Underreporting of Fall Injuries of Older Adults: Implications for Wellness Visit Fall Risk Screening

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OBJECTIVES: To compare the accuracy of and factors affecting the accuracy of self-reported fall-related injuries (SFRIs) with those of administratively obtained FRIs (AFRIs).
DESIGN: Retrospective observational study
SETTING: United States
PARTICIPANTS: Fee-for-service Medicare beneficiaries aged 65 and older (N=47,215).
MEASUREMENTS: We used 24-month self-report recall data from 2000–2012 Health and Retirement Study data to identify SFRIs and linked inpatient, outpatient, and ambulatory Medicare data to identify AFRIs. Sensitivity and specificity were assessed, with AFRIs defined using the University of California at Los Angeles/RAND algorithm as the criterion standard. Logistic regression models were used to identify sociodemographic and health predictors of sensitivity.
RESULTS: Overall sensitivity and specificity were 28% and 92%. Sensitivity was greater for the oldest adults (38%), women (34%), those with more functional limitations (47%), and those with a prior fall (38%). In adjusted results, several participant factors (being female, being white, poor functional status, depression, prior falls) were modestly associated with better sensitivity and specificity. Injury severity (requiring hospital care) most substantively improved SFRI sensitivity (73%).
CONCLUSION: An overwhelming 72% of individuals who received Medicare-reimbursed health care for FRIs failed to report a fall injury when asked. Future efforts to address underreporting in primary care of nonwhite and healthier older adults are critical to improve preventive efforts. Redesigned questions—for example, that address stigma of attributing injury to falling—may improve sensitivity. **J Am Geriatr Soc 66:1195–1200, 2018.**

Key words: fall injuries; self report; Medicare; screening; survey

Self-report is the primary method of identifying fall-related injuries (FRIs) in older adults. In 2011, assessment of fall risk became part of health risk assessment within the Medicare Annual Wellness Visit. The American Geriatrics Society also recommends screening of prior falls for older adults who visit a clinician.[1] Screening using fall-risk questions can identify older adults who are newly at risk for falling and may benefit from fall prevention efforts. Self-reported data from national surveys provide surveillance prevalence estimates.

Using intensive interview methods (e.g., telephone review of self-recorded falls diaries) and small community samples,[2–7] prior studies have found that older adults modestly underreport falls and FRIs. Accuracy was 56% to 87% for falls[2,4,6,8] and 60% for FRIs.[2] Similar studies have not been performed using nationally representative survey data. Additionally, although perceptions of fall risks can differ according to sex[9] and race and ethnicity,[10,11] little is known about differences in accuracy of fall reporting depending upon patient sociodemographic and health characteristics.

We assessed the accuracy of self-reported FRIs (SFRIs) using the Health and Retirement Study (HRS), a large, biennial, nationally representative survey of older Americans conducted primarily by telephone interviews with linkages to Medicare claims data. Its large sample enabled assessment of the accuracy of FRIs over varying time intervals between the injury and interview. The linked

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Medicare data including outpatient claims allowed for estimates of the full range of injuries. We used a claims-based algorithm[7,12,13] as the criterion standard to test self-reports of FRIs from the HRS.

METHODS

Data and Study Population

Our final sample included 47,215 adults aged 65 and older from the 2000 to 2012 HRS. Proxy interviews were conducted for participants unable to participate because of medical or cognitive disability. Post mortem interviews were conducted with next of kin. More than 80% of participants consented to data linkage with Medicare, which included acute, ambulatory, emergency department, and nursing home care. Interviews were included if the participant was continuously enrolled in Medicare Parts A and B for the 2 years before the interview.

Outcome Variable

To create our criterion standard, we used a method that the University of California at Los Angeles (UCLA) and RAND devised to indicate an administratively identified FRI (AFRI).[7,12,13] AFRIs were identified using *International Classification of Diseases, Ninth Revision*, diagnostic codes for fractures, head trauma, and joint dislocations, plus external cause-of-injury codes and physician and outpatient procedural codes indicating falls.[7] We classified participants as having an AFRI in the 2 years before each survey if an AFRI was observed during the time since their last scheduled survey or the prior 2 years if the respondent did not participate in the prior survey wave.

Predictor Variable of Interest

We classified participants as having a SFRI if they reported having a fall with an injury serious enough to require medical treatment. The SFRI was considered to be the "test" in comparison to the criterion standard AFRI.

