

## **A discussion on the legal barriers in addressing sleeping disorders in aged care using wireless technology**

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### **Abstract**

Disturbed sleep can affect personal well being. In the case of old people, disturbed sleep will impede recovery from any illness. Therefore, sleep quality is an essential ingredient for well being. While previous studies have provided a number of solutions based on clinical trials, it appears that 'technology' solutions are not yet caught up with the problems of sleeping specific to aged care. This 'research in progress' paper provides a conceptual model of how wireless technology solutions can provide answers to some of the monitoring problems of sleeping disorders. Based on the review conducted by the JBI on sleep research, this paper provides guidelines to future research. The paper also provides current status of regulatory issues that may affect the uptake of wireless solutions in this domain.

**Keywords:** Aged care, wireless technology

### **Introduction**

People's health is dictated by the quality and pattern of their sleep. Prior studies have clearly established that older people are affected by disrupted sleeping patterns (ref needed). An implication that results from regular habits of sleep in older people is fewer burdens on nurses and care workers in the aged care industry. While previous studies have discussed the sleep of older people, little information can be obtained about the quality of their sleep and the pattern of the sleep in specific nursing care settings as the data collection exercise is a complex process.

Due to the irregular nature of sleeping disorders, it appears that data collection of sleeping time, sleeping quality and other details associated with sleep becomes a complicated issue. Prior studies have introduced many tools to measure sleep pattern including observations, and self-reported time by the subjects (Crow, 2004). Common to many studies in sleep care appears to be factors such as sleep pattern timings, day and night awakenings, and level of sleepiness. In many cases, nursing staff and care givers collect data on the irregular patterns of sleep. However, it appears that due to the physical conditions such as nursing care or home environment, differences could be noted in terms of various data collected (Chau & Turner, 2004). Further, due to the cost involved, it appears that the data collection exercise becomes very difficult in this irregular sleeping issue.

However, due to the development of frontier technology such as the wireless technology, it appears that sleeping patterns can be monitored remotely. For instance, by installing certain wireless equipment in a patient's bedroom, it may be possible to remotely monitor body movements and then to determine the sleeping pattern. Similarly, using some laser beams, it is possible to determine the movements of a subject while sleeping to derive a sleeping pattern. The strength of these technologies lie in the fact that the sleeping pattern can be monitored remotely, without the need for a staff on site.

This 'research in progress' paper, therefore, briefly examines the applicability of wireless technology in sleep studies and any potential legal barriers to such an implementation as legal issues appear to be hindering the uptake of wireless technology in many healthcare setting. Further, due to the sensitive nature of information associated with aged care patients and other governing

privacy legislations, legal issues assume importance in aged care environment and hence the specific focus on this domain.

## **Background**

The definition of sleep, among many other things, includes ‘a period of rest for the body and the mind’ (ref needed). This definition implies that during sleep, bodily functions are temporarily 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.

It appears that the nature and the 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. 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 (ref needed). This appears to 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 movement eye sleep (REM). NREM accounts for about 70% of the sleep and REM the remaining. Due to its regular natural 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 on 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 that the deeper stages of sleep are particularly affected as ageing process occurs.

Sleeping irregularities can occur at any time, but noticeable and increasing as ageing occurs. While ageing alone is not a cause for sleeping disorders, it appears that sleeping disorders are pronounced in aged people. Some reasons attributed to this include emotional illness and periodic leg movement syndrome. Disturbed sleep is a common complaint among aged people and can be of short or long term nature. Prior studies also indicate that in aged people length of time taken to get to sleep, ability to stay asleep, early morning wakening and insomnia result in day time fatigue, tiredness, and increased frequency of daytime sleeping. Further, age related physiological factors also contribute to irregularities in sleeping patterns in aged people. A solution to these problems appears to be the introduction of wireless technology.

Wireless technology includes the concept of mobile computing, which consists of portable devices that can connect to traditional networks without the utilisation of cables. Wireless technology provides increased flexibility and mobility to the use of information technology in today’s competitive environment. Current aged care systems, due to the increasing costs and due to the complexities in managing the patient data and associated information such as billing and pharmaceutical information, are not functioning at their expected level (Davis, 2002). This can, in turn, compromised the level of service provided to the stakeholder involved. For instance, a patient

may have difficulties in accessing pharmacy information and associated benefits provided by the government to different categories of people, as this information doesn't appear to have been integrated with the current hospital systems. On the other hand, it may be difficult for an external doctor to ascertain whether an operation theatre in a hospital is available to schedule an operation as hospital administrative staff maintains the current systems of scheduling. While it is possible to point out that these problems can be sorted out with proper integration and access to systems (Craig & Julta, 2001), it is also possible to argue that the wireless technology will be able to provide better access to data from anywhere at any time. This notion, it appears, has prompted aged care organisations to consider wireless devices in their overall information technology development.

