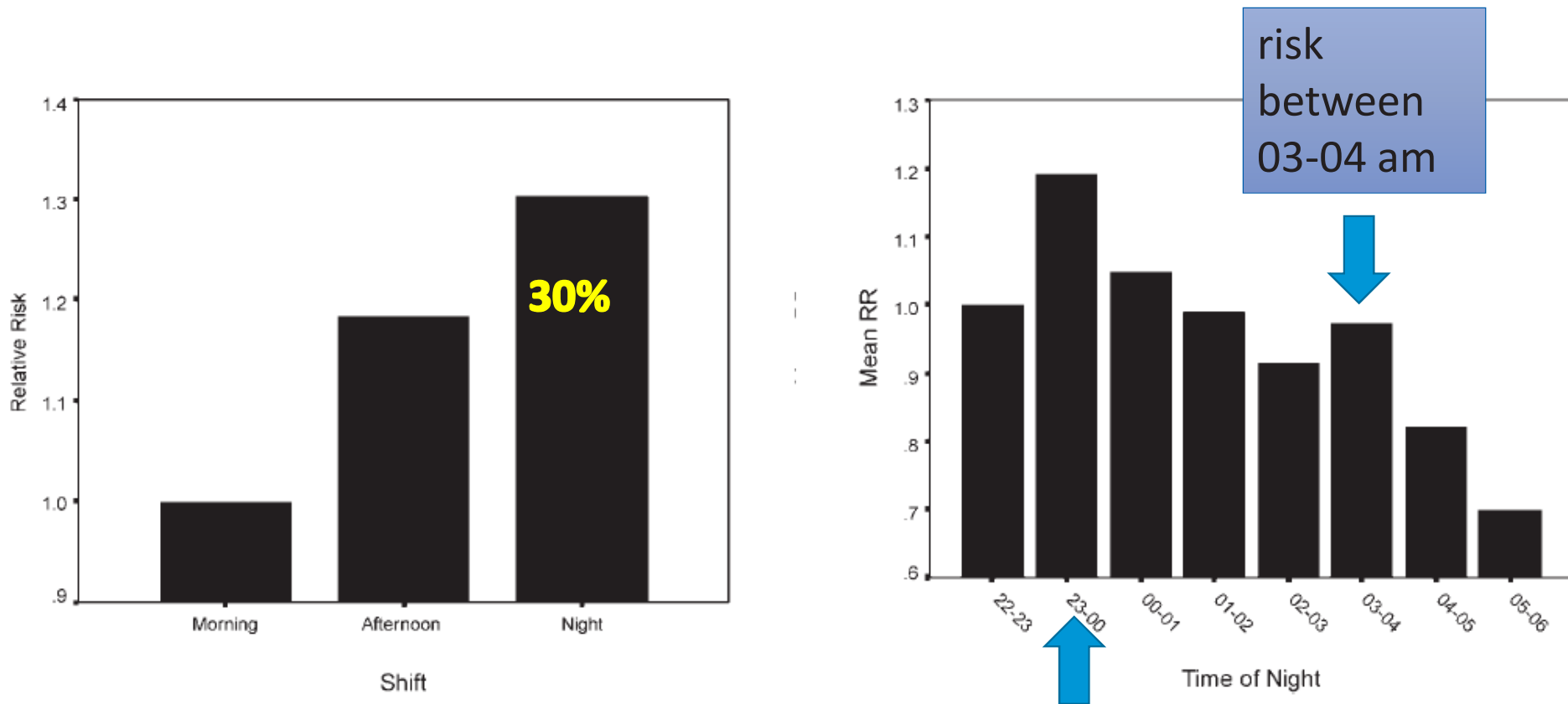
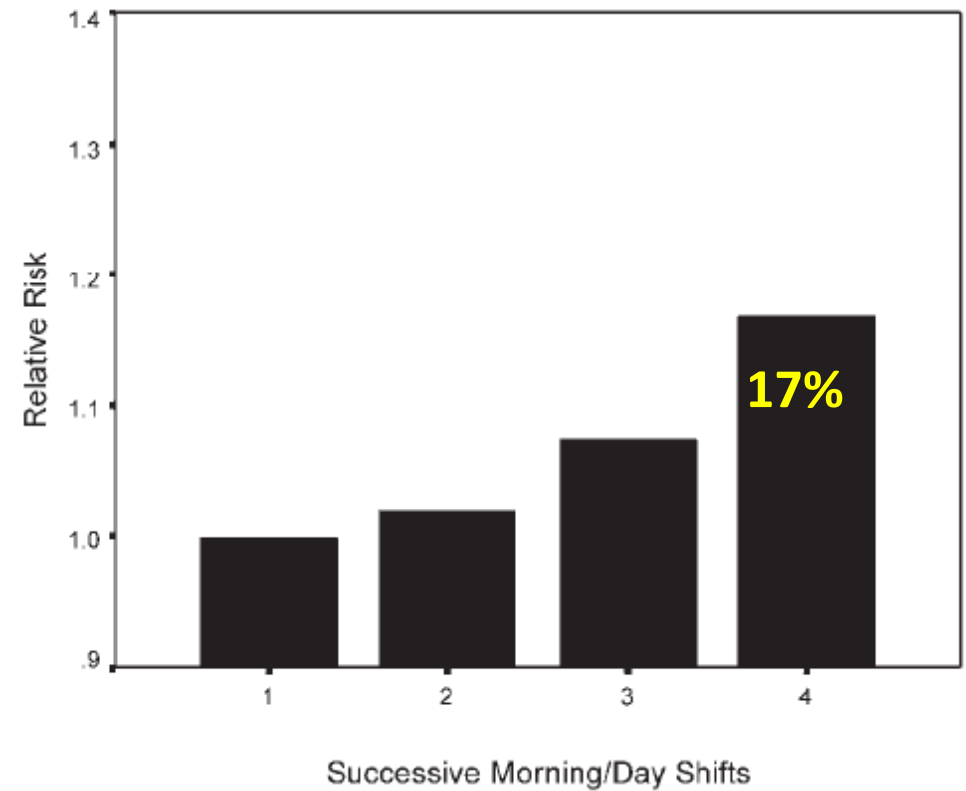
