Prevalence, risk factors, and burden of disease for falls and balance or walking problems among older adults in the U.S.

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ABSTRACT

This study assesses the prevalence of falls, factors predicting future falls, and health impacts of falls and balance or walking problems for U.S. older adults. Data were from participants ≥65 years in the Medicare Health Outcomes Survey Cohort 15 (baseline survey in 2012; follow-up survey in 2014; *n* = 164,597). We examined baseline factors predicting falls at follow-up and estimated the impact of falls and balance/walking problems on health-related quality of life (HRQOL), mortality, and quality-adjusted life years (QALYs). About 23% reported falls and 34% reported balance/walking problems in the past 12 months. The strongest predictors of falls were previous falls [adjusted odds ratio (OR) = 2.9] and balance/walking problems (OR = 1.7). Many self-reported chronic conditions (e.g., depression, stroke, and diabetes), geriatric symptoms (e.g., urine leakage), and limitations of activities of daily living (e.g., transferring and walking) also predicted falls, but at a smaller magnitude (ORs = 1.1–1.3). Having balance/walking problems was associated with a greater decrease in HRQOL scores (0.195 points) than falls (0.077 points), while falls were associated with a greater increase in mortality [adjusted hazard ratio (HR) = 1.5] than balance/walking problems (HR = 1.1). Falls were associated with a 4.6-year (48%) decrease in QALYs, while balance/walking problems was associated with a 7.3-year (62%) decrease in QALYs. Falls are a major problem for U.S. elderly and will continue to have an even greater impact as the population ages. The nearly 50% decrease in QALYs for falls and > 60% decrease for balance or walking problems demonstrates the substantial burden associated with these problems among older Americans.

1. Introduction

As the US population ages, falls have become an increasing priority in clinical and public health arenas. Nearly 30% of persons over 65 years report at least one fall each year (Bergen et al., 2016), with the two most common causes of falls in older persons categorized as environment-related and gait/balance disorders or weakness (Rubenstein et al., 2006). Compared to younger persons, adults aged 65 years or older experience the greatest risk of injury and death as a result of a fall (Dykes et al., 2010). Among the elderly, falls are increasingly likely in persons with impairments in physical functioning, especially mobility, impairments in psychological functioning, such as cognitive deficits and depression, chronic conditions, and geriatric syndromes, and the use of particular medications, such as sedatives, as well as polypharmacy

(Rubenstein, 2006; Dykes et al., 2010; Tinetti et al., 1988).

Falls are associated with substantial morbidity, use of health care services, and medical expenditures (Tinetti et al., 1988; Florence et al., 2018). One out of five falls causes a serious injury (O'Loughlin et al., 1993), and the total medical cost attributable to older adult fatal and nonfatal falls has been estimated to be approximately $50 billion (Florence et al., 2018). Falls cause most injury-related emergency department visits, and the rate of emergency department visits due to falls among older adults is increasing (Shankar et al., 2017). Experiencing a fall also is a strong risk factor for recurrent falls, recurrent emergency department visits, and subsequent hospitalization and nursing home admission (Sri-on et al., 2017; Tinetti and Williams, 1997). Elderly participants from a general population who reported a fall had substantially lower health-related quality of life (HRQOL), both at baseline

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and at follow-up six years later (Stenhagen et al., 2014). Similarly, having a balance problem was associated with lower HRQOL (Lin and Bhattacharyya, 2012). Among a large community-dwelling sample of older adults, respondents who reported having dizziness with falls in the past 12 months had mean HRQOL scores resembling those of respondents reporting four or more co-morbidities (Lutomski et al., 2017). With regard to mortality, unintentional injuries were the seventh leading cause of death among the U.S. population aged 65 and older (National Center for Health Statistics, 2017), and falls account for more than one-half of unintentional injury deaths this population (Kramarow et al., 2015). In 2016, 29,668 U.S. residents aged ≥ 65 years died as the result of a fall (Burns and Kakara, 2018).