The need for wireless technology in aged care can be justified as a solution to the financial crisis encountered in many healthcare systems (Davis, 2002), to address the increasingly complex information challenges (Yacano, 2002), to comply with the rigorous regulatory framework (Wisnicki, 2002), to reduce the medication errors (Turisco, 2000) and to generate affordable healthcare applications that allow for greater mobility and ease of use in entering, sending and retrieving data (Athey & Stern, 2002).

While the use of wireless technology can be justified, it should be remembered that wireless technology can not solve all problems encountered in aged care (Wisnicki, 2002). Even though the technology is rapidly improving and cost involved coming down these devices are still experiencing some practical problems. This includes slower speed compared with the desktop computers (Shah, 2001), lack of real time connectivity due to the mobility of the device (Stevenson, 2001), the limited size of the screen and hence the problems that may be encountered in displaying data, little or no provision for high quality graphic display (Atwal, 2001).

In sleep care, wireless technology can be introduced at many points. For instance, it is conceivable to collect sleeping pattern data using wireless technology based on body movements. It is also possible to remotely monitor sleeping patterns of aged people using wireless technology, resulting in cost savings. Emotional illness can be determined using wireless technology by measuring body temperatures etc. In certain cases, it is possible to use Radio Frequency Tags (RF Tags) to communicate body functions to a computer. Aged people can be monitored for various sleeping related problems at their home using wireless technology and this may reduce the burden on nursing care associated with aged people. While the technology provides solutions to some of the sleep disorder issues, legal issues may prohibit the uptake as discussed below.

### **Legal Issues**

According to a Clayton Utz report, there are 10 areas of wireless technology specific to aged care that may be impacted by the national privacy principles. They are collection of data, use and disclosure, data quality, openness, access and correction, identifiers, anonymity, trans-border data flow, data security and sensitive information. These are discussed below in detail.

#### 1. Collection of data

According to privacy laws, an organization can collect data only for the purpose and should be 'fair' in the way in which the data is collected. An organization should identify itself to the person from whom the data is collected and can collect personal information 'directly' where practicable. Further the national privacy regulations also state that if the information is collected from someone else about a person, then the involved parties need to be notified.

This opens up some new legal challenges in the wireless technology domain. When the data passes through wireless networks, it goes through many service providers and it is difficult to apply national privacy regulation at this point, as some networks may be 'transparent'. Further, when

security breaches occur on the wireless networks, the data become visible to all parties involved and this introduces risks in data handling.

## 2. Use and disclosure

The privacy principle states that an organization can use and disclose information as per the expectations of the user. When it comes to wireless technology, the user may not have any awareness of the potential of the technology and hence the expectation may not be valid as the user has no comprehension of the technology. Therefore, organizations may find it difficult to perform certain functions that are capable of using the technology. Further, in certain conditions, it may be difficult to prevent the disclosure of the user information because of the technical limitations. During these instances, organizations may fail to comply with this principle.

## 3. Data quality

National laws state that an organization must ensure that the data collection process is accurate and the collected data accurately reflects the purpose. While this is theoretically possible, in wireless technology, if the device is not calibrated properly, then inaccuracies may be introduced in the data collection exercise. If the wireless device is manufactured by an overseas company, then due to contractual issues, it may not be possible to accurately calibrate the device as often as an organization would like to do so. This lack of frequent calibration would result in poor data quality.

## 4. Openness

The Australian privacy laws state that organizations must set out clearly how personal information will be managed. When this concept is applied to the wireless technology, there may be issues associated with data storage, where the data is stored, how this is stored etc. When this reaches the vandals, sensitive information is at risk. Further, it is not clear whether the policies should cover the data transfer procedures as well. A major complication that may arise in a wireless domain is due to the transmission of data through various service providers. When the data is sent across different wireless networks, the control information such as the type of encryption used will be stripped from the data for 'transfer' from one network service provider to another to ensure Quality of Service (QoS). At this time, anybody having access to these networks will be able to see the data as transmitted in its raw form. This process is generally termed as the 'WAPGAP' or the Wireless Application Protocol Gap. So, openness, when interpreted in technical terms, can create problems to organizations.

