Functional decline of the elderly in a nursing home

Ang Y H, Au S Y L, Yap L K P, Ee C H

ABSTRACT

Introduction: This study aims to determine if risk factors present on admission to the nursing home could be predictive of later functional decline and to determine the causes of decline.

Methods: This is a retrospective case-control study conducted in 2000 at a voluntary welfare nursing home. Functional decline was defined as deterioration in two or more of the five activities of daily living (ADLs), namely: mobility, toileting, bathing, dressing and feeding, from the time of admission to the study period. Potential risk factors for decline studied were: age, sex, marital status, number of medical diagnoses and medications, types of medical diagnoses, and the presence of dementia on admission to the home. Causes of decline were categorised as (A) Development of new illness, (B) Progression of chronic illness, or (C) Both of the above.

Results: 36 out of 103 residents had functional decline. On analysis, univariate and multivariable logistic regression models, adjusted for length of stay, yielded the same significant risk factors for decline, namely: age (p-value is 0.02) and dementia (p-value is 0.04). Majority of decline (78 percent) was due to progression of chronic illnesses, most commonly dementia (15 out of 36), eight percent were due to acute illness (stroke), and 14 percent were due to both. In January 2003, 18 out of the 36 residents who declined had died.

Conclusions: Functional decline is common in the nursing home. More attention should be paid to the older residents and those with dementia, right from the point of admission.

Keywords: activities of daily living, dementia, elderly, functional decline, nursing home

Singapore Med J 2006; 47(3):219-224

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INTRODUCTION

Singapore has one of the most rapidly ageing populations in the world[1]. Projections indicate that more than 25% of the population will be aged 60 years or older by year 2020, unless immigration influx and natural increase reverse trends[2]. Although the majority of the elderly in Singapore live with their children (84% among those aged 65 or above) and most of them are satisfied to do so[3], many are not able to cope and institutionalisation becomes necessary. The number of nursing home beds have already increased to over 6,400, with 75% provided by 28 nursing homes run by voluntary welfare organisations (VWOs) and the remainder by privately-run nursing homes[4]. To ensure that the health of the institutionalised elderly is not neglected, we need to have good standards of care in our nursing homes. To the minds of many, laymen as well as medical professionals alike, the process of functional decline seems inevitable once an older person steps into a nursing home.

There have been few studies, even internationally, on functional decline in the nursing home. McConnell et al[5] found a slow decline of 0.84 points per year (based on an activities of daily living [ADLs] dependence score of 0-20) among long-stay residents. Functional change is influenced by severity of cognitive impairment: those with moderate severity showing a more linear decline[6]. In another study, functional decline is found to be associated with lower respiratory tract infections[7]. To prevent functional decline in the nursing homes, more studies are needed to determine the causes of decline and the factors associated with it. Our primary aim is to determine if risk factors present on admission to the nursing home could be predictive of later functional decline. We also aim to study the causes of functional decline in these elderly.

METHODS

This is a retrospective case-control study involving 106 elderly residents of a voluntary welfare nursing

home in Singapore, conducted between April 2000 and January 2001. A random sample of 120 subjects was obtained from a total of 350 residents in the nursing home. 106 completed the study as the rest were either discharged or had died after the sampling was performed. The main descriptive results of the study have already been published[8].

Information on the residents' biodata, presence of medical problems, use of medications and functional abilities were obtained from the review of case records. Functional abilities were measured based on five basic ADLs, namely: mobility, toileting, bathing, dressing and feeding, and were determined both on admission to the nursing home as well as during the study period. Functional decline was defined as deterioration in two or more of the five ADLs, from the time of admission to the study period. Residents who were maximally dependent in four or five ADLs on admission were excluded (they would not be able to decline any further based on our definition). Cases were defined as residents with functional decline, while controls were those without functional decline.

The potential risk factors for functional decline studied were: age, sex, marital status, number of medical diagnoses, number of medications, types of medical diagnoses, and the presence of dementia on admission to the home. These were studied using univariate and multivariable logistic regression models. Length of stay in the home (although not a risk factor of interest as it cannot be determined at the time of admission) was adjusted for in all the models because of potential confounding. All statistical analysis were carried out using the Statistical Package for Social Sciences (SPSS) for Windows software version 10.0 (Chicago, IL, USA).

