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Title: Pattern of Sleep Loss using Actigraphy over Fourteen Days in Police Officers doing 12-Hour Rotating Shifts.

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#### Introduction:

The Calgary Police Service Health and Human Performance Research Initiative Phase II, is a pilot field study designed to objectively monitor sleep/wake cycles during 12-hour rotating shifts for the purpose of determining critical fatigue factors and to develop fatigue countermeasure strategies.

#### Methods:

Subjects (N=9) were monitored over 14 days of a 12-hour shift rotation (D/D/D/N/N/O/O/O/O/O/D/D/N/N). Data was collected using Proportional Integrating Measures with actigraph sensitivity .01 G at 2.5 Hz, epoch length of 60 seconds, sampling rate 10Hz. Sleep/wake was manually scored combining University of California San Diego (UCSD) algorithm, sleep log and event marker information. Total sleep time is defined as the number of epochs scored as sleep within 24 hours (06:00-06:00).

#### Results:

Actigraphy data was analyzed for patterns of cumulative sleep loss and sustained wakefulness. Over 14 days of 12-hour rotating shifts, two periods of extended wakefulness (> 18 hours, equivalent to BAC of 0.05%) were observed when officers transitioned from dayshift to nightshift. This transition is characterized by termination of nighttime sleep between 05:28-09:24 AM, on average 103.9 minutes of daytime sleep/nap, a 12-hour nightshift and sleep onset between 05:12-10:49 AM. Over 14 days it is estimated that there is an accumulation of 13.66 hours of sleep debt, based on an average sleep requirement of 7.5 hours per day.

**Conclusion:**

This pilot field study reveals a pattern of extended hours of wakefulness specifically associated with the transition from dayshift to nightshift and that officers accumulate approximately 13-14 hours of sleep debt over 14 days. Larger cohorts need to be studied over the full shift rotation to confirm the results. Fatigue countermeasures such as strategic use of caffeine and prophylactic naps are recommended during the transition and sleep recovery strategies need to be developed.

**Support:**

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