## 5. Access and correction

As per the privacy laws, individuals can have access to their personal information, wherever possible. While this concept is easy to comprehend in theoretical terms, in terms of implementation this introduces some difficulties. For instance, medical records need to be maintained for longer period of time and can not be destroyed due to the sensitive nature of the data. In the case of aged care, it may so happen that a patient can access their data and interpret a treatment in an adverse manner. In certain instances, care providers may be limited by the facilities available at the time of providing the care and this can be interpreted in an adverse manner by patients and their families. Further, the physical condition of a patient may prevent a care provider to avoid certain procedures. Any such documented information, accessed by stakeholders, may result in a legal procedure. When this happens, organizations need to bear the cost of defending their actions. Further, in some cases, presenting the data and other evidence may require expensive and time consuming processes. When organizations are found guilty, the correction of medical records may also result in bad publicity.

## 6. Identifiers

National privacy principle states that an organization must not use its own identifiers in certain conditions. In physical environment it is possible to do achieve this aim when sensitive data is collected as organizations may be able to hire an external agency to perform the data collection exercises for them. However, when technology such as wireless is used, it may not always be possible to hide the 'identifier' information as national regulations (Communication Authorities) warrant the disclosure of identification for data communication. Therefore, it may not be possible to 'hide' the identity of an organization in a wireless domain.

## 7. Anonymity

National privacy principle states that in certain cases individuals have the option of concealing their identity when entering into transactions with organizations. While the concept is valid, in certain specific cases, there may be management problems. When wireless technology is used for communication purposes in the aged care sector, the individual identity is automatically revealed for communication purposes. Therefore, for the technology to be enabled identification is essential. Therefore, concealing identification may not be possible in a technical communication using wireless technology as this identification is essential to pass data between networks and send responses to the originator. Email messages from doctors to pharmacists must have identification for action and hence the concept of anonymity may be difficult to implement in certain specific conditions using the wireless technology.

## 8. Trans-border data flow

The privacy principle states that an organization can transfer data pertaining to a patient only under specific conditions, especially when it involves a foreign country. The concept of wireless technology is to support anywhere, anytime and anyhow access to data and messages. When the data transfer occurs in a wireless domain, it is difficult ensure that standards maintained by a service provider in a country are compatible with standards maintained by another service provider in a different country. This includes record keeping standards, procedures, certification associated with the industry practice, technology standards and a range of other issues associated with these. In addition, when things go wrong due to technical issues, it may be difficult to enforce certain conditions as technology implementation differs in many countries. Therefore, trans-border data flow is a complicated issue when technology is involved.

## 9. Data Security

In wireless technology multiple security level standards are available. Therefore, data security depends upon the security sophistication of an organization. Further, there is no guarantee that two service providers facilitating wireless services will maintain the same level of security protocols. Therefore, it is difficult to guarantee security standards for data security.

## Sensitive information

Privacy principles state that an organization must only collect sensitive information in certain specified conditions. While this is applicable to a condition where human intervention is allowed, this is not possible when technology is involved as current technology has not yet reached the level of understanding human feelings to the expected level. Further, in certain specified conditions, technology may react differently. For example, in extreme heat temperatures, wireless technology may fail. In certain electro-magnetic induction fields, wireless may not perform well. Therefore, collection of sensitive data may not work well in wireless technology domain. Further, when the sensitive information is linked with privacy principles, any ignorant disclosure of the collected data may result in an adverse reaction.

## Future Research

This paper is our initial attempt to provide an overview of potential legal barriers to implementing wireless technology in aged care environment. The paper, based on the guidelines of privacy framework, highlighted some glaring problems in managing data using wireless technology. Future research, continuing from this paper will include a comprehensive study of existing legal requirements in Australia for data management specific to aged care. The proposed study will explore various issues culminating in a theoretical model of data management in aged care. The theoretical model will also result in a check list that can be used by aged care data administrators to ensure the privacy and confidentiality of patient data is maintained.

## Conclusion

This paper discussed the role of legal barriers in providing wireless technology solutions to aged care. While it is possible to apply wireless technology to address some problems encountered in this area, the assessment specific to legal issues indicate that due to privacy principles, organizations engaged in providing aged care should consider the introduction of this technology with caution. It is proposed that this issue will be investigated further to form a model that can readily be used by aged care data administrators.

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