Because falls occur frequently and are associated with substantial morbidity and mortality, quantifying the burden of disease due to falls through a multi-dimensional summary measure of population health, such as disability-adjusted life years (DALY) or quality-adjusted life years (QALYs), can provide a more holistic picture of the impact of falls on seniors (Field and Gold, 1998). Between 1990 and 2016, falls moved from 21st to 13th among the leading causes of DALYs (an increase of 87.5%) (US Burden of Disease Collaborators, 2018). However, this estimate did not focus on older persons, an at-risk group for both falls and adverse outcomes from falls (Bergen et al., 2016; Verma et al., 2016). Moreover, this estimate is based on additive models using multiple data sources to assess the separate impacts of falls on morbidity (disability) and mortality (US Burden of Disease Collaborators, 2018).

While much is known about the risk of falls and their subsequent impact, most studies have relied upon small cross-sectional samples, and are often comprised of patients with a particular clinical condition (Verma et al., 2016; Wildes et al., 2015). The few cohort studies examining mortality due to falls have tended to rely upon data only from primary care practices (Gribbin et al., 2009). It would be particularly useful to longitudinally assess the risk factors of future falls and health impact of falls from a large population-representative sample. Moreover, examining morbidity and mortality rates after falls and their associated QALY loss would allow evaluation of the burden of disease due to falls, facilitating comparisons to other impairments, chronic conditions, and geriatric syndromes, as well as economic evaluations of promising interventions to prevent falls (Field and Gold, 1998). With regard to interventions, the Centers for Disease Control and Prevention has promoted their Stopping Elderly Accidents, Deaths, and Injuries (STEADI) initiative, which is a tool kit for health providers based upon the American and British Geriatrics Societies' clinical practice guidelines for fall prevention (CDC, 2019). Investigators also have demonstrated the feasibility of implementing STEADI fall prevention strategies into large health systems (Casey et al., 2017).

This study uses a large longitudinal sample of the U.S. elderly population to estimate the prevalence of falls and balance or walking problems, examine prognostic factors for falls, and assess the health impact (HRQOL and mortality) of falls and balance or walking problems. We also examine the burden of disease associated with falls and balance or walking problems by estimating their expected QALYs, a measure of disease burden that includes both the quality and quantity of life lived. This single data source includes both morbidity and mortality outcomes, thereby enabling QALYs to be estimated directly while avoiding additive or multiplicative model assumptions.

2. Materials and methods

2.1. Data sources

The data come from the Medicare Health Outcomes Survey (HOS), a nationwide annual survey of Medicare beneficiaries who enrolled in Medicare Advantage health plans (Centers for Medicare and Medicaid Services, 2018). Each year, the Centers for Medicare and Medicaid Services (CMS) randomly selects a cohort of up to 1200 members from each participating plan. The sampled individuals who completed a mailed questionnaire at the baseline survey are resurveyed two years later. This study used the Limited Data Set of the HOS Cohort 15 whose baseline data were collected in 2012 and follow-up data in 2014. If a respondent died before January 31, 2015, the date of death was included. This study included respondents who were aged 65 years and older and alive at the time of the baseline survey, and participated in the baseline survey, giving a total sample size of 164,597.

2.2. Measurements

The HOS defines a fall as "when your body goes to the ground without being pushed" (Centers for Medicare and Medicaid Services, 2012). In this study, respondents were classified as having a fall if they answered "Yes" to the question, "Did you fall in the past 12 months?" and as having balance or walking problem if they answered "Yes" to the question, "In the past 12 months, have you had a problem with balance or walking?"