Respondent and Clinical Characteristics

To assess whether respondent characteristics were predictive of reporting accuracy, we assessed age, sex, race and ethnicity, general health status, numbers of chronic health conditions,[14] difficulty performing activities of daily living (ADLs), depressive symptoms,[15] and cognitive impairment.[16,17] We measured prior self-reported fall status (no fall vs fall without injury or SFRI in prior survey) and dual Medicare and Medicaid eligibility.[18] Because it is expected that a more recent or severe event will increase sensitivity, we examined days elapsed between the AFRI and survey (0–60, 61–120, 121–360, 361–720 days) and severity of the injury. To construct a proxy for injury severity, we adapted UCLA/RAND categories (greatest to least severity): probable inpatient (inpatient care for an injury diagnosis), probable outpatient (injury diagnosis plus fracture splinting, casting, or repair), possible outpatient AFRI (injury diagnosis plus imaging only), and fall-related medical care (fall e-code without injury diagnosis, inpatient or outpatient).[13]

Analysis

We compared the accuracy of respondent SFRIs with that of the AFRI criterion standard. The unit of analysis each 2-year interview interval matched with the corresponding lookback period in the administrative data. We assessed sensitivity (the proportion of claims with an AFRI that also involved an SFRI in the linked survey data) and specificity (the proportion of claims with no AFRIs that did not include an SFRI in the linked survey data). We first calculated unadjusted sensitivity and specificity and 95% confidence intervals (CI) overall and then compared differences according to respondent and clinical characteristics (Figures 1 and 2) using tests of proportions.

Next, we specified multivariable logistic regression models to estimate the odds of a false-negative response (no SFRI when an AFRI occurred) and a true-negative response (no SFRI when no AFRI occurred). We adjusted model standard errors using the Stata (Stata Corp., College Station, TX) cluster command to account for repeated observations.[19]

RESULTS

Unadjusted Results

There were nearly twice as many AFRIs (n=11,080) as SFRIs (n=6,128) (Table 1). Overall, sensitivity was 28% (95% CI=27–29%) for all respondents and specificity 92% was (95% CI=91–92%).

In general, sensitivity was higher in sicker participants, for example, 25% in participants with no chronic conditions and 36% in those with 5 or 6 (Figure 1). Sensitivity for AFRIs that occurred 1 to 2 years before the interview was 25% and increased to 32% within 60 days before the interview. Sensitivity was greater for probable inpatient (73%) and probable outpatient (63%) than for possible outpatient (33%) and fall-related medical care (20%) AFRIs, with respective specificities of 86%, 83%, 76%, and 59%. Specificity was higher and varied less between risk groups than sensitivity (Supplementary Figure S1).

Multivariable-Adjusted Results

After multivariable adjustment, several sociodemographic and health factors were associated with more accurate reporting. Overall, women; non-Hispanic whites; and individuals with greater functional impairment, depressive symptoms, a prior fall, and a more severe injury were more accurate reporters of FRIs (Table 2). We did not observe different patterns when examining the odds of false-negative self-report when separately examining probable inpatient, probable outpatient, or possible outpatient AFRIs or fall-related medical treatment. Patterns were also similar when accuracy was assessed as odds of true-negative responses (Supplementary Table S1).

