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Incidence of falls by rural elders compared with their urban counterparts

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Purpose: The primary purpose of this study was to investigate how the incidence of falling by rural people over the age of 65 differed from those in an urban community. Secondary outcomes were the Modified Falls-Efficacy Scale (MFES), Activities-specific Balance Confidence (ABC) Scale, and the Timed Up & Go Test (TUG).

Methods: A total of 115 subjects completed questionnaires at 2 separate sites, one urban, one rural. Forty rural subjects (age 75.5 ± 7.7, mean ± standard deviation), and 75 urban subjects (age 76.0 ± 7.3) were recruited.

Results: Twelve rural subjects (30.0%) reported at least 1 fall in the previous 12 months, which was not statistically different from the 22 urban subjects (29.3%) who fell during the same time period. Neither the MFES (rural 8.94 ± 1.99, urban 8.86 ± 1.82), nor ABC (rural 81.7 ± 23.7, urban 77.4 ± 23.7), nor TUG (time in seconds; rural 12.21 ± 4.95, urban 13.25 ± 5.65), were found to be statistically different between the 2 groups. The ABC appeared to be more sensitive to the fear of falling in a rural, ambulatory population compared to the MFES. The TUG was predictive of falling if > 15 seconds.

Conclusions: Falls by elderly people in rural areas are as prevalent as falls by their urban counterparts. However, it is not known whether rural elders have different risk factors from urban elders that may combine to give this same incidence rate.

Objet : Cette étude visait principalement à déterminer la différence entre l'incidence

des chutes en milieu rural et en milieu urbain chez les personnes de plus de 65 ans. L'échelle modifiée chute et efficacité (MFES -- Modified Falls-Efficacy Scale), l'échelle de confiance de l'équilibre spécifique aux activités (ABC -- Activities-specific Balance Confidence) et le test chronométré lever et marcher (TUG -- Timed Up & Go Test) ont constitué les résultats secondaires.

Méthodes : Au total, 115 sujets ont rempli des questionnaires à deux sites, soit un en milieu urbain et un autre milieu rural. On a recruté 40 sujets en milieu rural (âgés de 75,5 ± 7,7 ans, âge moyen ± écart type) et 75 sujets en milieu urbain (âgés de 76,0 ± 7,3 ans).

Résultats : Douze sujets du milieu rural (30,0 %) ont déclaré être tombés au moins une fois au cours des 12 mois précédents, ce qui ne présentait aucune différence statistique par rapport aux 22 sujets du milieu urbain (29,3 %) ayant fait une chute au cours de la même période. On n'a constaté aucune différence statistique entre les deux groupes en ce qui concerne les échelles MFES (ruraux 8,94 ± 1,99; urbains, 8,86 ± 1,82) et ABC (ruraux 81,7 ± 23,7; urbains, 77,4 ± 23,7), ou les résultats du test TUG (durée en secondes; ruraux, 12,21 ± 4,95; urbains, 13,25 ± 5,65). L'échelle ABC semblait plus sensible que l'échelle MFES pour repérer la crainte de tomber dans une population ambulatoire rurale. Le test TUG était prédicteur d'une chute si le résultat dépassait 15 secondes.

Conclusions : Les chutes chez les personnes âgées sont aussi prévalentes en milieu rural qu'en milieu urbain. On ne sait toutefois pas si les personnes âgées en milieu rural présentent des facteurs de risque différents de celles du milieu urbain qui peuvent se conjuguer pour produire le même taux d'incidence.

Introduction

Falls by older people have been shown to result in significant morbidity and mortality. These accidental falls are quite common in the elderly population. The existing literature reports that approximately 30% of all ambulatory people over 65 years of age suffer at least one fall per year, with the rate increasing with age.1–3 However, incidence rates have not been specifically investigated for falls in rural areas. There may exist differences in lifestyles between older people living in rural communities and those in tertiary centres where this research commonly takes place. Medical consequences of falls may range from no noticeable lesions or minor soft-tissue injuries to fractures, disability and, rarely, death. In addition, the psychological post-fall effects and staggering health care costs4–6 from falling

provide extra incentive to develop an appropriate approach to dealing with falls in all communities. Roughly one-quarter of all Canadians live in rural areas. If the incidence of falls in these rural areas is as high as reported in major centres in Canada and the United States, even a small decrease in the rate of falls could result in significant benefits, both clinical and economic.