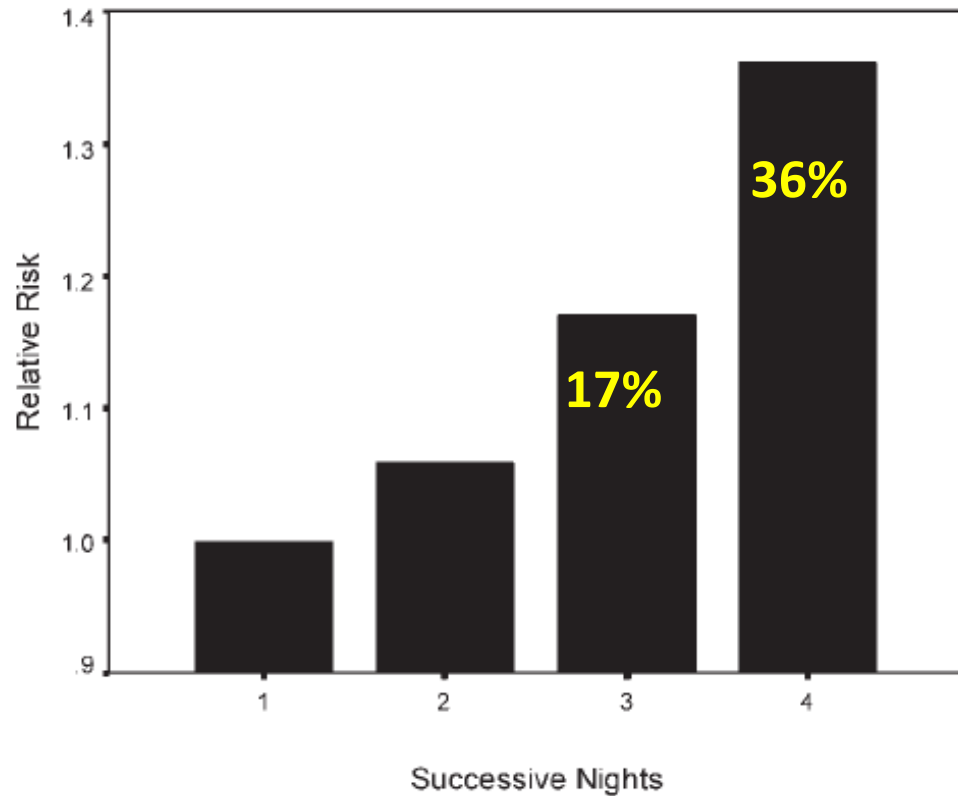


