Introduction

What is Shiftwork

Normal Human Rhythm

What are the Health Effects of Shiftwork?

Blue Light

Prevention
What is Shiftwork?

• Includes any arrangement of daily working hours other than the standard daylight hours (8/9 am – 5/6 pm)

• Schedules change impacts
  • Social life
  • Family life
  • Health

Facts

• Shiftwork is a reality for about 25 percent of the North American working population.
  • Is it really more than that? Moonlighting – Uber.

• Industries and Services
  • Manufacturing, energy production, transportation, health, enforcement and military.
Facts

• Incidents in, Bhopal, Chernobyl and the Exxon Valdez oil spill occurred between midnight and 4 AM.

• “Night owl” types personalities adapt better to night and rotating shifts than “morning larks”

Normal Human Rhythm

• Humans are “programmed” to be awake during daylight hours and to sleep/reduce activity levels at night

• These rhythms are managed by an internal clock
  • Circadian Rhythm
Circadian Rhythm

- "about a day"
  - sleep-wake cycle which is related to the cycle of the sun
  - Social activities
  - Meal times

- Circadian functions
  - Sleeping
  - Waking
  - Digestion
  - Secretion of hormones
  - Blood pressure

Circadian Rhythm

- Leading up to sleep, glands activated by darkness begin to secrete hormones (melatonin) to signal that our body is preparing for sleep.

- Normally, biologic cycles are kept in rhythm by signal hormones such as melatonin
  - Disruption in these systems have health effects.
  - Disrupted by both internal and external signals
Circadian Rhythm – Internal/External Factors

- Shift Schedule
- Fitness Level
- Nutrition
  - Caffeine
  - Smoking
- Job Requirements
- Rotational Schedule
- Circadian Rhythms
- Age
- Gender
- Psycho-social Factors

Health Effects

- Inner circle
  - systems disturbed by circadian misalignment
- Outer circle
  - medical conditions
- Outer Quadrant
  - broad components
Health Effects of Shiftwork

- Heart Health
- Associated with elevated risk of heart disease and ischemic stroke
- Coronary heart disease
- Disrupts blood pressure
- Fatigue

Health Effects of Shiftwork

- Increased risk of type II diabetes
  - Altered meal timing
  - Crave foods with carbohydrate content
  - Convenience foods available 24-hrs are predominantly processed and fried
Health Effects of Shiftwork

• IARC (International Agency for Research on Cancer)
  • Shiftwork that involves circadian disruption
  • Group 2A - Probably carcinogenic to humans (2007)
  • Based on long-term night workers who have shown a to have a higher risk of breast cancer than women who do not work at night.
  • Mainly nurses and flight attendants

They concluded that “shift-work that involves circadian disruption is probably carcinogenic to humans.” This places shift-work in Group 2A.

• IARC Evaluation of Carcinogens
  • Group 1: Carcinogenic in humans
  • Group 2A: Probably carcinogenic in humans
  • Group 2B: Possibly carcinogenic in humans
  • Group 3: Not classifiable, generally inadequate evidence in humans and limited or inadequate in animals
  • Group 4: Evidence of a lack of carcinogenicity in both humans & animals
Health Effects of Shiftwork

- 2018: Systematic Review of Primary Cancers in Women
  - In addition to breast cancer a positive relationship between long term shift work and
    - digestive system cancer
    - skin cancer
  - Nurses: Increasing the number of years working shiftwork increase the risk of breast cancer and increases risk of
    - digestive system cancer
    - lung cancer

2015: Does night-shift work increase the risk of prostate cancer? a systematic review and meta-analysis
- Conclusion: night-shift work is associated with an increased risk of prostate cancer
Shift Work and Mental Health

- Abnormal or heightened response to stress
  - results in difficulty managing response to stress
- Inability to regulate emotions
- Shift work limits social interactions
  - lack of social support system
- Work-life interference (timing of events)
- Fatigue

Shift Work and Mental Health

- Chronic Stress associated with shift work has been associated with an increased risk for coronary heart disease
- Law enforcement workers have higher risk of stress-related mood disorders.
- 2013 Medical Journal of Australia
  - Mood disturbances
Health Effects of Shiftwork

- Journal: Sleep Medicine Reviews (2017)
  - Solid lines are an established response stress disrupts the healthy functioning of the intestinal gut
  - Hypothesize that sleep and circadian disruption alters gut microflora (bacteria normally found in the digestive tract) contributing to inflammation and metabolic disease.

