The Use of Technology for the Alzheimer's Patient: A Literature Review

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A Literature Review

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Abstract

Technology has long been used to assist in the diagnosis of Alzheimer’s disease (AD); but not until recently has it been used in the treatment of symptoms of this debilitating disease. The current focus of technology use is assistance with activities of daily living (ADL’s) and patient safety. Research and experimentation have been conducted with devices to assist with memory loss in the Alzheimer’s patient. To better understand the need for technological assistance, it is necessary to first take a look at the current technology used and its effectiveness, the ethical issues involved with any medical technology, and to examine the technology which is on the horizon to determine if more research is indicated and the development of other products explored. This literature review will analyze the needs and abilities of the Alzheimer’s patient with regards to technology, the effectiveness and ethical considerations of the technology currently being used, and the technology that is on the horizon.

Keywords: Alzheimer’s disease, ethics, technology, memory
The Use of Technology for Alzheimer’s Patients: A Literature Review

According to Carrillo and Dishman (2007), by mid-century the numbers of people over the age of 65 could triple, making illnesses related to a person’s age even more pervasive than currently experienced. With these growing numbers come the growing numbers of patients with Alzheimer’s disease (AD) and other forms of dementia. This means that the numbers of patients requiring specialized care will far outnumber healthcare workers who are trained to assist these patients.

There have been many strides in the technology used to diagnose Alzheimer’s disease. Many years ago, this disease could only be diagnosed during an autopsy. Now, with technology like CT scans, MRI’s and brain scans, the notorious tangles and webs which are the markers of Alzheimer’s disease (AD), are recognized much sooner and treatment can begin earlier. Currently, the most accepted treatment is medication to slow the rate of cognitive decline. However, it has become more apparent to persons in the technology field that the use of technology, could, in fact, also impede the rate of cognitive decline in the Alzheimer’s patient. The strides in technology have opened the door for more research in this area, as well as patient care and safety.

Literature Review

Buettner, Yu, & Burgener (2010) have found that there are many innovative uses of technology for better care and better quality of life for the AD patient. Crete-Nishihata et al. (2012) have reviewed research which shows that when technology enhances personal memory it helps to address the needs of those older adults who have cognitive impairment. Time and space do not permit an in-depth evaluation of all technology and research currently being conducted. Nor will
this be a comprehensive study, but this review will endeavor to propose additional research and development of useful technology to better assist the AD patient with cognition and activities of daily life while maintaining the highest ethical standards with regards to patient rights and privacy by exploring the following topics:

1. Current technology used to assist in cognitive retention in the Alzheimer’s patient
2. Ethical issues in the use of technology for the treatment of the Alzheimer’s patient
3. Ongoing research and development in technology for the Alzheimer’s patient

**Current Technology Used to Assist in Cognitive Retention in the Alzheimer’s Patient**

According to (Tal, 2013), “some researchers are beginning to focus specifically on how technology could help Alzheimer’s patients maintain independence for longer periods of time” (p. 1). Tal (2013) goes on to assert that the use of technology would not only improve the quality of life for the AD patient, but also lessen the strain on healthcare systems. The AD patient has long been monitored for safety with the use of technology such as alarm bracelets and bed alarms. However, the possibilities of other technological advances for the AD patient are just beginning to emerge.

Thota et al. (2007) state that while the AD patient is in the early stages, they can live independently using cognitive aids, such as a pager or tablet, to assist in task remembrance. Such devices will only be useful for the AD patient with the ability to use the technology. In a study of activity limitations in older adults with AD, Nygard, Pantzar, Uppgaard & Kottorp (2012) found that when “mild cognitive impairment (MCI) is involved, the AD patient often found it difficult to use or understand how to use everyday technology” (p. 362). To assist the
AD patient with the use of technology which would help recapture their ability to engage in the basic activities of daily life, the patient and caregiver would need instruction. Pilotto et al. (2011) “found that older people, especially those with AD, have rarely been involved in the development of technology; therefore, user acceptability has tended to be assessed via proxy report” (p. 135). Lancioni et al. (2009) found that “behavioral intervention in promoting activities of daily living (ADL’s) through computer-mediated verbal instruction that required little to no effort on the part of the patient proved to increase the overall independence of the AD patient”(p. 212). In a follow-up maintenance assessment, Lancioni et al. (2010) found that interventions duration must be tested continually given that AD is a degenerative disease and cognitive impairment could change the results of the interventions. Regular assessment of the cognitive decline of the AD patient would be required to adjust the use of verbal instructed cues needed to carry out the ADL’s needed to maintain some independence. Technologies could then be adjusted to meet the patient’s capabilities. Hagen, Cahill, Macijauskiene, Nygard, & Faulkner, (2007) state that “technologies for the AD patient should fall into one of four categories: safety, communication, multi-sensory stimulation and memory enhancers” (p. 56).