Literature specifically concerned with falls by older people who live in rural communities appears to be limited to just 1 study in North America. In this 1996 study 16 of 31 subjects reported falling in the previous year.7 This incidence rate of just over 50% is much higher than the usual 30% reported in urban studies, and is cause for concern. The alarmingly high rate may have simply been a result of a self-reporting bias on the part of the subjects or because of the small sample size. Unfortunately, no parallel data were collected concerning what the results would be of applying similar methodologies to urban controls, and thus no statistical conclusions could be drawn. With no other published information concerning falls by rural elders, it appears they may have some unique risk factors toward falling.

Intrinsic or extrinsic factors

Risk factors for falls may be divided into intrinsic or extrinsic factors.2 Intrinsic factors are those individual characteristics of the patient that may be due to age (e.g., poor visual acuity), disease or medications. Extrinsic factors are those in the home surroundings (e.g., poor household lighting) or community environment. While these risk factors may not be entirely controllable by the person at risk, identifying both intrinsic and extrinsic factors may allow anticipation of difficulty and could result in activity or environmental modification to better prepare for at-risk situations.

There is great difficulty, however, in determining the extent of the interaction of intrinsic or extrinsic factors for any one fall; that is, it is difficult to know where to lay the "blame." A study8 of 162 recent fallers asked each person to what extent they attributed their fall to their "own limitations," or their "surroundings." People with poorer self-rated health, dexterity difficulties, and those living in an apartment were associated with attributing their fall to their own limitations. Those with higher self-rated health and those who fell outdoors were more likely to attribute their fall to the external surroundings.

People's attributions about falls may have important consequences. Firstly, if rural elders assign the blame for their falls differently from their urban counterparts, examining attributions about falls may in fact provide some insight into

investigating any unique rural risk factors. Secondly, some attributions may provide the patient with a sense that the fall was caused by a random occurrence that may be prevented in the future. Conversely, an attribution that the fall was caused by some permanent, intrinsic factor could lead to feelings of hopelessness and actually enhance someone's fear of falling.8 Identification of these intrinsic factors allows for possible remedial action that may be very effective at preventing falls.

Fear of falling

Fear of falling may also have consequences for rural populations. Fear of falling has been shown to be correlated with changes in functioning and activity levels.9 Increased physical activity has been associated with both an increased and a decreased risk of suffering a serious injury from a fall.3,9,10 A decreased activity level is also considered to be a risk factor for falling,11 as well as an increasing risk of injurious falls.12 Recently, exercise interventions have been shown to decrease the incidence of falls.13,14 To date, there are no existing studies documenting any information regarding the fear of falling or falls self-efficacy (i.e., an individual's perception of capabilities and confidence in regard to falling) in rural areas, although this may have interesting implications considering the potential difference in activity levels and demands of living of those in rural areas.

Goal of study

The aim of this study was to determine the incidence of falls and associated factors among older, community-living adults in a rural area compared to those in an urban setting. Secondary measures included 2 measures of falls self-efficacy (the Modified Falls-Efficacy Scale [MFES] and the Activities-specific Balance Confidence [ABC] Scale), the Timed Up & Go (TUG) Test, and the attempt to gather qualitative information surrounding specific fall events.

Similar to the definition used by Baldwin and colleagues,7 a fall is considered to be any event in which the person comes to rest inadvertently on the ground or other lower level (e.g., stairs, a coffee table, pile of snow), as long as the action is not the consequence of a violent blow or assault, loss of consciousness, onset of paralysis or from an epileptic seizure. The term "faller" will be used to denote someone who has had at least one fall in the previous 12 months; the term is not intended to be a label or a designation for any person or group of people.

Methods

Subjects

A total of 121 people were approached to participate voluntarily in this study at 2 independent sites -- Blenheim, Ont., a rural community of approximately 4500 people (the rural medical practice) and London, Ont., (pop. 350 000) (the urban medical practice). These 2 communities are both in Southwestern Ontario and are roughly 90 minutes apart by car. All data were collected simultaneously over the course of 3 weeks during the summer of 2000.

