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Classification trees for identifying non-use of community-based long-term care services among older adults

Michael James Penkunas[a], Kirsten Yuna Eom[b,*], Angelique Wei-Ming Chan[b,c,d]

[a] Clinton Health Access Initiative, Inc, United States
[b] Centre for Ageing Research and Education, Duke-NUS Medical School, Singapore
[c] Program in Health Services & Systems Research, Duke-NUS Medical School, Singapore
[d] Department of Sociology, National University of Singapore, Singapore

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ABSTRACT

Home- and center-based long-term care (LTC) services allow older adults to remain in the community while simultaneously helping caregivers cope with the stresses associated with providing care. Despite these benefits, the uptake of community-based LTC services among older adults remains low. We analyzed data from a longitudinal study in Singapore to identify the characteristics of individuals with referrals to home-based LTC services or day rehabilitation services at the time of hospital discharge. Classification and regression tree analysis was employed to identify combinations of clinical and sociodemographic characteristics of patients and their caregivers for individuals who did not take up their referred services. Patients' level of limitation in activities of daily living (ADL) and caregivers' ethnicity and educational level were the most distinguishing characteristics for identifying older adults who failed to take up their referred home-based services. For day rehabilitation services, patients' level of ADL limitation, home size, age, and possession of a national medical savings account, as well as caregivers' education level, and gender were significant factors influencing service uptake. Identifying subgroups of patients with high rates of non-use can help clinicians target individuals who are need of community-based LTC services but unlikely to engage in formal treatment.

1. Introduction

Community-based long-term care (LTC) services play an important role in delaying institutionalization of older adults [1] and in helping caregivers cope with the challenges of caregiving [2]. Without these services, caregivers may be exposed to greater degrees of physical [3] and mental [4] stress, potentially accelerating the timeframe in which patients are transferred into nursing homes [5]. Despite the positive outcomes associated with community-based LTC services for both patients and their caregivers, uptake rates of home-based services and center-based services, such as day rehabilitation remains low [6]. Developing a thorough understanding of the factors influencing community-based LTC service uptake will inform healthcare providers of individuals with the lowest propensities to take up care, and could play an important role in allowing older adults to remain in the community for as long as possible.

The proportion of older adults in Singapore is projected to increase from 11% in 2014 [7] to approximately 30% in 2050 [8], translating into a growing number of individuals who will require some form of LTC. Historically, LTC in Singapore has rested with unpaid family caregivers who provide care within the home [9]. Although nursing homes are beginning to serve more older adults as family sizes shrink, expectations that the family should be very involved in LTC exists throughout Asia [10]. For the provision of LTC for the elderly, the Singapore government has long pivoted around nongovernmental voluntary welfare organizations (VWOs) as primary service providers while the government plays the role of direction setting, financing, and regulation [11]. In 2009, the Ministry of Health Singapore established the Agency for Integrated Care (AIC) to promote integration and continuity of care between different providers and care settings. AIC manages referrals to LTC services; coordinates the placement of elderly patients into appropriate LTC services, including nursing homes and community-based services; and facilitates discharge planning

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* Corresponding author at: Program in Health Services & Systems Research, Duke-NUS Medical School, Singapore, 8 College Road 169857, Singapore.
E-mail address: kirsten.eom@duke-nus.edu.sg (K.Y. Eom).

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and transition of patients from hospitals to the community [12]. In addition, the Singaporean government has actively funded expansion of the community-based LTC sector to allow families to remain as the locus of care while meeting the needs of older adults and offering formal assistance to caregivers [13]. Although the demand for nursing home placements still outpaces supply, referrals to community-based LTC services in Singapore often go unused.

It may be partially due to the financing structure for LTC services in Singapore. Based on the fundamental twin philosophy of shared responsibility and targeting of government support to lower-income groups through means testing, payment for LTC services operate the underlying “3 M” system (Medisave, MediShield, Medifund) and a co-payment to minimize the risk of moral hazard. Government subsidies for LTC services, which are only available to VWO providers, are provided on a means-tested basis, depending on per capita household income per month [14]. Medisave is a compulsory personal health savings account, funded from employer and employee contributions. MediShield is a basic, opt-out national medical insurance scheme that protects against large catastrophic hospital expenses and selected costly outpatient treatments. Medifund is an endowment fund that acts as a safety net for low-income Singaporeans who cannot afford medical treatment [15,16]. Of note, MediShield does not cover LTC expenses, and Medisave cannot be used for LTC expenses with the exception of day rehabilitation and inpatient hospice and home palliative care services [14].

