

SmartCells® Dual-Stiffness Flooring: Does it Reduce Falls-Related Injuries Among Frail Older Adults?

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ABSTRACT

Background

Falls and injury are a significant issue for older adults. A number of intrinsic and extrinsic methods have been tried to reduce the risk and impact of falling, but few are easily accepted by older adults and compliance is not high. Thus, alternative falls reduction methods which do not rely on the compliance of the potential faller, such as technological products, are explored to reduce falls-related injuries.

In 2005, a pilot study using SmartCells®, a dual-stiffness flooring product by SATECH Inc., compared the SmartCells® floor to conventional flooring. Anecdotal evidence suggested that the SmartCells® experimental flooring shows promise in reducing injuries related to falls. Within the pilot study, the comparison found no significant difference in selected items of the Berg Balance Scale and the Timed Up and Go (TUG) test, suggesting its suitability for comfort in daily use and thus a potentially appropriate falls-reduction strategic product in Long-Term Care (LTC) facilities.

This poster presentation examines the long-term falls-injury reducing impact of the floor on a frail older population residing in a new LTC facility.

Method

Since early 2006, the TAFETA Smart Apartments for Older Adults Project, has partnered to design an experiment to verify the utility of the SmartCells® flooring. The impact of falls will be studied prospectively in a new LTC facility, for an estimated 24 months, to compare the morbidity in the group falling on the SmartCells® floor to those falling on the conventional floor. Demographic and medical profile data of the population will also be studied as covariates of the main factor.

Results and Discussion

Facility admissions began in April 2007. Initial results are outlined within this presentation.

INTRODUCTION

The TAFETA Smart Apartment for Older Adults Project focuses on harnessing technology to facilitate aging in place. A primary objective for the TAFETA Research Team is to address mobility issues amongst the aging population.

The ability to prevent fall-related injuries amongst older adults is a healthcare priority.^{1,2} Approximately 15% of patients hospitalized for hip fracture die in the hospital, 33% die within one year of sustaining a fracture, and one-third require placement in long-term care facilities.³

Older adults with Dementia of Alzheimer's Type are at a greater risk of falls due to (1) decreased capacity to assess fall risk, (2) decreased dual-attention, as well as (3) decreased physical components (i.e., stride length, balance, and walking velocity).^{4,5}

To date, interventions have focused on intrinsic factors (diet, medication, exercise) and extrinsic factors (hip protector and home environment modifications). However, compliance is not high.⁶

It has been shown that the type of floor can have an impact on the outcome of falls in the elderly. SATECH Inc. has developed a dual-stiffness floor called SmartCells®, which was originally designed to reduce fatigue in employees who stand at work. The flooring has been proven anecdotally to reduce injuries related to falls.

A preliminary comparison study at the Elisabeth Bruyère Health Center in 2005 involving patients from a regional geriatric rehabilitation program verified the SmartCells® product is safe amongst the older adult population.

In April 2006, the TAFETA Research Team partnered with the Perley Rideau Veterans' Health Center, the Alzheimer Society of Ottawa, and Carefor Health and Community Services, to begin a 24-month prospective study to further examine the utility of the SmartCells® floor.

The location of this study is a long-term care facility called the Guest House: A Home Away from Home, a respite center for patients suffering from Dementia of Alzheimer's Type.

METHODS

Location

- The Guest House: A Home Away from Home
- Partnership of: The Perley Rideau Veterans' Health Center, the Alzheimer Society of Ottawa, and Carefor Health and Community Services
- Constructed in 2006: Ottawa, Canada



Fig. 1: The Guest House: A Home Away from Home

- 12-bedroom facility
- Architecturally-modified to allow for SmartCells® installation and study
- Every second bedroom outfitted with SmartCells® flooring; alternate bedrooms with conventional flooring
- Both floors installed and "flush" with the hallway flooring and indistinguishable to the eye.



Fig. 2: The Guest House Floor Plan

Subjects

- Ottawa residents from the Champlain Health Region
- Early or moderate Alzheimer's disease
- Admitted to Guest House for respite care
- Consent from Substitute Decision Maker (SDM)
- Random assignment to a SmartCells® experimental room or a conventional room

Sample Size

- 1500 clients (30% estimated to fall)
- Estimated 700 falls during projected time frame (7.4% estimated major injury rate)
- 50 major injuries



Fig. 3: Smart Cells® Flooring and Installation

The SmartCells® patented structure consists of an integrated surface layer and an underlayment of resilient rubber cells. This structure provides a resilient surface supported by resilient rubber cells that soften on impact in response to surface activity.

METHODS CONT'D

Data Collection

- Incident reports to capture each fall incident
- Injuries sustained will be classified as major or minor
- Additional data to include client medical history, medications, fall history, etc.

Data Analysis

- Logistic regression with room type (SmartCells® experimental room versus conventional room) as the dependent variable
- Injuries sustained, falls, and covariates of risk-injury entered into the regression as predictors of room assignment

Ethics

- Approved by SCO Health Service Research Ethics Board

RESULTS AND DISCUSSION

Results

Preliminary results from the period of April 1 to June 8, 2007 are outlined below:

Admissions	Consent to Contact	Consent to Participate	Number of Falls to Date
29	17	13	1

Discussion

- Occupancy rates at the Guest House are expected to increase.
- It is hypothesized that the study results will confirm the anecdotal evidence that SmartCells® flooring will reduce morbidity.
- We believe that this is the first prospective study to look at flooring to modify the outcome of falls.

REFERENCES

- Luukenen H, Koski K, Honkanen R, et al. "Incident of injury-causing falls among older adults by place of residence: a population-based study." *JAGS*, 43(8), pp. 871-6, 1995.
- Lehtola S, Koistinm P, Luukinen H. "Falls and injurious falls late in home-dwelling life." *Arch Gerontol Geriatr* 42(2), pp. 217-24, 2006.
- Armstrong AL, Wallace WA. "The epidemiology of hip fracture and methods of prevention." *Acta Orthop Belg*, 60, pp. 85-101, 1994.
- Petterson AF, Olsson E, Wahlund LO. "Motor function in subjects with mild cognitive impairment and early Alzheimer's disease." *Dement Geriatr Cogn Disord*, 19(5-6), pp. 299-305, 2005.
- Fransson BH, Souren LE, Torosian CL. "Equilibrium and limb coordination in mild cognitive impairment and mild Alzheimer's disease." *JAGS*, 47(4), pp. 483-9, 1999.
- Nakamura T, Hagiura K, Sasaki H. "Relationship between falls and stride length variability in senile dementia of the Alzheimer type." *Gerontology*, 42(4), pp. 108-13, 1996.
- Hinos J, Nabhan F, Bamford JS. "Can flooring and underlay materials reduce hip fractures in older people?" *Nurs Older People*, 16(5), pp. 16-20, 2004.

ACKNOWLEDGEMENTS

- The TAFETA Team would like to thank SATECH Inc. for the generous donation of the SmartCells® flooring as well as incurring the cost of the flooring's installation.
- Additionally, the team acknowledges the contributions of all partners, including the Perley Rideau Veterans' Health Center, the Alzheimer Society of Ottawa, and Carefor Health and Community Services throughout this study.
- As well, thank you to Jodie Morley for her coordination efforts on this project and the design of this poster artwork.