The people who were asked to volunteer in the study were the first 121 consecutive patients over 65 years of age who visited their family doctor for reasons other than a recent fall. No subjects from nursing homes were consulted, and patients cognitively impaired beyond the ability needed to complete the questionnaire were excluded.

Instrumentation

The first part of the study consisted of a questionnaire that was designed to gather information regarding demographics, self-rated health on a scale of zero (poorest health) to 10 (completely healthy), most recent eye examinations, use of walking aids, alcohol consumption, current medications, falls-specific situations for those reporting falls, specific exercise routines or daily activities, and 2 measures of falls self-efficacy.

The 2 self-efficacy scales used to determine the degree of fear of falling were the MFES15 and the ABC Scale.16 The MFES is a 14-item scale that was expanded from the original 10-item Falls Efficacy Scale (FES).17 The FES measures fear almost exclusively using indoor activities, which may negate any differences experienced by those in a rural setting. The MFES has 4 extra questions involving outdoor activities, which may provide a more useful measure of the fear of falling in an ambulatory population. The ABC Scale was developed to have a wider continuum of activity difficulty within its 16 questions, and thus may be a more suitable measure of balance confidence in highly functioning elders.16 The MFES measures falls-efficacy from zero (not at all confident) to 10 (completely confident), whereas the ABC expresses confidence as a percentage from 0% (no confidence) to 100% (complete confidence).

The TUG Test involves a patient getting up from an armchair, walking 3 metres,

turning around, walking back to the armchair, and sitting down.18 The event is timed with a stopwatch and has been shown to be a useful predictor of falling in older people.19 Patients are instructed to walk at a safe, comfortable speed, and the time to complete the task is recorded in seconds. In this study identical chairs were used at both sites. The chairs had seats 42.0 cm high, 47.5 cm wide, and arm supports 64.5 cm from the ground.

People who reported a fall in the last 12 months were asked to report if they had been able to get up without help, the extent of any injuries, any medical consequences, their attributions surrounding the fall, where the fall occurred and, finally, how many falls they have had in the past 12 months. To determine a person's attributions regarding the most recent fall, subjects were asked to rank the reason for the fall on a scale from zero to 10 where zero indicated the fall was caused entirely by their own personal limitations and 10 indicated the fall was entirely due to external surroundings. A minor injury was described as "cuts or bruises," whereas a major injury was considered to be "broken bones or a head injury."

Study protocol

Upon the patient's arrival at the medical office, his or her age was checked in the medical records to determine eligibility. The patient was then invited to an examining room, where a staff member, but not the doctor, briefly explained that participation in the study consisted of a questionnaire followed by the TUG Test. It was stressed at this time that the response sheet would be coded with a number to assure the patient's confidentiality and that the physical answer sheets would be destroyed once the responses were entered into a computer. A consent form detailing all of this information was also provided. The signed consent form was retained in the medical chart, but the questionnaires were not.

The subject was then left alone to complete the questionnaire. Those requesting help for reasons such as forgotten eyeglasses had the questionnaire read to them, but answered the questions on their own. Upon completion of the questionnaire, the subject was walked to the chair for the TUG Test.

The entire procedure rarely exceeded 20 minutes.

Statistical analysis

Independent sample *t*-tests were used to determine statistical differences in continuous variables between the rural and urban populations. The relative risk (RR) of falling for each discrete variable was calculated along with the confidence interval (CI) using cross tabulations. These RRs for falling were calculated for the entire population and for the urban and rural subsets. The 0.05 level was adopted as the maximum probability value denoting a statistically significant difference. To simplify analyses and to calculate RRs, some continuous variables were grouped at extreme ends of the scales. The MFES scores were arbitrarily called "low" if the score was less than 6 and called "high" if the score was greater than 9. Likewise, a "low" ABC score was considered less than 60% and "high" was greater than 90%. The TUG score was referred to as a "low" score if it was less than 12 seconds and "high" if the subject took longer than 15 seconds to complete the task. A subject was said to have a "low" self-rated health if they ranked themselves lower than 5; a score above 8 was called "high."

Results

A total of 121 consecutive people over the age of 65 were invited to participate in the study. Four people refused participation from the urban medical practice, and 2 from the rural practice; the most common reason was lack of time.