**Safety**

Safety measures have been in place for some time. The alarm bracelets on the arms of the AD patient used to alert caregivers to wandering behavior have been used for more than 15 years. The same holds true with alarms for doors in the home of the AD patient or in the nursing home. Bed alarms have also been used for some time to help prevent the AD patient from falling or wandering off at night. Pilatto et al. (2011) found that certain technology systems could be
used in the home to issue reminders to the AD patient to take medicine or other life-saving activities, thus ensuring a safer environment.

**Communication**

Communication help comes in many forms. For the AD patient, technology can bridge the gap between meaningful communication and frustration. Tal (2013) states that “there has been a link between social interaction and brain exercises on the computer and the slowing down the symptoms of Alzheimer’s disease” (p. 1). According to Thota et al. (2007), a combination of technologies for daily living can help the gerontology patient with their many medical needs. The communication may take place on a landline, a smartphone, a tablet or a computer, whichever one the AD patient is most comfortable with.

**Multi-sensory stimulation**

Multi-sensory stimulation may benefit the AD patient in many ways. Carrillo & Dishman (2007) found technology that would create a DVD that stores and plays the patient’s biography. Buettner, Yu, & Burgener (2010) relate the use of a device which is similar to a karaoke where AD patients can choose music and then sing along with the lyrics which are displayed. This allows the patient to enjoy a relaxing and stimulating exercise (Buettner, Yu, & Burgener, 2010). Video games and interactive technology would also fall into this category.
Memory Enhancers

Crete-Nishihata et al. (2012) state that assisting human memory with machines has long been a goal of computer science. The same technology that people use every day, such as calendar tasks lists can be used to assist the AD patient with memory. According to Thota et al. (2007), a computer could be used to keep records of family events to help remind the AD patient of their past or their history. In their research, Nygard, Pantzar, Uppgaard & Kottorp (2012) found that the more often an AD patient used technology, the easier it became for the AD patient to use the technology. This would suggest that rote memory may be applicable to the AD patient. This could also apply to muscle memory, though not much research has been done on this topic.

Ethical Issues in the Use of Technology for the Treatment of the Alzheimer’s Patient

As with any device or technology used with regard to patient information or care, the utmost attention must be paid to the rights and privacy of that sector, particularly when that sector is considered, by law, to be vulnerable adults. Baldwin (2005) states that discussion regarding bioethics in the use and development of technology for the AD patient is limited in scope. This is further complicated by the fact that the level of cognitive impairment directly affects whether the AD patient is competent or incompetent to make decisions regarding which technologies they will permit into their homes and lives. Corvol et al. (2012) found in their research on “ethical issues in case management of the gerontology patient that there was a conflict in principles when what was beneficial for the patient conflicted with the respect for patient autonomy” (p. 87). This was echoed in the study by Tracy et al. (2004) when patient
healthcare information disclosure was examined. According to Tracy et al. (2004), “Professionals valued disclosure to colleagues and family caregivers. Patients valued inter-professional disclosure but sought strong control over what was disclosed to family members. Family members felt value in being kept informed of the patient’s condition, even without their consent” (p. 203).

With this information in mind, there must be an evaluation of competency in the AD patient to determine how much input they are allowed in the use of technology. Moberg and Kniele (2006) state “The assessment of decision-making capacity is an essential element of competency determinations” (p. 101). Once mental competency has been determined, the physical and intellectual competency of the AD patient to use technology must then be assessed. Will the technology be truly useful for the patient or is the true intention meant for the convenience of the caregiver? If the AD patient is hesitant, to what extent do we try to persuade them to use technology? It is important that the rights and wishes of the AD patient be protected and honored at all times.

Baldwin (2005) states that for many years the ethical issues that arise during the design and application of technology for the AD patient have been a concern. There has been some debate, but not much progress in the advancement of ethics in medical technology for those suffering from dementia or AD. For instance, Baldwin (2005) mentions that there are several different definitions of technology. To better utilize technology, we must arrive at the same definition in order to address the ethical concerns around that technology. We must also consider if the technology is safe for the AD patient. If the risk of injury is greater than the benefit that may be derived, then we must ask ourselves if that technology is the answer for the AD patient’s needs.
Dilworth-Anderson, Pierre, & Hilliard (2012) bring up an interesting point when it comes to social justice for the AD patient when they state that the age of the patient brings disparity in access to treatment of AD. Does this disparity also affect research and development in the arena of technology that will not only keep the AD patient safe, but assist them in maintaining some quality of life and memory for a longer period of time? According to Dilworth-Anderson, Pierre, & Hilliard (2012), “among older Americans, health status varies by race, income and gender” (p.26). Disparities of any kind must be addressed and dealt with so that all older Americans receive the same level of health care as younger Americans. Real progress must be made in the development of bioethics regarding the care and treatment of the AD patient, particularly as it relates to technology.