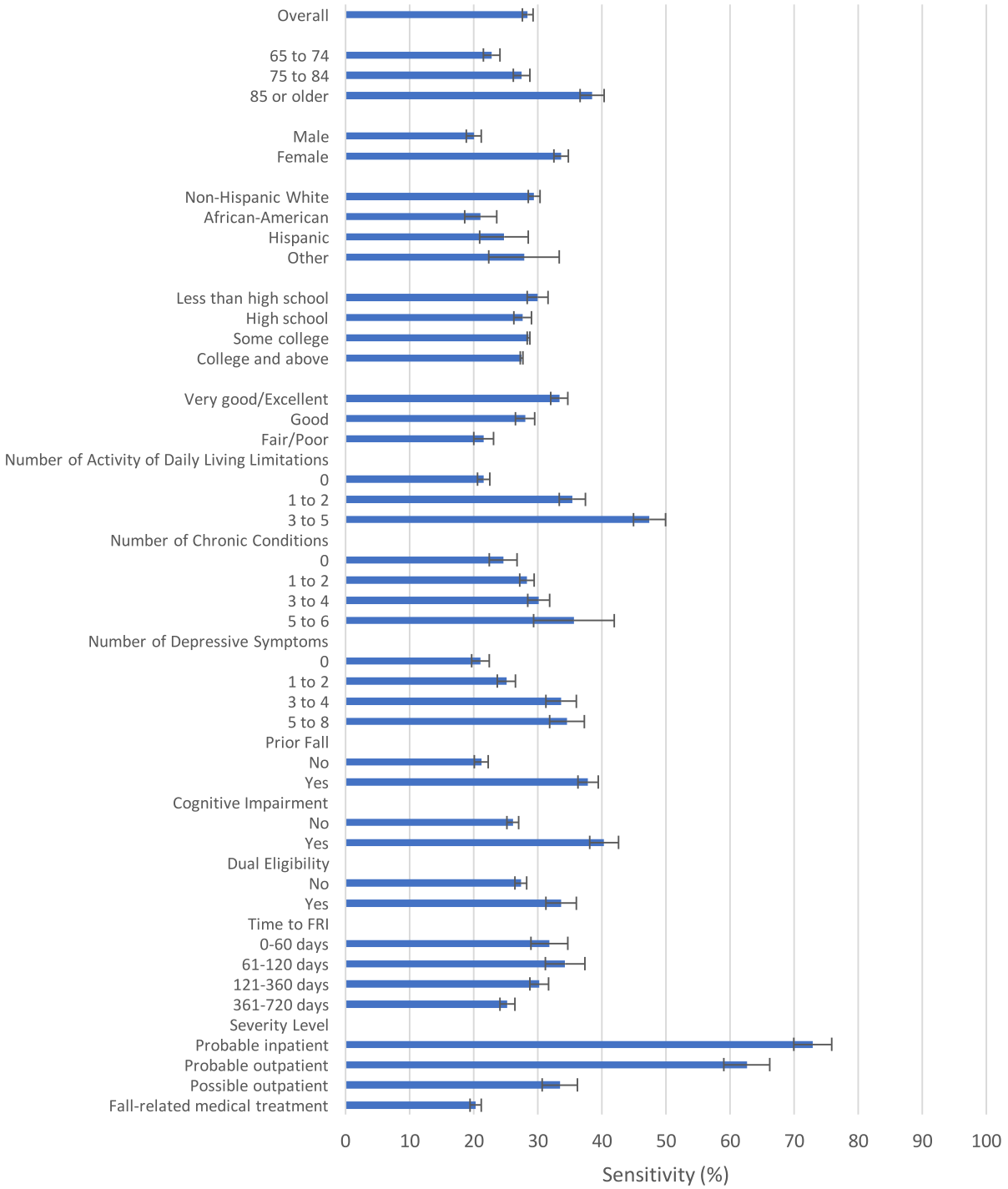

Figure 1. Sensitivity of self-reported fall-related injuries (FRIs) of older adults (≥65) according to respondent and clinical characteristics (N=7,442). The figure represents sensitivity (%) and 95% confidence intervals. Data are from the 2000–2012 waves of the Health and Retirement Study. Sensitivity is the proportion of administratively identified FRIs in which SFRIs were also reported by the participant in linked survey data.

DISCUSSION

In this national survey of older Americans that was linked with inpatient and outpatient Medicare data for health care received for fall injuries, self-reporting as the sole method of data collection on a biennial basis greatly underestimated actual healthcare delivery for fall injury events, with an overall sensitivity of only 28%. To our knowledge, this is the first analysis of the accuracy of fall self-report and predictors of accuracy using a large, nationally representative survey.

To the extent that individuals fail to identify prior events, prevention opportunities are missed. For an FRI that occurred 1 year before or less, similar to the time period discussed during the Medicare Annual Wellness Visit, fewer than 1 in 4 FRIs are accurately reported, meaning that more than three-quarters of beneficiaries may leave the visit

Table 1. Self-Reported (SFRIs) and Administratively Identified Fall-Related Injuries (AFRIs) of Older Adults (≥65) According to Respondent Characteristics