As part of the questionnaire, all subjects were asked if they were currently living in a rural or urban community. Nine subjects from the urban medical practice designated themselves as living in a rural area, whereas 26 of the subjects from the rural medical practice were actually from urban communities. Thus, a total of 75 subjects were classified as urban (from this point on referred to as "urban"), and 40 subjects were classified as rural ("rural"). Demographic information for the rural and urban groups are shown in Table 1. The small age difference between the urban and rural groups was not statistically significant. Forty-one of 75 urban subjects were female (54.7%), as opposed to 17 of 40 rural subjects (42.5%). Ninety-five percent of rural subjects were living in a house, whereas only 66.7% of urban subjects were living in a house. Almost twice as many urban subjects were living alone (39.2% urban vs. 20.0% rural).

Characteristics of health for both groups are shown in Table 2. The incidence of falls was 29.3% in the urban group and 30.0% in the rural group; these rates were not statistically different.

A less often employed measure of falling reported in the literature is the fall rate,

calculated as the total number of falls per 100 person-years. The urban group reported 53 total falls for a fall rate of 71 falls per 100 person-years. There were 20 falls in the rural group for a fall rate of 50 falls per 100 person-years. The fall rate calculated here is considered less reliable due to the reporting methodology, because a person is more likely to remember if they have had a fall in the past year, but not necessarily how many falls they have had in the same time period.

Independent sample *t*-tests revealed no differences in self-rated health, time since last eye exam, nocturia frequency, MFES, ABC, or TUG scores between groups. The use of walking aids, amount of alcohol consumption and medication profile were also remarkably similar between the groups. The majority of study subjects used no walking aids (75.7% in the urban group, 82.5% rural), and did not consume any alcohol (66.7% urban, 55.0% rural). More than half of the urban subjects partook in some type of regular exercise program (62.7%), but less than half of the rural subjects did the same (45.0%).

RR analysis for falls in the urban subjects found that a "high TUG" (RR = 6.9, 95% CI 2.15–22.28) and a "low ABC" score (RR = 4.5, 95% CI 1.42–14.57) were associated with an increased risk of falling; a "high ABC" (RR = 0.3, 95% CI 0.11–0.99) was associated with a decreased risk of falling (Table 3). None of the measured variables attained statistical significance within the rural group.

Characteristics of the falls by the 22 urban subjects and 12 rural subjects who fell are summarized in Table 4. A larger percentage of rural fallers fell outside than did urban fallers, and on average laid less blame on their surroundings (lower attribution score) than their urban counterparts. However, none of the differences of the fall characteristics were statistically significant between urban and rural groups.

Discussion

The incidences of falling found in this study were 29.3% and 30.0% for urban and rural centres, respectively.

These rates are believable for a number of reasons. First, the rate of falling in the urban group was identical to the commonly reported incidence of falling of 30% as determined in urban settings.1–3 Because the urban and rural rates of falling, found to be the same, were calculated using the same questions as part of the same package at the identical time, any measurement or self-reporting biases should

cancel out. Indeed, a rural incidence rate of falling of around 30% is much more favourable than the 52% calculated in the only other North American study specifically directed at falls by the elderly in a rural area.7 The larger sample size of the rural group and the large urban control group used in the current study strengthens the results found here.

One potential limitation of this study was the reliance on people to self-designate themselves as either rural or urban subjects regardless of their medical practice, thus allowing "rural" patients to attend the urban medical practice and vice versa. While this may confound the analysis, it tends to echo the difficulty in separating rural and urban Canada from a research perspective by highlighting the various definitions of "rural area." Other studies on falling reported to be from rural areas actually examined smaller cities of 900020 and 13 500 people.21 The Canadian census defines rural as less than 1000 people; the United States census extends the definition to less than 2500. Future rural medical research must accommodate for these differing definitions.

The implications of the incidence rates being similar in both the urban and rural areas needs some study. It may be that the incidence of falling by those over 65 in rural areas is the same as those in urban areas simply because they share the same risk factors and fall for the same reasons in both the city and countryside. If this is the case, fall-prevention programs could be prepared and delivered in the rural setting in a similar fashion to those programs used in larger centres. Future studies may, however, find that although the rate of falling in rural areas is the same as urban centres, rural people have different and unique factors that combine in a different manner to add up to the same incidence rate.