For those residents identified to have functional decline, the causes for the decline were elicited through review of their case notes. Causes were categorised as (A) Development of new illness, (B) Progression of chronic illness, or (C) Both of the above. Category A was assigned if there was a documented acute decline following a new illness. Category B was assigned if the progression of the decline was gradual, there was no attributable acute illness and the decline could be explained by the underlying chronic illness. If decline was due to both the development of new illness and the progression of chronic illness (e.g. development of hip fracture in a demented resident), Category C was assigned. The progression of decline is defined as acute if it happened over days (of less than two weeks duration), and gradual if it happened over weeks or months. Vital status of the study residents was sought from the nursing home in January 2003.

Table I. Functional status on admission and at time of study.

		On admission Number (%)	At time of study Number (%)
Mobility	Ambulant (independent)	41 (40)	23 (22)
	Semi-ambulant (aids required)	50 (49)	50 (49)
	Non-ambulant/ bed-ridden	12 (12)	28 (27)
	Not known	0 (0)	2 (2)
Dressing	Independent	44 (43)	23 (22)
	Need minimal assistance	26 (25)	20 (19)
	Need substantial assistance/ dependent	18 (17)	18 (17)
	Not known	15 (15)	42 (41)
Feeding	Independent	82 (80)	63 (61)
	Need assistance	17 (17)	27 (26)
	Totally dependent	2 (2)	8 (8)
	Not known	2 (2)	5 (5)
Toileting	Independent	51 (50)	30 (29)
	Need assistance to go to toilet	26 (25)	20 (19)
	Need bedpan, urinal, commode	7 (7)	6 (6)
	Incontinent of urine/requires diapers or urinary catheter	15 (15)	45 (44)
	Not known	4 (4)	2 (2)
Bathing	Independent	40 (39)	18 (18)
	Need some assistance/ supervision	34 (33)	33 (32)
	Dependent on staff	23 (22)	50 (49)
	Not known	6 (6)	2 (2)

Table II. Progression of ADLs.

	Number (%)			
	Same	Declined	Improved	Not known
Mobility	72 (70%)	27 (26 %)	2 (2%)	2 (2%)
Dressing	43 (42%)	15 (15%)	0 (0%)	45 (44%)
Feeding	75 (73%)	19 (18%)	3 (3%)	6 (6%)
Toileting	61 (59%)	35 (34%)	2 (2%)	5 (5%)
Bathing	59 (57%)	36 (35%)	1 (1%)	7 (7%)

RESULTS

One resident was excluded as he was maximally dependent in four ADLs. There was no information on ADLs for two residents, leaving a total of 103 residents for this sub-study. There were 31 males and 72 females, and average age on admission to the nursing home was 75 years. Out of the 103

Table III. Risk factors for functional decline using univariate logistic regression models, adjusted for length of stay.

Factor		Number	OR	95% CI	p-value
Age (in years)					**0.02**
70 or less		32			
71-80		40	4.3	1.4-13.3	
81 or more		31	1.9	0.5-7.2	
Sex					0.81
Male		31			
Female		72	1.1	0.5-2.8	
Marital status					0.16
Single		37			
Married		19	2.8	0.78-9.7	
Widowed/divorced/separated		47	2.2	0.85-6.0	
No. of medical diagnoses					0.43
0-3		69			
4 or more		34	1.4	0.59-3.4	
No. of medications					0.72
0-3		58			
4 or more		45	1.2	0.51-2.7	
Types of medical problems					
CNS	No	57			0.85
	Yes	46	0.92	0.40-2.1	
CVS	No	40			0.59
	Yes	63	0.79	0.34-1.9	
Musculoskeletal	No	70			0.48
	Yes	33	0.72	0.29-1.8	
Respiratory	No	94			0.14
	Yes	9	3.0	0.70-13.0	
Dementia	No	87			**0.04**
	Yes	16	3.3	1.1-10.1	
Depression	No	89			0.47
	Yes	14	0.63	0.17-2.3	

Table IV. Significant risk factors for functional decline using multivariable logistic regression models, adjusted for length of stay.

Factor	Number	OR	95% CI	p-value
Age (in years)				**0.02**
70 or less	32			
71-80	40	3.8	1.3-11.0	
81 or more	31	1.3	0.4-4.2	
Dementia				**0.04**
No	87			
Yes	16	3.4	1.1-10.7	

residents, 37 were single, 19 were married, 43 were widowed, and four were separated or divorced. These 103 residents had stayed in the nursing home for an average of 5.2 years. Table I describes the residents' functional status on admission as well as at the time of the study. Table II showed the proportion of residents who improved, declined or remained the same in each of their ADLs. Residents were most likely to decline in their abilities to bath and toilet themselves.