The HOS includes four questions referred to as the Healthy Days items that ask respondents to rate their general health from excellent to poor and to report numbers of their physically unhealthy days, mentally unhealthy days, and days when usual activities were limited during the past 30 days (Centers for Medicare and Medicaid Services, 2012; Centers for Disease Control and Prevention, 2000). We applied a previously developed and validated algorithm to obtain respondents' EQ-5D index score, a single value index of HRQOL commonly used to calculate QALY, based on their age and answers to the four Healthy Days questions (Jia and Lubetkin, 2008).

2.3. Statistical analyses

We estimated the prevalence of falls and balance/walking problems at the baseline and the follow-up surveys. A logistic model was used to examine how well the following baseline factors predicted future falls reported by the follow-up: age, sex, race/ethnicity, marital status, education, previous falls, balance/walking problems, proxy reporting, smoking, limitations in activities of daily living (ADL), chronic diseases, vision problems, hearing problems, urine leakage problems, HRQOL scores (EQ-5D index), body mass index (BMI), and smoking. We examined limitations for the following six ADLs: bathing; dressing; eating; getting in or out of a chair; using toilet; and walking. We studied the 15 self-reported chronic diseases included in the HOS: hypertension; angina pectoris; congestive heart failure; myocardial infarction; other heart conditions; stroke; emphysema, asthma, or chronic obstructive pulmonary disease (COPD); Crohn's disease; arthritis of the hip or knee; arthritis of the hand or wrist; osteoporosis; sciatica; diabetes; any cancer other than skin cancer; and depression.

To examine the impact on HRQOL (i.e., EQ-5D score) at both baseline and follow-up, we applied a generalized estimating equation (GEE) linear model for repeated measures data. To examine the impact on mortality, we applied a Cox proportional hazards model with time-dependent covariates. In both models, the independent variables were age, sex, race/ethnicity, marital status, education, proxy reporting, number of chronic conditions, falls, and balance/walking problems and all variables except sex and race were time-dependent variables.

2.4. Impact on QALYs

QALYs are defined and calculated by weighting life-years lived with preference-based HRQOL measures (Field and Gold, 1998; Jia and Lubetkin, 2016). A preference-based HRQOL measure (for example, the EQ-5D index) is a summary score that assesses the value for preferring one health state over that of another health state (Field and Gold, 1998). The preference-based measure is anchored at 0 for death and 1 for full health, so that one year lived at a reduced score of 0.5 equals 0.5 QALYs, the same as living a half year in full health (Field and Gold, 1998; Jia and Lubetkin, 2016). The expected QALYs throughout the

Table 1

Sample Characteristics, Medicare Health Outcomes Survey, Older Adults, 2012 Baseline and 2014 Follow-up Surveys.

	2012 baseline survey		2014 follow-up survey	
	N	Percent	N	Percent
Total	164,597	100%	102,274	62%
Age, mean (SD)	75.1 (7.4)		76.3 (6.8)	
65–69	46,358	28.2%	17,025	16.6%
70–74	41,614	25.3%	31,352	30.7%
75–79	31,983	19.4%	23,254	22.7%
80–84	23,693	14.4%	16,855	16.5%
85 +	20,949	12.7%	13,788	13.5%
Sex				
Male	69,482	42.2%	42,722	41.8%
Female	95,115	57.8%	59,552	58.2%
Race				
White non-Hispanics	121,334	76.1%	79,326	78.3%
Black non-Hispanics	13,031	8.2%	7539	7.4%
Hispanics	15,735	9.9%	8925	8.8%
Asian/PI	6275	3.9%	3785	3.7%
American Indian	3129	2.0%	1723	1.7%
Chronic conditions, mean (SD)	3.2 (2.2)		3.3 (2.2)	
Had falls[1]	36,949	23.2%	21,643	22.6%
Had balance/walking problems[1]	53,929	33.9%	32,379	33.8%

[1] During past 12 months.

remainder of the lifetime is a good indicator of the long-term health of an individual, where lower QALYs indicate a shorter life span in full health.

