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Short Report

"Text It" program to track falls in patients with Alzheimer's disease and dementia

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Abstract

Introduction: Falls are a significant problem among older adults with Alzheimer's disease, leading to high rates of fracture, hospitalization, and death. Tracking falls in older adults, particularly those with cognitive impairment, is a clinical and research challenge.

Methods: This prospective pilot study evaluated the feasibility of a text message program to track falls among patients with dementia. We also compared this technique with the calendar method of fall data collection.

Results: There was a 96% completion rate of text messaging and 100% of calendars; however, the text-gathered data were more accurate.

Discussion: A text-messaging platform to track falls shows promise in cognitively impaired individuals.

Keywords: Text It; Alzheimer's disease; Falls; Dementia; Mobile health

1. Introduction

Falls are a common condition in patients with Alzheimer's disease (AD) with nearly 70% experiencing at least one fall annually [1–5]. AD patients are twice as likely to fall compared with age-matched cognitively intact older adults [1]. Falls lead to increased rates of institutionalization, fractures, and mortality [6–10]. Indeed, the heightened risk of mortality in AD has been attributed to the higher rate of falls experienced by these patients. The pathogenesis of falls in AD is not yet fully understood and likely relates to the accelerated neurodegeneration observed in AD, poor postural control and gait impairment [11,12], spatial disorientation [13,14], and the increased use of psychotropic medications [15,16].

A limitation of falls research in patients with AD (as well as falls research more broadly in older adults) is the difficulty in accurately tracking fall events. Currently, the gold standard for falls ascertainment involves collecting fall calendars in which patients mark the dates when falls occurred over a period of time [17,18]. The limitations of the fall calendars include difficulty remembering to complete the calendar daily, leading to recall bias when completed at a later date; poor participation; need for reminders to complete or return calendars; and need for phone calls to clarify unclear information conveyed on submitted calendars [17–19]. Mobile health ("mHealth"), defined as the

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delivery of health-care information via mobile technology, is increasingly being used to effectively track and manage disease in older adults [20,21]. There have been multiple studies evaluating the use of mHealth to promote balance and monitor fall risk, but to our knowledge, no studies have reported the use of mobile technology in tracking fall events [21,22]. There have also been studies in cognitively impaired (CI) adults exploring the use of mobile applications involving cognitive training, tracking wandering behavior with Global Positioning System technology, reminders to perform activities of daily living, and promoting physical and cognitive exercise [23]. In this study, we propose a novel falls data collection technique using the application, "Text It" (Nyaruka, LTD & UNICEF) in a small pilot study of patients with cognitive impairment. Daily text messages were sent to participants and their caregivers to query about fall events on a more real-time basis. This pilot study aimed to assess the feasibility of this text-messaging platform in tracking falls in a sample of 10 patients with cognitive impairment associated with mild cognitive impairment (MCI), AD, and dementia due to other causes.

2. Methods

This is a prospective, observational pilot study in which participants were screened and recruited from the Johns Hopkins Memory and Alzheimer's Treatment Center. Inclusion criteria of CI participants were as follows: diagnosis of MCI, AD or other dementia, age greater than 60 years old, and if cognitively impaired to the extent that a caregiver was needed, that caregiver spends at least 10 hours weekly with the participant. Fall event data were collected via two methods. The first method used the automated, multiplatform messaging service, Text It. Daily text messages were sent each morning at 9:00 am to the cell phone of the CI participant or caregiver asking, "Did you fall yesterday?" Responses "yes" or "no" were recorded. If a response other than "yes" or "no" was sent, another message was sent to the CI participants or caregiver, "Sorry, please respond with a yes or no response." The texts were sent directly to the cell phones of the CI participant or caregiver, and response data were stored on the online secure, encrypted, anonymized Text It platform.

The second measure was to complete a calendar with each day marked with "yes" or "no" for a fall occurring on that date. CI participants or caregivers completed 1 month of daily texting and then mailed their completed calendars to the research team. Clinical data were extracted from the CI participants' electronic medical record. Informed consent was obtained from the CI participant and/or their caregiver per established procedures in patients with cognitive impairment [24]. The Institutional Review Board approval was obtained.

3. Results

We recruited 10 CI participants for this study (Table 1). Six participants (60%) had a diagnosis of AD, one participant (10%) had vascular dementia, one participant (10%) had dementia with Lewy bodies, one participant (10%) had MCI, and one participant (10%) had dementia of unknown etiology but was thought to be related to history of stroke, depression, and fibromyalgia. Nine participants had a designated caregiver who completed the daily texts and calendars, whereas the one participant with MCI had no caregiver and completed this himself. The mean age of CI participants was 74.3 years, and five participants (50%) were female. The mean baseline Mini–Mental State Examination was 21.3, and scores ranged from 9 to 27.

Daily text messages were sent on 304 days across all CI participants, and responses were sent on 292 days ($292/304 \times 100 = 96\%$ completion rate). Calendars had 100% completion rate. However, one caregiver initially forgot to complete the calendar and mailed it one month late after reminders from the research team. Another CI participant's caregiver lost the calendar and a replacement was sent. Two falls were reported by calendar and two falls were reported by text (Table 2). The caregiver for participant number 3 reported one fall by text and one fall by calendar, which were recorded on the same day. Per caregiver report, the CI participant has peripheral neuropathy, spinal stenosis, and weakness at baseline, and he fell while walking upstairs when he was unable to bring his foot high enough to clear a step. The caregiver for participant number 9 reported one fall by text and one fall by calendar, but the reported dates of the fall were several days apart. After interviewing the caregiver, it was confirmed that the text fall date was correct and the calendar-recorded date was in error. The CI participant had tripped over an object leading to a fall.

Table 1
Demographic characteristics of participants at baseline visit

ID	Age	Marital status	Race*	Dementia diagnosis	MMSE†
1	77	Married	White	Vascular dementia	21
2	78	Divorced	White	AD	27
3	85	Married	White	AD	13
4	68	Married	White	Dementia with lewy Bodies	27
5	66	Married	Other	MCI	25
6	87	Widowed	White	AD	24
7	69	Married	Black	Unknown etiology‡	25
8	71	Married	White	AD	20
9	74	Widowed	White	AD	22
10	68	Married	White	AD	9

Abbreviations: AD, Alzheimer's disease; MCI, mild cognitive impairment; MMSE, Mini–Mental State Examination.

*Self-identified race included the following: white, black, American Indian or Alaskan Native, Asian, Native Hawaiian or Pacific Islander, or other.

†Mini–Mental State Examination given within 1 year of enrollment in the study.

‡Unknown etiology but likely secondary to past cerebral vascular event, depression, and fibromyalgia.