36 out of the 103 residents had functional decline, according to our definition. Table III showed the risk factors for decline using univariate logistic regression models, adjusted for length of stay. The significant factors were age (p=0.02) and the presence of dementia (p=0.04). On multivariable logistic regression analysis, adjusted for length of stay, the significant risk factors for decline were similarly age (p=0.02) and the presence of dementia (p=0.04)(Table IV).

The causes of decline were shown in Table V. Majority (78%) was due to progression of chronic illnesses, most commonly dementia (15 out of 36, or 42%), 8% were due to development of acute illness (stroke), and 14% were due to a combination of both. In January 2003, 18 (50%) out of the 36 residents who declined had died, compared to 20 (30%) out of the 67 residents with no decline (p=0.045; OR=2.4; 95% CI 1.02-5.4).

DISCUSSION

Decline in functional status should not be the inevitable outcome of institutionalisation. Although it may seem a daunting task, we should aim to improve the standards of care in our nursing homes such that the physical functions of the residents can be improved or maintained. This may be done through the provision of rehabilitative services, increased medical input by doctors (especially geriatricians and psychogeriatricians), increase in staffing ratios, and the development of special care programs aimed at preventing disabilities. In fact, an objective measure of functional decline is one of the outcomes for quality assessment in long-term care in the United States[9].

A study by Gillen et al[10] on long-stay residents showed that stability was the predominant functional pattern during the first 90 days in a nursing home and any functional change is more likely to be improvement rather than decline; hence, functional decline was not the norm. However, a certain proportion of these frail nursing home residents would still be expected to decline. In our study, 36 out of 103 residents, a significant proportion (35%), had declined. Moreover, functional decline is associated with mortality as half of these residents were dead two years later, making it an important area to address.

There is a paucity of studies on the causes and factors associated with decline in the nursing home, which are needed to help us better understand the process and plan strategies targeted at its arrest. Functional decline in the nursing home

has been found to be associated with influenza-like illnesses[11], or the development of lower respiratory tract infections[7]. Another study found the fear of falling to be predictive of decline[12] as measured by the Barthel Index[13]. As our study was a retrospective one and subjects would have variable lengths of stay at the time of study, we were careful to adjust for length of stay in our analysis. Length of stay would be expected to be associated with functional decline given the progression of chronic illnesses and development of new illnesses with time.

Our results showed that age and the presence of dementia were risk factors for functional decline. Binder et al[7] also found age and short-term memory problems to be associated with ADL decline. Age may be a surrogate of comorbidities; however, in our study, it was an independent risk factor on multivariable logistic regression analysis. The older person may be more likely to decline due to reduced functional reserves. The prevalence of dementia is high in nursing homes and functional decline is not unexpected in this chronic debilitating condition. Thus, more attention should be paid to the older residents, as well as those with dementia, right from the point of admission to the nursing homes.

Our study showed that the main cause of decline is progression of chronic illnesses rather than development of new illnesses. In fact, the main cause of decline is progression of dementia (42%). Dementia in the nursing home is an interesting area that needs to be explored further. Recent advancements have shown the benefits of the cholinesterase inhibitors not only on cognitive but also ADL functions of dementia patients[14-17]. However, these benefits have to be weighed against the economic cost of widespread use of these expensive agents in the nursing homes. Furthermore, the use of these drugs should be initiated and monitored by either the geriatrician or psychogeriatrician, and many nursing homes are not serviced by these specialists.

Other chronic medical illnesses that led to decline were neurological conditions, namely parkinsonism and stroke disease, cardiovascular diseases (mainly heart failure) and respiratory diseases (Table V). Strategies aimed at arresting decline should include adequate treatment and stabilisation of these conditions. The importance of controlling cardiovascular risk factors should not be forgotten. Acute stroke was the cause of decline in three residents, and cardiovascular diseases were the second commonest chronic illnesses (after dementia) causing decline in our study. Regular monitoring of blood pressure and blood glucose levels in diabetic patients, with the aim of achieving optimal control, should be available as basic medical care in the nursing home. Although drug treatment for hyperlipidaemia in the very old (especially the institutionalised ones with physical and mental disabilities) may still be debatable, it should be considered at least in the functionally better residents.

Table V. Causes of functional decline.