We estimated expected QALYs throughout the remainder of the lifetime using the hybrid method (Jia and Lubetkin, 2016). QALYs were calculated in two periods: during the follow-up period (from baseline survey to January 31, 2015) and beyond the follow-up period (after January 31, 2015). The first part was estimated based on the Kaplan-Meier method and the second part on a Weibull model to extrapolate survival time beyond the follow-up. We calculated QALYs according to whether or not participants reported falls and balance/walking problems at the baseline. Because participants in subgroups might differ with regard to age, sex, race/ethnicity, marital status, education, number of chronic conditions, and proxy reporting, we calculated QALYs adjusting for these variables.

3. Results

At baseline, the average participant age was 75.1 years with 28% between 65 and 69 years old, and 13%, 85 years or older (Table 1). About 23% reported a fall, and 34% reported a balance/walking problem in the past 12 months. Among those who completed the baseline survey, 62,323 (38%) did not complete the follow-up survey, which included 24,127 (15%) who had died. Among those who were alive and completed the follow-up survey (n = 102,274), 23% reported falls, and 34% reported balance/walking problems in the past 12 months.

A much higher percentage of participants who completed the survey by proxy reported a fall as compared to those who completed these surveys by themselves (38% vs. 21% at baseline; 36% vs. 21% at follow-up) (Table 2). As proxies, professional caregivers reported falls more often (43% at baseline) than family members or relatives (38%) and friends (33%). Also, nearly twice as many who completed the survey by proxy reported a balance/walking problem as those who completed the surveys by themselves (58% vs. 30% at baseline; 58% vs. 31% at follow-up).

Table 3 highlights the baseline factors that predicted future falls by follow-up. The adjusted odds of a fall increased among the following groups: increasing age (OR = 1.02 for each year), white non-Hispanics, more than a high-school education (ORs = 1.2–1.3), and proxy

reporting (OR = 1.2). Previous falls (OR = 2.9) and balance/walking problems (OR = 1.7) were the strongest predictors of future falls. Only two of the six ADL limitations [having problems getting in or out of chairs (OR = 1.2) and walking (OR = 1.2)] predicted falls. Of the 15 chronic diseases examined, depression, stroke, diabetes mellitus, Crohn's disease, arthritis, and osteoporosis predicted falls (ORs = 1.1–1.3). Having problems with urine leakage (ORs = 1.2 and 1.3 for small and big problems, respectively) and hearing problems (OR = 1.1) also predicted falls. Individuals with higher baseline HRQOL (EQ-5D) scores had a slightly lower risk of future falls (OR = 0.98 for each 0.1-point increase in EQ-5D scores).

Participants who reported a balance/walking problem had greater decreases in their EQ-5D scores (adjusted beta = −0.195) than those who reported falls (adjusted beta = −0.077) (Table 4). The EQ-5D scores decreased 0.035 points with each additional chronic condition and 0.162 points with proxy reporting. Completing the survey using a proxy had the greatest increase in mortality [adjusted hazard ratio (HR) = 2.2], followed by reporting falls (HR = 1.5) and balance/walking problems (HR = 1.1). For each additional chronic disease, the hazard of death increased approximately 10%.

The total sample had 6.9 expected QALYs throughout the remainder of the lifetime (Table 5). Participants who reported a fall at baseline had 4.9 expected QALYs, 4.6 QALYs less (48% less) than participants who did not report a fall (9.5 QALYs). Similarly, participants who reported a balance/walking problem at baseline had 4.4 expected QALYs, 7.3 QALYs less (62% less) than participants who did not report a balance/walking problem (11.7 QALYs).

