

# Chapter 20

## The Role of Wireless Technology in Addressing Sleeping Disorders in Aged Care

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### ABSTRACT

*Sleep problems are frequently witnessed in aged care facilities with a large proportion going undetected. Multiple factors are known to contribute many abnormal sleep/wake patterns for residents. A systematic review conducted by Haesler (2004) provided a guide to the direction of future research into sleep in older adults residing in care facilities. This chapter evaluates the effectiveness of implementing the following evidence based recommendation from Haesler (2004): Wrist actigraphy currently represents the most accurate objective sleep assessment tool for use in the population of interest. Factor analysis was utilized to study the patterns of relationship among many dependent variables, with the goal of discovering something about the nature of the independent variables that affect them. Wrist actigraphy showed a disparity between the actual bed time and wake time. One clear difference detected using the device was the increased detection of sleep during the day.*

### INTRODUCTION

This chapter focuses exclusively on the effectiveness of strategies to assess sleep disturbances and manage sleep in residents of aged care facilities. Research indicates that there are substantial changes to an individual's sleeping cycles as they age. An accelerated decrease in melatonin levels, a hormone implicated to control the body's sleep-wake cycle

has been described by some researchers. In addition, there are a number of age-related sleep disorders, such as sleep apnoea syndrome and periodic limb movement, which may be experienced. For older people living in residential aged care facilities, the risk of sleep disturbances may be exacerbated due to a number of reasons. Environmental elements, such as increased light, noise and disruption to sleep by staff and other residents can substantially impact upon the quality and quantity of resident's sleep. The routines typically adhered to aged care

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facilities mean residents spend much time in bed during the day, which has been shown to interfere with circadian rhythms. In addition, residents are often given short-acting hypnotics or long-acting benzodiazepines to manage sleeping difficulties, despite research indicating that these medications may be counter-productive.

In a wrist actigraphy assessment, a monitoring device containing an accelerometer that measures intensity and frequency of body movement, is worn on the subject's non-dominant wrist. Activity is measured in 1-5 second intervals and data are analysed to determine sleep-wake cycles. Some wrist actigraphy devices have the added benefit of recording noise and light levels, enabling the opportunity to concurrently assess sleep patterns and the sleep environment objectively. Wrist actigraphy was found to offer the most accurate objective sleep assessment tool for use with residents of aged care facilities. Wrist actigraphy offers benefits over EEG in that it can be used in a resident's normal sleep environment (as opposed to a sleep laboratory), is noninvasive, more cost-effective and the data are not influenced by brain wave changes associated with dementia. The main issue appears to be compliance, and regular staff checks to ensure the resident is still wearing the wrist device are highly recommended.

This chapter demonstrates that the introduction of wrist actigraphy into a residential aged care environment can improve the detection of sleep problems. Measures collected prospectively using the wrist actigraphy software included: Sleep Efficiency, Total wake time, Percentage of wake, Wake bouts, Total sleep time, Percentage of sleep, and Sleep bouts.

## **BACKGROUND**

The definition of sleep, among many other things, includes 'a period of rest for the body and the mind' (Haesler, 2004). This definition implies that during sleep, bodily functions are temporar-

ily suspended in order to provide rest to limbs and other organs. Other definitions state that sleeping results in 'a natural occurrence having a psychological and physiological function that activate the restorative repair process of the body'. Both definitions indicate that the human body recovers from various abuses during sleep, but it also appears that the nature and purpose of sleep is not completely established. Theories from previous studies suggest that the primary function of sleep is to restore physical organs of the body and to conserve energy. Adam & Oswald (1984), after examining over 100 studies in this domain established that sleeping is restorative. The main findings include the evidence of protein synthesis and its implication on tissue healing after surgery.

Studies have also established that lack of sleep results in irritation, anger, anxiety, weeping, erratic behavior, impaired cognitive processes, lethargy, reduced motivation and decreased pain tolerance (Adam & Oswald, 1984). This appears to be connected with the ability to perform daily activities.

Prior studies provide details of some form of sleeping patterns. It appears that there are two distinct phases of sleep: non rapid-eye movement sleep (NREM) and rapid-eye movement sleep (REM). NREM accounts for about 70% of the sleep and REM the remainder. Due to its regular nature of electrical activity, NREM is also called as synchronous sleep. At this sleep level, minimum mental activity is taking place, tissue renewal appears to be taking place and this sleep is deep. On the other hand REM is active in mental activities such as dreaming and this sleep appears to be impacting the restorative functions of the brain.

Previous studies have also indicated that sleep progresses in cycles of 60 – 90 minutes duration starting with NREM sleep and cycling through REM sleep. With increased age, it appears that the lighter period of sleep increases and the deeper periods of sleep decreases. Some studies state

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