Andersen’s behavioral model of health services use [17] is a prominent framework for guiding questions pertaining to why some individuals engage in treatment while others do not. The model has recently been modified to assist with understanding individuals’ uptake of LTC services [18] and has been applied to the Singaporean LTC context by Wee and colleagues [19]. As expected, patients who were more limited in their activities of daily living (ADL) were more likely to utilize community-based LTC services compared to those with fewer limitations. Interestingly, characteristics of patients’ caregivers also predicted service uptake; patients’ whose caregivers were of high socio-economic status were the most likely to engage in treatment. In the United States, Bookwala and colleagues [20] showed that caregivers’ needs also predicted the use of home- and center-based LTC services. Here, formal service use increased as caregivers’ symptoms of depression worsened and as their engagement in personal activities declined, suggesting that the LTC services were sought as a form of respite for caregivers. These studies support findings that decisions around LTC service use are often made jointly by caregivers and patients [21] and demonstrate that both patient and caregiver factors must be considered when investigating determinants of LTC service uptake.

Our study contributes to the literature on LTC utilization by identifying combinations of patient and caregiver characteristics that are associated with failure to take up community-based LTC services. We employed classification and regression tree (CART) analysis [22], a population partitioning method that is particularly well suited for identifying subgroups of individuals who share common sets of characteristics associated with the outcome of interest. These results can be used by policy makers and healthcare providers to develop interventions targeting specific segments of the population who are at-risk or underserved.

The aim of the present study is to identify older adults who were referred to community-based LTC services but failed to take up treatment. The CART method is well suited for identifying non-users. Because each individuals’ specific needs determines the type of LTC services they require [23], we study separately patients referred to home-based services (HBS) and day rehabilitation center (DRC) services.

2. Methods

2.1. Study population and participant recruitment

This study analyzed data from a longitudinal survey of Singaporean’s attitudes towards the LTC sector and their use of LTC services. Participant recruitment was conducted in partnership with the AIC. Hospital-based AIC teams assess patients with potential LTC needs upon hospital discharge and, if deemed appropriate, refer patients to a specific type of LTC service.

For the original survey, a random sample of 4402 patient-caregiver dyads (Singaporean citizens or permanent residents) were identified within the AIC referral database and contacted as potential participants. Three waves of data collection, approximately six months apart, took place between July 2012 and April 2014 in the form of face-to-face interviews within patients’ homes. Survey components and data collection procedures have been described in detail elsewhere [19,21].

The present analysis included patient-caregiver dyads who participated in the first two waves of the longitudinal survey. Our goal was to identify subgroups of patients who did not use the community-based LTC services they were referred to within six months of hospital discharge. We excluded all patients referred to nursing home services (n = 126), patients who reported receiving care from a different caregiver at wave 2 compared to wave 1 (n = 13), and patients who did not identify a caregiver (n = 8). Because the relatively small sample size could result in inadequately specified CART models, patients referred to dementia day care services (n = 96) were also excluded. One additional patient was excluded due to over 50% missing data on the wave 1 survey. Our final analytical dataset included 868 patient-caregiver dyads; 402 referred to HBS and 466 referred to day DRC services.

2.2. Assessment of service utilization

During each data collection wave, patients listed all formal LTC services they were utilizing. A proxy was interviewed on the behalf of the patient if the patient was unable to respond due to cognitive or physical limitations. Patients were characterized as “non-users” if they did not report using a formal community-based LTC service they were referred to by the AIC during either data collection wave. Since community-based LTC services may address acute conditions that do not require care indefinitely, such as rehabilitation after a stroke [24], patients only had to report using an LTC service that matched their referral at one data collection wave in order for them to be considered a “user”.

2.3. Predictor variables

During the first wave of data collection, patients’ and caregivers’ socio-demographic characteristics as well as patients’ clinical characteristics were collected. We included 10 dichotomized characteristics of patients in our initial analyses: age (≤64 years or ≥65 years), gender (male or female), ethnicity (Chinese or non-Chinese), marital status (married or non-married), co-residence with caregiver (co-residing or not co-residing), housing size (1–2 room home or 3 room or larger home), degree of ADL limitation measured using the Barthel Index [25] (low degree of disability: Barthel Index score ≤ 20 or moderate/high degree of disability: Barthel Index score ≥ 21), number of co-residing family members (none or at least one), possession of a national medical savings account (yes or no), and monthly income (≤SG$1999 or ≥SG$2000).

Eleven caregiver characteristics were originally considered: age (<54 years or >55 years), gender (male or female), ethnicity (Chinese or non-Chinese), marital status (married or non-married), housing size (1–2 room home or 3 room or larger home), employment status