4. Discussion

Consistent with other investigations, our study highlights the overall high prevalence of falls and balance or walking problems among the elderly population in the U.S. About 23% of participants reported a fall, and about 34% reported a balance or walking problem in the past 12 months. These findings reinforce the American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons recommendation that all older adults be asked whether they have fallen in the past 12 months or have experienced problems with walking or balance (Panel on Prevention of Falls in Older Persons, 2011). The findings also support the continued use of fall risk assessment as a clinical quality measure, given that many falls can be prevented with proper screening, assessment, referrals, and intervention, such as evidence-based falls prevention programs and protocols (Centers for Disease Control and Prevention, 2018). In particular, a recent literature review that examined seven fall risk factors and seven evidence-based fall interventions for U.S. adults aged ≥65 estimated that between 9563 and 45,164 medically treated falls could be prevented annually (Stevens and Lee, 2018). In terms of government initiatives, the Medicare Access and CHIP Reauthorization Act (MACRA) incentivizes providers to screen for falls in addition to conducting fall risk assessments and interventions, such as the ones described by the CDC's STEADI initiative. Furthermore, selected states have enacted legislation that addresses falls among older adults (National Conference of State Legislatures, 2018).

This study had a number of strengths. We used a large longitudinal sample of the U.S. older adult population that allowed us to detect small associations and provide information on a multitude of covariates. This study also could identify the time sequence of causes and outcomes due to the longitudinal follow-up design of the HOS. Our findings illustrate the complex and multifactorial nature of falls. Not surprisingly, having a fall or a balance or walking problem were most predictive of future falls (about two years later). This is consistent with other investigations that found falling increases the risk of a subsequent fall two- to three-fold, and that the most consistent predictor of future falls was clinically detected abnormalities of gait or balance (O'Loughlin et al., 1993; Ganz et al., 2007). Many chronic conditions (e.g., depression, stroke, and

Table 2
Percentage of older adults that reported falls, balance or walking problems by proxy status.

		Total	Falls			Balance or walking problems		
		N	N	%	RR[1]	N	%	RR
Proxy status for survey								
At the baseline[2]	Self-reported survey data	142,664	28,941	20.9%	1.0	41,768	30.2%	1.0
	Proxy reported survey data	21,933	8008	38.2%	1.8	12,161	58.2%	1.9
	By family members or relatives	19,369	7086	38.2%	1.8	10,753	58.2%	1.9
	By friends	1279	417	33.3%	1.6	615	49.5%	1.6
	By professional caregivers	1285	505	42.9%	2.1	793	67.5%	2.2
At the follow-up[2]	Self-reported survey data	91,802	18,131	21.1%	1.0	26,694	31.1%	1.0
	Proxy reported survey data	10,472	3512	35.6%	1.7	5685	57.5%	1.8
	By family members or relatives	9569	3230	35.8%	1.7	5199	57.5%	1.9
	By friends	534	149	29.4%	1.4	249	48.9%	1.6
	By professional caregivers	369	133	38.4%	1.8	237	68.9%	2.2

[1] RR: Unadjusted relative risk of having falls or balance problems reported by proxies relative to not by proxies.
[2] Baseline survey was in 2012 and follow-up survey was in 2014.

Table 3
2012 Baseline Predictors of Older Adult Falls Reported at the 2014 Follow-up Survey.

Independent variables[1]	OR[2]	95% CI
Age	1.02	(1.02, 1.02)
Race		
White non-Hispanics (Ref)	1.0	–
Black non-Hispanics	0.74	(0.69, 0.80)
Hispanics	0.84	(0.78, 0.90)
Asian/Pacific islander	0.70	(0.63, 0.77)
American Indian	1.1	(0.97, 1.28)
Education		
Less high school (ref)	1.0	–
High school or GED	1.0	(0.97, 1.1)
Some college	1.2	(1.1, 1.3)
4-year degree or higher	1.3	(1.2, 1.3)
Reported by a proxy	1.2	(1.1, 1.2)
Previous falls	2.9	(2.8, 3.0)
Balance/walking problem	1.7	(1.6, 1.8)
Have problem with		
Getting in/out of chairs	1.2	(1.1, 1.3)
Walking	1.2	(1.1, 1.2)
Chronic conditions		
Stroke	1.2	(1.2, 1.3)
Inflammatory bowel disease	1.2	(1.1, 1.3)
Arthritis hip or knee	1.1	(1.1, 1.2)
Arthritis hand or wrist	1.1	(1.1, 1.1)
Osteoporosis	1.1	(1.1, 1.2)
Diabetes	1.2	(1.2, 1.3)
Depression	1.3	(1.2, 1.3)
Hearing problem	1.1	(1.05, 1.2)
Urine leakage		
No problem	1.0	–
Small problem	1.2	(1.2, 1.3)
Big problem	1.3	(1.3, 1.4)
HRQOL (EQ-5D)[3]	0.98	(0.98, 0.99)
AUROC[4]	0.73	