Calculating RR ratios for each of the urban and rural groups provided little conclusive information concerning risk factors or indicators of falling. The relatively small sample of 40 rural subjects, of whom 12 fell, failed to yield significant RR ratios for any of the measured variables. The urban data, drawn from 75 subjects, indicated that those with a TUG score in excess of 15 seconds or an ABC score below 60% were more susceptible to falling, whereas an ABC score greater than 90% indicated the person was less likely to have suffered a fall in the previous year. Due to the nature of this study, it cannot be concluded whether fallers had high TUG times or low ABC scores before they fell, or if they had modified their activity levels and developed an increased fear of falling since their fall.

The demographic survey revealed that almost all rural subjects were living in

private houses, and were only half as likely as urban counterparts to be living alone. This is likely attributable to a lower proportion of urban subjects who are married. While not directly studied here, independent rural living may present important implications with regard to immediate post-fall consequences.

Roughly one-quarter of both urban and rural subjects reported that they were unable to get up by themselves after their most recent fall. This is well within the range of 14%–50% previously reported.4,22 Other studies have shown that between 3% and 16% of fallers remain on the ground for more than one hour.4,21,23 Fallers who require help to get up must therefore either live with others or count on people to periodically check on their well-being. The main threat here is that a rural resident who has fallen outside (e.g., on a gravel driveway), may have a longer wait before they are discovered than someone who has fallen outside in the city, a longer time until the ambulance arrives, a longer drive to the hospital, and the potential of a hospital less well equipped to handle the severe consequences of the longer lie (e.g., specialists, imaging technologies).

Literature reports that approximately 4% of all elderly people seek medical help specifically for falls each year.24 The sample size of the present study was too small to determine if that value held true for the rural fallers, but indicates the need for proper referral for post-fall follow-up. Evidence suggests that falls are commonly markers for underlying disorders that may be readily detectible by post-fall assessment within 7 days.25 People will seek help after a fall depending on their own attributions toward the accident. However, it is not clear if internal or external attributions are predictive of seeking help. This study found that, on average, the rural fallers laid less blame on their surroundings (and thus more on themselves) for causing the fall than did the urban group, although this difference was not statistically significant.

There are no previous studies that have specifically investigated falls self-efficacy in rural elders; there appears to be no difference in this regard when examined with the ABC and MFES. With this ambulatory population it appears that the ABC Scale was more sensitive to change between subjects, as shown by the relative risks of falling. The MFES was modified from the original FES to be more applicable to an active population,15 although the rural subjects expressed some difficulty completing the survey because they were asked questions they felt did not apply to their lifestyles. Specifically, asking about confidence while using public transportation (MFES question 11) in a town with no public transportation network, or asking farmers about confidence while performing light gardening (MFES question 13), caused a certain degree of hesitation while answering.

A TUG score in excess of 15 seconds was shown to increase the relative risk of falling in the urban sample only (RR = 6.9, 95% CI 2.15–22.28). When the urban and rural subjects are taken together, the use of the TUG as a tool for fallers is also supported (RR = 3.4, 95% CI 1.30–8.60). Recent information may show that the TUG is not as feasible for elderly fallers as originally determined;26 however, that study population involved cognitively-impaired older adults, a group excluded from this study. Previously, the TUG has been endorsed as a predictor of falling for those people who took longer than 16 seconds to complete the task.19

This study has raised important questions about falls in the elderly in rural communities and points future research in the direction of investigating more quantitative data concerned with rural fallers. The small data set here reveals no significant differences between injury rates, fall attributions, or whether the fall happened inside or outside, but a larger number of subjects would better explore these variables. Work is also needed to investigate the consequences of the fall itself -- the ability to get up after the fall, the time until help is obtained, and the degree of complications for those in rural areas compared with urban counterparts.

Competing interests: None declared.

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References

1. Tinetti ME. Prevention of falls and fall injuries in elderly persons: a research agenda. Prev Med 1994;23(5):756-62.
2. Steinweg KK. The changing approach to falls in the elderly. Am Fam Physician 1997;56(7):1815-23.
3. O'Loughlin JL, Robitaille Y, Boivin JF, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. Am J Epidemiol 1993;137(3):342-54.
4. King MB, Tinetti ME. A multifactorial approach to reducing injurious falls. Clin Geriatr Med 1996;12(4):745-59.
5. Rizzo JA, Friedkin R, Williams CS, Nabors J, Acampora D, Tinetti ME. Health care utilization and costs in a Medicare population by fall status. Medical Care 1998;36(8):1174-88.