Fatigue

- A state of being exhausted
  - Difficulty concentrating
  - Decreased reaction times
- Both safety and productivity are reduced at night
- Safety declines over successive night shifts
Blue Light

- Sources
  - Sun
  - LED tablets, phones, computers and TVs.
- Sunlight and white light all contain a combination of various wavelengths
- Getting blue light from the sun is essential during the day for remaining awake and improving mood.
- These benefits are great but only during natural day light.
Blue Light

• Brain Interprets blue light from LED screen as daytime

2015: Study on the use of light-emitting eReaders in the evening
• Participants reading an eBook (compared to reading printed book)
  • took longer to fall asleep
  • had reduced evening sleepiness
  • reduced melatonin secretion
  • later timing of their circadian clock
  • reduced next morning alertness
Blue Light

• Avoid looking at bright screens beginning two to three hours before bed.
• App/filters that filter out the blue light

Blue Light

• Increased use of technology in the workplace
  • workplace provided tablets

• Technology has made us available 24/7
  • need to respond to e-mails at anytime

• Flexible working arrangements
  • working and/or responding to emails beyond the 9 - 5
Prevention

• The Occupational Hygiene approach is to apply hazard control in the following order:
  1. Engineering controls
  2. Administrative controls
  3. Personal protective Equipment

Prevention – Engineering Controls

• Work environment designed to improve alertness
  • Appropriate lighting levels (bright vs. dim)
  • Task variation

• Eliminate or substitute
  • Is shiftwork appropriate/necessary?
  • Are resources (human and otherwise) right?
Prevention – Administrative Controls

• Rotate shifts forward
  - Days – afternoons – midnights (preferred)
• How long is the shift
  - 8 hour vs. 12 hour
  - Longer shift advantage: fewer consecutive night shifts
  - Additional fatigue from longer shift
• Timing of shift
  - Start/end time
  - Early morning shifts (5/6am) are associated with shorter sleep and greater fatigue

Prevention – Administrative Controls

• Rapid rotating shifts
  - Switch once or twice during a week
  - Found to cause the least disturbance to the circadian rhythm
• Permanent night shift
  - Circadian adjustment can be achieved
Prevention – PPE (at the worker)

- Sleep
  - Make sure family and friends are aware of your schedule and sleep needs
- Work-life balance
  - There’s an app for that
- Napping strategies
  - Mixed results

Prevention

- Some people adapt after 2-3 days, others much longer.
  - Generally, all systems can shift 1 - 2 hrs per day
- Exercise regularly
  - Reduce stress
  - Avoid vigorous exercise right before you plan to sleep.
- Limit caffeine intake
- Education
  - On the potential health and safety effects of shiftwork
Prevention

• Sleep on a set schedule to help establish a routine
• Healthy eating habits

More Information

• Canadian Centre for Occupational Health and Safety - Rotational Shiftwork
  • https://www.ccohs.ca/oshanswers/ergonomics/shiftwrk.html

• The National Institute for Occupational Safety and Health (NIOSH)
  • https://www.cdc.gov/niosh/topics/workschedules/education.html

• Simple Calendar App For Shift Workers
  • http://www.myshiftworkapp.com/
References

• Tosini, G., Ferguson, I., & Tsubota, K. (2016). Effects of blue light on the circadian system and eye physiology. Molecular vision, 22, 61


References