[1] Following variables were not statistically significant and excluded from the final model: Sex, marital status, BMI categories, smoking, difficulty with bathing, difficulty with dressing, difficulty with eating, difficulty with using toilet, hypertension, myocardial infarction, congestive heart failure, angina pectoris, other heart conditions, emphysema/asthma/COPD, sciatica, any cancer (except skin), and vision problem.
[2] OR: Adjusted odds ratio and corresponding 95% confidence interval (CI).
[3] HRQOL: For 0.1 points increase in EQ-5D.
[4] AUROC: Area under the receiver operating characteristic curve.

diabetes), geriatric symptoms (e.g., urine leakage), and having limitations in ADL (e.g., transferring and walking) have been associated with predicting future falls. These results align with those of other investigations that showed an increasing risk of falling as the number of risk factors increased, highlighting the importance of baseline factors, chronic conditions, functional impairments, and other geriatric

Table 4
Impact of having falls and balance problems on HRQOL score and mortality, older adults.

	HRQOL		Mortality	
	Beta[1]	95% CI	HR[2]	95% CI
Survey completed by proxy	−0.162	(−0.167, −0.147)	2.23	(2.16, 2.31)
Number of conditions	−0.035	(−0.035, −0.034)	1.14	(1.14, 1.15)
Fall/balance questions				
Falls	−0.077	(−0.081, −0.074)	1.52	(1.14, 1.56)
Balance problems	−0.195	(−0.198, −0.192)	1.10	(1.07, 1.13)

[1] Adjusted mean EQ-5D score change and corresponding 95% confidence interval (CI). The model includes age, sex, race/ethnicity, reported by a proxy, number of chronic conditions, falls, and balance/walking problems.
[2] Adjusted hazard ratio and corresponding 95% confidence interval (CI). The model includes age, sex, race/ethnicity, reported by a proxy, number of chronic conditions, falls, and balance/walking problems.

Table 5
Impact of falls and balance or walking problems on quality-adjusted life years throughout the remainder of the lifetime (QALYs), older adults.

	QALY[1]	95% CI
Total sample	6.9	(6.7, 7.1)
Falls		
No (ref)	9.5	(9.1, 9.9)
Yes	4.9	(4.7, 5.2)
Difference	4.6	(4.1, 5.0)
Balance/walking problems		
No (ref)	11.7	(11.1, 12.3)
Yes	4.4	(4.2, 4.7)
Difference	7.3	(6.6, 7.9)

[1] Mean quality-adjusted life years (QALY) throughout the remainder of the lifetime and corresponding 95% confidence interval (CI), adjusted for age, sex, race/ethnicity, marital status, education, number of conditions, and reporting by a proxy.

syndromes on the risk of falling (O'Loughlin et al., 1993; Tinetti et al., 1988; Campbell et al., 1989).