Figure 2. The relative risk across the three shifts.

20% risk increase second hour of night shift



Relative risk over successive shifts



Shift work, safety and productivity. Simon Folkard and Philip Tucker.
Occupational Medicine 2003.

mental health

probable effect

- potential psychosocial stressor: Irritability, aggression, anxiety and depression
- difficult to objectivate
- shift workers are a self selected population

Cardiovascular disorders

probable effect

- coronary artery and myocardial infarction

possible effect

- hypertension and stroke

Metabolic disorders

proven effect

- metabolic syndrome

probable effect

- obesity and overweight
- diabetes type 2

possible effect

- dyslipidemias

metabolic syndrome

- **Diagnostics: at least 3 out of 5**
 - abdominal obesity
 - increased triglycerides
 - reduced HDL-cholesterol
 - high blood pressure
 - increased fasting glucose



Advices for best practice (1)

shift schedules

- respect physiological rotation
- promote rapid shift rotation (max. 1 or 2 nights)
- postpone heavy work or safety critical task to day shift
- no permanent night shifts

eating & drinking

- eating:
 - keep meals on regular daily time-slots (breakfast after night shift)
 - possible snack but not a 4th meal during night shift
- drinking:
 - 5 hours before going to bed no stimulant (coffee, tea,...)
 - avoid alcohol

Advices for best practice (2)

rest

- sleep: at least 7 hrs/24 hrs
- nap: 1h30 after morning shift, 20 min. the other days
- drowsiness:
 - 15 min. sleep improves vigilance for 1 to 2 hrs
 - intense lightning at beginning of morning shift and during night shift

Conclusion & Question

Conclusion:

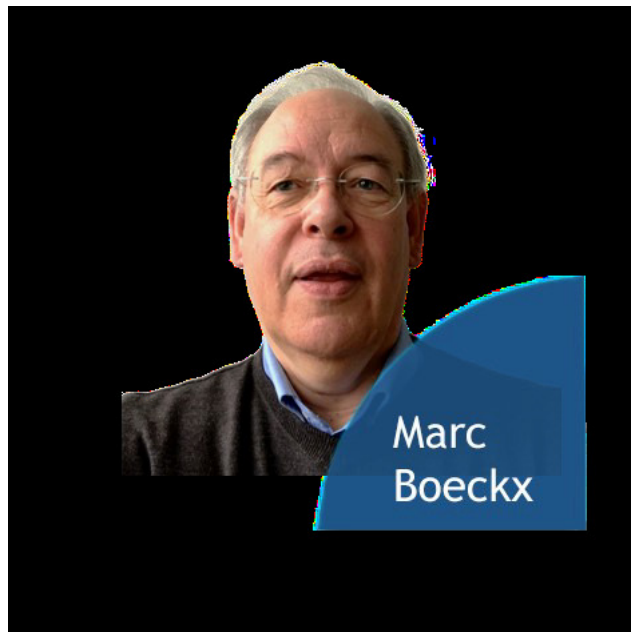
Chrono disruption by shift work can have a deleterious effect on health, safety and social life!

Question:

Could higher levels of automation eliminate the night-shift???

Thanks

Thanks to Marc Boeckx our Medical Doctor of Vynova who gave this presentation at the Euro Chlor Technology conference in 2017



Thank You

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