Causes of functional decline	Number (%)
Development of new illness only:	
Acute stroke	3 (8)
Progression of chronic illness only:	
Dementia	15 (42)
Cardiovascular disease	4 (11)
Stroke disease	3 (8)
Parkinson's disease/parkinsonism	2 (6)
Respiratory disease	2 (6)
Cervical spondylosis	1 (3)
Delusional disorder	1 (3)
Both development of new illness and progression of chronic illness:	
Dementia and bilateral hip fracture	1 (3)
Dementia, hip fracture and sepsis	1 (3)
Dementia, bilateral hip fracture and subdural haemorrhage	1 (3)
Mental retardation and hip fracture	1 (3)
Congestive heart failure and bilateral hip fracture	1 (3)
Total	36 (102*)

* Percentages do not add up to 100 due to rounding.

Hip fractures contributing to functional decline featured prominently in our study (Table V). Not unexpectedly, demented residents are the ones who suffer hip fractures, as they are at risk of falls. Falls in the nursing home is an important subject. Functional decline can result from fracture-related disability or psychological limitations due to fear of falling. In a meta-analysis of falls in the nursing home, Rubenstein et al[18] noted that the most important risk factors for falls include lower extremity weakness, gait and balance instability, poor vision, cognitive and functional impairment, and sedatives/psychoactive medications. In the prevention of falls, the authors mentioned strategies based on identification and monitoring of high-risk residents, environmental hazards reduction and physical therapy or exercise to improve muscle strength as well as gait and balance training. In another study, Ray et al[19] showed that falls in

nursing may be preventable by targeting all residents of the home. Interventions included staff education, review of psychotropic medications, walking and transferring skill improvement as well as environmental modifications. As our nursing homes work towards the implementation of fall prevention programs, consideration should be given to these research findings.

Rehabilitation plays an important role in the nursing home, both in the management of chronic disabling conditions and the prevention of falls. Neurological diseases, namely stroke and parkinsonism, are common causes of functional decline (Table V). The physiotherapist and the occupational therapist are needed to help this group of residents optimise and maintain their physical functions and activities of daily living. As mentioned above, they also have established roles in the prevention of falls by providing muscle-strengthening exercises, gait and balance training as well as inputs into environmental modification.

The main limitation of our study is its retrospective design. Information based on case notes review may not be totally accurate and there is some missing data. This is especially so in the recording of the ADL status of the residents, which is descriptive in nature and may be subjective. Similarly, the process of assigning the causes of decline was only based on the available information recorded in the case notes (by the resident doctors and nurses). Without an objective marker, it may be difficult to establish the temporal relationship between illness and decline.

Our study only looked at functional decline and did not include those residents who have died since admission. Functional decline is associated with increased mortality; there would be many who declined before death but were not included as we used prevalent cases. Hence, the proportion of residents who declined in our study might be spuriously low. Use of prevalent cases may also account for the reduced risk for decline in the oldest age group (81 years or more) compared to the intermediate age group (71-80 years) as the subjects from the oldest age group who have functional decline are more likely to have died.

An important factor that could not be addressed in our study (as it involved only one nursing home) is the quality of care. Walk et al[20] found that quality of care is associated with functional improvement of residents, especially in the domains of bathing and bladder continence. Institutions offering higher quality of care, as reflected by increased staffing ratios and proportion of trained and skilled personnel, facilitate functional improvements and prevent decline.

To address the above limitations, we recommend that a prospective study, preferably involving a few nursing homes, be carried out, with recruitment of the elderly subjects right from the point of admission to the nursing home. These elderly residents can then be followed up, with regular e.g. quarterly, review and documentation of their ADL status. An objective disability scale such as the Barthel Index[13] or the FIM instrument[21] should be used for assessment of functional status. Death and functional decline can then be studied as individual or composite end-points.

In conclusion, our study found that functional decline is common in the nursing home. The risk factors for decline are age and the presence of dementia. Decline is more likely to be due to progression of chronic illnesses rather than the development of acute illnesses. Prevention of functional decline may be possible through improved management of dementia, falls and chronic medical conditions as well as establishment of rehabilitation and quality care in the homes.

In the past 30 years, nursing homes in Singapore have progressed from merely providing basic shelter to the aged destitute, to the provision of nursing and medical care to the frail and sick older persons. In the past couple of years, the Ministry of Health has worked towards the establishment of an accreditation standard in the nursing homes. Functional status would be an important indicator of outcome. Certainly, the prevention of functional decline is a priority area requiring further research.

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