In terms of specific chronic conditions, depression, stroke, and diabetes, have been associated with a greater risk of falls (Yang et al., 2016). Of note, depression has been found to interact with other conditions, resulting in a greater risk of falls among older persons with both depression and chronic conditions, such as diabetes, which also has an increased association with functional disability, malnutrition, and cognitive impairment (Kao et al., 2012; Araki and Ito, 2009). Viewing ADL limitations, the increased association between reporting difficulty with transferring and walking and future falls among older adults has been noted among participants in the 1984–1990 Longitudinal Study of Aging (Mamikonian-Zarpas and Laganá, 2015). While the associations

between individual chronic condition and future falls were relatively weak (all ORs ≤1.3), despite being statistically significant due to the large sample size, the association between falls and chronic conditions would be stronger for a greater number of conditions, given that more than half (55%) of the participants in this sample reported three or more chronic conditions, and the impact would be substantial from a population perspective.

Most of baseline characteristics examined did not predict future falls well. This is because, unlike other problems (such as balance problems), fall-related incidents tend to occur accidentally. It is more difficult to predict whether a given person would have a fall in the next two years than to identify people who are prone to falls. The area under the receiver operating characteristic curve (AUROC) of the prediction model, a measure of how well the model distinguishes those who did fall from those who did not fall, is 0.73. While an AUROC of 0.73 is generally considered as a fair prediction, this value was better than the AUROC for predicting future falls in previous studies (Palumbo et al., 2015).

The higher risk of future falls among participants using proxies is consistent with other investigations that have demonstrated a relationship between cognitive impairment and falls (Jensen et al., 2003). Participants with dementia are more likely to use proxies and have more health and functional limitations as compared to participants without dementia (Li et al., 2015). This might also help explain our finding of increased mortality and lower HRQOL scores among participants using proxies.

The 0.195 point adjusted decrease in HRQOL (morbidity) for having balance or walking problems is greater than the commonly used threshold of 0.1-points for the minimal clinically important difference (Crosby et al., 2003), and the 1.5 hazard ratio of death for falls would translate to a decrease of 4.2 life years in this sample. Both falls and balance or walking problems were associated with approximately a 50–60% decrease in estimated QALYs among older persons who reported these problems compared to those who did not. The decrease in QALY for balance or walking problems (7.3-QALY decrease) exceeded that for falls (4.6-QALY decrease). A fall might be a discrete, acute event without any long-term consequences. By contrast, a balance problem might be a chronic condition that, ultimately, might affect many areas of daily life, including exercise, driving, and social events, as well as increase the risk of falls (Lin and Bhattacharyya, 2012; Lutomski et al., 2017).

This study has a number of limitations. First, because this study used data from the HOS, a survey of Medicare beneficiaries enrolled in Medicare Advantage health plans who are predominantly white, non-Hispanic, this sample may be younger and healthier than the overall Medicare population (Byhoff et al., 2016). Second, falls, balance or walking problems, disease status, geriatric syndromes, and functional limitations were self- or proxy-reported and were not validated by medical chart reviews. Falls and chronic diseases may be under-reported, and certain ADL items may have a wider interpretation due to such factors as culture, education, and language (Wiener et al., 1990). However, because these factors were associated with future falls, their measurement error from not being validated appears to be small. Third, although the HOS included 15 self-reported conditions, dementia or other cognitive impairment were not included among this list. A more recent version of the Medicare HOS, however, includes an item on memory loss.

In conclusion, given falls are a major health problem for the U.S. older persons, policy makers and providers must continue to implement interventions designed to reduce the risk and impact of falls. The association of falls with an increase in healthcare utilization and spending, morbidity and mortality, and a decrease in health-related quality of life will become even more pronounced as the population continues to age and the age pyramid changes in shape (Jia et al., 2018; Pew Research Center, 2014). Obtaining a clearer portrait of the prevalence of falls, associated factors that can predict falls, and the influence of falls (morbidity, mortality, and QALYs) is essential for a range

of audiences, including clinicians, public health officials, and policymakers. The nearly 50% decrease in QALYs for falls and > 60% decrease for balance or walking problems demonstrates the substantial burden associated with these problems among older Americans.

Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Centers for Medicare and Medicaid Services.

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