Characteristic	SFRI, n = 6,128	AFRI, n = 11,080
	%	
Sex		
Male (n = 19,488)	9.6	21.7
Female (n = 27,727)	15.3	24.7
Age		
65–74 (n = 18,956)	9.0	20.5
75–84 (n = 17,127)	12.0	26.9
≥85 (n = 7,327)	20.2	35.4
Race and ethnicity		
Non-Hispanic white (n = 38,211)	13.5	24.4
Black (n = 5,596)	9.0	18.2
Hispanic (n = 2,072)	13.3	24.0
Other (n = 1,322)	14.0	19.3
Education		
< High school (n = 13,422)	14.3	22.3
High school (n = 17,191)	12.4	23.4
Some college (n = 8,526)	12.9	24.1
≥College (n = 8,074)	12.2	24.9
Health status		
Very good, excellent (n = 14,408)	7.6	19.8
Good (n = 13,934)	10.7	24.3
Fair, poor (15,024)	17.5	32.1
Number of chronic conditions		
0 (n = 11,151)	13.9	13.4
1–2 (n = 26,398)	11.4	24.8
3–4 (n = 9,098)	15.8	31.1
5–6 (n = 568)	23.1	39.1
Number of activity of daily living limitations		
0 (n = 32,761)	8.6	21.8
1–2 (n = 6,703)	18.6	32.3
3–5 (n = 3,924)	29.6	45.2
Number of depressive symptoms		
0 (n = 16,512)	7.9	20.5
1–2 (n = 13,579)	10.3	25.3
3–4 (n = 5,158)	16.3	29.2
5–8 (n = 3,888)	19.0	31.1
Cognitive impairment[a]		
Yes (n = 5,265)	20.8	34.2
No (n = 41,950)	12.0	22.1
Dually eligible		
Yes (n = 4,776)	16.7	31.3
No (n = 38,247)	11.4	24.7
Prior fall measured in last survey wave		
Yes (n = 13,060)	21.8	28.1
No (n = 24,919)	8.5	22.0

[a]Nonproxy cognitive impairment measured with proxy respondent

Data are from the 2000–2012 waves of the Health and Retirement Study. Significant differences ($p<.001$) were observed across respondent characteristics for SFRIs and AFRIs. Approximately 10% of AFRIs occurred 0-2 months and 2-4 months prior, while 34% and 47% of AFRIs occurred 4 months to 1 year and 1-2 years prior to the date of survey administration. Nine percent of AFRIs involved probable inpatient FRIs, 6% were probable outpatient FRIs, and 10% were possible outpatient FRIs; 75%, involved fall-related medical treatment.

without fall prevention activities being initiated. We also found that FRIs are potentially undercounted in younger individuals, men, non-white individuals, and individuals with better function and health. These groups should be recognized in future fall prevention efforts and in survey-based prevalence estimates. In particular, healthier older adults who did not recall or denied having medical care for their FRI are underrecognized. They could benefit from enhanced population-level fall prevention efforts particularly because they may not see themselves as being at risk.

Our estimates of the sensitivity of SFRI are lower than those from prior work using more intensive interview methods (e.g., weekly diaries), which ranged from 56% to 89%,[2,4–6] although it is likely that prior studies overestimated sensitivity because they were specifically designed to explore fall recall,[2] which may have sensitized participants to recall of falls. They also used shorter recall periods, which (as demonstrated in this research) can improve recall.[20–22] Finally, they often did not examine less serious injuries, as ours did. When a prior study included outpatient AFRIs, it reported a sensitivity of just 24%.[8] We found a high proportion of injuries (~75%) in the least severe category (fall-related outpatient care without other evidence of fracture, dislocation or head injury), consistent with another report that found that most fall injuries are minor, such as bruises and sprains.[23] It is likely that minor injuries were included in our least-severe category, which was associated with the poorest accuracy. Minor injuries are less memorable than injuries requiring casting or surgery, although in the absence of a procedure, some patients may not consider medical evaluation to be medical treatment. We suggest that future fall injury screening inquire about "medical attention" to capture the fuller range of FRIs.

Although it is likely that individuals with cognitive impairment will be less accurate, past studies excluded such individuals.[2–4] In the HRS, cognitively impaired individuals had proxy respondents help them report falls, which explains why we observed better rather than worse recall in that group in unadjusted sensitivity analyses.

Finally, subtle psychosocial factors may explain poor accuracy. The topic of falling can be met with embarrassment, fear, or avoidance.[24–26] The word "fall" may carry its own stigma, because falling implies weakness and frailty.[24,27] Perceived stigma may also vary according to culture, which could explain our observed differences in accuracy according to race and ethnicity.[28] Second, individuals may provide inaccurate information because of lack of insight into the cause of their fall.[2,3,6] Individuals (and clinicians) often attribute a fall injury to an environmental hazard rather than their own health or behavior.[25,29] In reality, falling in response to tripping results from inability to compensate and prevent the fall from occurring.