6. Buchner DM, Cress ME, de Lateur BJ, Esselman PC, Margherita AJ, Price R, et al. The effect of strength and endurance training on gait, balance, fall risk, and health services use in community-living older adults. J Gerontol A Biol Sci Med Sci 1997;52(4):M218-24.
7. Baldwin RL, Craven RF, Dimond M. Falls: Are rural elders at greater risk? J Gerontol Nurs 1996;22(8):14-21.
8. Weinberg LE, Strain LA. Community-dwelling older adults' attributions about falls. Arch Phys Med Rehab 1995;76(10):955-60.
9. Tinetti ME, Doucette J, Claus E, Marottoli R. Risk factors for serious injury during falls by older persons in the community. J Am Geriatr Soc 1995;43(11):1214-21.
10. Speechley M, Tinetti M. Falls and injuries in frail and vigorous community elderly persons. J Am Geriatr Soc 1991;39(1):46-52.
11. Campbell AJ, Borrie MJ, Spears GF. Risk factors for falls in a community-based prospective study of people 70 years and older. J Gerontol 1989;44(4):M112-7.
12. Sorock GS, Bush TL, Golden AL, Fried LP, Breuer B, Hale WE. Physical activity and fracture risk in a free-living elderly cohort. J Gerontol 1988;43(5):M134-9.
13. Gardner MM, Robertson MC, Campbell AJ. Exercise in preventing falls and fall related injuries in older people: a review of randomised controlled trials. Br J Sports Med 2000;34(1):7-17.
14. Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner DM. Falls prevention over 2 years: a randomized controlled trial in women 80 years and older. Age Ageing 1999;28(6):513-8.
15. Hill KD, Schwarz JA, Kalogeropoulos AJ, Gibson SJ. Fear of falling revisited. Arch Phys Med Rehab 1996;77(10):1025-9.
16. Powell LE, Myers AM. The Activities-specific Balance Confidence (ABC) Scale. J Gerontol A Biol Sci Med Sci 1995;50(1):M28-34.
17. Tinetti ME, Richman D, Powell L. Falls efficacy as a measure of fear of falling. J Gerontol 1990;45(6):239-43.
18. Podsiadlo D, Richardson S. The Timed "Up & Go": a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc 1991;39(2):142-8.
19. Okumiya K, Matsubayashi K, Nakamura T, Fujisawa M, Osaki Y, Doi Y, et al. The Timed "Up & Go" Test is a useful predictor of falls in community-dwelling older people. J Am Geriatr Soc 1998;46(7):928-30.
20. Berg WP, Alessio HM, Mills EM, Tong C. Circumstances and consequences of falls in independent community-dwelling older adults. Age Ageing 1997;26(4):261-8.

21. Campbell AJ, Borrie MJ, Spears GF, Jackson SL, Brown JS, Fitzgerald JL. Circumstances and consequences of falls experienced by a community population 70 years and over during a prospective study [published erratum appears in Age Ageing 1990;19(5):345-6]. Age Ageing 1990;19(2):136-41.
22. Tinetti ME, Liu WL, Claus EB. Predictors and prognosis of inability to get up after falls among elderly persons. JAMA 1993;269(1):65-70.
23. Wild D, Nayak US, Isaacs B. How dangerous are falls in old people at home? BMJ Clin Res Ed 1981;282(6260):266-8.
24. Ryynanen OP, Kivela SL, Honkanen R, Laippala P, Soini P. Incidence of falling injuries leading to medical treatment in the elderly. Publ Health 1991;105(5):373-86.
25. Rubenstein LZ, Robbins AS, Josephson KR, Schulman BL, Osterweil D. The value of assessing falls in an elderly population. A randomized clinical trial. Ann Intern Med 1990;113(4):308-16.
26. Rockwood K, Awalt E, Carver D, MacKnight C. Feasibility and measurement properties of the functional reach and the Timed Up & Go Test in the Canadian study of health and aging. J Gerontol A Biol Sci Med Sci