**Ongoing Research and Development in Technology for the Alzheimer's Patient**

George & Whitehouse (2011) have found that a new marketplace of “brain fitness” technology products is emerging. According to George & Whitehouse (2011), devices such as video games to computer software promise to enhance the memory of the AD patient. These types of technology, of course, hinge on the ability of the AD patient to use them. As stated earlier, the need for ease of use must be constantly on the mind of the designer/producer of technology which requires moderate to intensive training for the AD patient.

Some of the technology on the horizon which looks promising in that it requires minimal involvement of the AD patient is taking place at Carnegie Mellon University Quality of Life Technology Center. A research team is developing a product called the MemeXerciser. According to (Research Projects: Cognitive Coach: MemeXerciser, 2013), this product is a
lifelogging technology which provides memory support to AD patients by capturing life experiences via sensors or cameras. Their research is based on the product SenseCam (a device for passive capturing of recent events through a camera worn by the patient) by Microsoft.

Most of the technology on the horizon is in the form of assistive technology which is just a term for any device or object which enables a person to perform a task they would otherwise be unable to complete. Types of this technology are already here, such as: safety sensors, aids to remind patients to take medication, bed alarms, etc. Many others are still in the research process. Tal (2013) states that there are interactive games and websites which could help stimulate the brain of the AD patient.

Bharucha et al. (2009) list some prospective technologies as cognitive aids and physical sensors. The cognitive aids are basically task and time reminder systems. The physical sensors are for monitoring vital signs, falls and location. These different technologies range from those which are simple to use to the other end of the spectrum, which would require an expert to use them. Bharucha et al. (2009) further state “primarily, the use of assistive devices for physical disability has been typically in younger adults and not the cognitive, functional, and behavioral sequelae of dementia in particular” (p. 89). So, while there is much research going on in the field of assistive technology, much of it is not geared to the older populations.

This problem is unique in that the user will not continue to learn and become better at the use of technology. The innate course of Alzheimer’s disease is cognitive decline, thereby limiting the expertise available by the user that many of the new technologies might require. This poses an additional concern for research and development as they continue to work toward solutions for a group whose situation may change on a daily basis.
Discussion and Future Study

A review of the literature on the technology used in the treatment of Alzheimer’s disease memory loss has shown a lack of adequate thought on the issues of ethics for the protection of the AD patient. Would the AD patient have made the same decision to use technology before they had AD? Is the dignity of the AD patient being considered and protected? Are we adding to the frustration felt by many AD patients by asking them to learn new devices? Are we considering the financial cost to the AD patient? Just as the internet is growing so fast that a new rhetoric for its use must be considered, so must a new rhetoric be developed for the use of technology for the AD patient or any medical needs patient.

The literature reviewed does, however, open a dialogue for further research and development of products which could assist the AD patient with memory, daily tasks, safety, and better quality of life. Many talented groups are experimenting with technology that could help the AD patient hold on to a piece of themselves, if only by a movie of their life events. This same technology could assist the caregiver with daily tasks so that they are not so burdened with daily care of the AD patient.

The weaknesses found during this review are that much of the technology offered is expensive and requires more technological savvy than the AD patient or caregiver may have. No thought has been given to the fact that the AD patient may only use the technology for a short time before their cognitive decline is such that they are no longer able to use the device. The literature did not show any type of technology researched or developed which would actually help with the retention of memory.
There were no mentions of computer chips which could be implanted in the brain which would remind it to breathe, eat, eliminate, or other bodily functions. As intrusive as this sounds, it is really no different than an artificial heart valve or a bionic arm or leg. Society must decide to what lengths it wants to go to lengthen life and at what price? If the body cannot function, the memory is of no consequence. The literature all agreed on the basic types of assistance, but each one seemed to dovetail off each other and end up with the same result, which was to record memories and play them back or ensure the safety of the AD patient.

Could a memory chip be implanted in the brain which would allow the AD patient to keep the memory of themselves alive? The fear of all people facing Alzheimer’s disease is not just losing who their family is, but in losing themselves. Social media could assist in keeping the AD patient in touch with other people and help with facial recognition of those people using the profile picture and making a game of matching names and faces. A personal website with pictures uploaded of family, friends and the AD patient at different stages of their life could assist in keeping memory alive. The website could include videos and music which triggers happy thoughts in the mind of the AD patient. It could also include games in which the AD patient has to work through certain animated tasks which could elicit muscle memory responses.

As the future unfolds in the research of Alzheimer’s disease, its progression, its devastation, and its cure, maybe more should go into the development of technology that could eradicate the tangles and webs that are Alzheimer’s disease. Every effort should be made to diagnose earlier, treat more aggressively, and reverse the damage that AD leaves behind. Technology is the latch pin in this possibility. With the proper ethics in place, technology could give an Alzheimer’s patient their life back and in doing so; give them back to their family and to the world.
References


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