To normalize the experience of a fall injury, survey questions could be redesigned to say: "Have you fallen or been injured by falling in the past year, even if the cause was accidental or due to tripping over something in your way?" Surveys might also clearly define falls[30] and FRIs so that respondents are prompted to report minor injuries (any requiring medical attention) as well as severe FRIs. Furthermore, qualitative research should be performed to better understand cultural sensitivity about fall risk in older nonwhite adults. Similarly, as the baby boom

Table 2. Sensitivity Model: Predictors of False-Negative Responses of Fall-Related Injuries for Older Adults (≥65) (n = 7,916)

Characteristic	Adjusted Odds Ratio (95% Confidence Interval) P-Value
Age (reference 65–74)	
75–84	0.91 (0.80–1.04) .18
≥85	0.76 (0.64–0.90) .001
Male	1.61 (1.41–1.84) <.001
Race and ethnicity (reference Non-Hispanic white)	
Black	1.61 (1.26–2.04) <.001
Hispanic	1.23 (0.90–1.68) .20
Other	1.09 (0.70–1.68) .71
Education (reference < high school)	
High school	0.97 (0.82–1.15) .73
Some college	0.93 (0.77–1.12) .43
≥College	0.76 (0.62–0.92) .01
Health status (reference very good, excellent)	
Good	0.91 (0.78–1.06) .24
Fair, poor	0.87 (0.74–1.03) .10
Number of chronic conditions (reference 0)	
1–2	0.85 (0.65–0.96) .02
3–4	0.71 (0.57–0.87) .001
5–6	0.80 (0.52–1.22) .30
Number of activity of daily living limitations (reference 0)	
1–2	0.71 (0.61–0.82) <.001
3–5	0.44 (0.36–0.54) <.001
Number of depressive symptoms (reference 0)	
1–2	0.96 (0.83–1.11) .60
3–4	0.67 (0.56–0.81) <.001
5–8	0.75 (0.61–0.91) .004
Cognitive impairment[a]	1.08 (0.88–1.32) .47
Dually eligible	1.16 (0.93–1.44) .18
Prior fall measured in last survey wave	0.52 (0.46–0.58) <.001
Severity level (reference probable inpatient FRI)	
Probable outpatient FRI	1.23 (0.93–1.63) .15
Possible outpatient FRI	4.75 (3.66–6.16) <.001
Fall-related medical treatment	10.32 (8.33–12.78) <.001

[a]Cognitive impairment measured with proxy respondent.

Data are from the 2000–2012 waves of the Health and Retirement Study. The analytical sample began with 11,080 individuals with an administratively identified fall-related injury (FRI), although for the regression, we used complete-case analysis, which resulted in a final sample of 7,916 individuals.

generation moves further into old age, this cohort may also require generational cultural sensitivity when gauging fall risk. Such efforts to understand and address stigma and clarity in fall questions may improve prevalence estimates and clinical fall risk assessments for Medicare beneficiaries. This in turn could assist population-wide efforts to reduce the risks, morbidity, and expenditures associated with fall injuries.[31]

Limitations

Our criterion standard, AFRIs, which limits the comprehensiveness of outpatient AFRI data, given that physicians are not required to submit a fall e-code as a diagnosis. If an office evaluation was performed, but no injury was found, then we conservatively counted this as a false positive. Second, we could not consider less-intensive care that some may interpret as medical treatment, for example, telephone-based care. Finally, telephone-based interview methods may not generalize to the clinical setting of the Annual Wellness Visit. Applying these results to the Annual Wellness Visit may require consideration that individuals may be more or less forthcoming about their fall injuries on the telephone than in a clinic visit, but we believe the differences are highly variable from person to person. As clinical practices move from using personal physicians to support staff and electronic portals to collect information, we believe the telephone as the mode of communication represents little systematic threat to the validity of these results. Finally, these results bring attention to missed opportunities for fall injury prevention, although some of our sample may have received preventive care. It is not possible to capture receipt of preventive care in this dataset.

CONCLUSION

Using a nationally representative survey, we found that FRIs are significantly underreported in older adults. Our data suggest that subgroups of older adults can be targeted for better surveillance of fall injuries. In addition, future efforts to improve accuracy of survey and Medicare Annual Wellness Visit questions for greater accuracy may require overcoming the stigma of attributing injury to falling.

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Conflict of Interest: None.

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Sponsor's Role: None.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

Table S1. Specificity Model: Predictors of True Negative Responses of Fall-Related Injuries for Older Adults (≥65) (n=23,361).

Figure S1. Specificity of Self-Reported Fall-Related Injuries of Older Adults (≥65) by Respondent Characteristics (n=25,320).

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