

ARIC Manuscript Proposal #2611

PC Reviewed: 9/8/15

Status: A

Priority: 2

SC Reviewed: _____

Status: _____

Priority: _____

1.a. Full Title: Orthostatic Hypotension and Risk of Falls in the Atherosclerosis Risk in Communities Study (ARIC)

b. Abbreviated Title (Length 26 characters): Orthostatic Hypotension and Falls in ARIC

2. Writing Group:

Writing group members: Stephen P Juraschek, Natalie Daya, Lawrence Appel, Edgar Miller, B. Gwen Windham, Lisa Pompeii, Kathryn Rose, Elizabeth Selvin, others welcome

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. x **[please confirm with your initials electronically or in writing]**

First author:

Address: Stephen P. Juraschek, MD PhD
19 N. Ann Street
Baltimore, MD 21231

Phone: (781) 608-8413 Fax: None
E-mail: spj@jhmi.edu

ARIC author to be contacted if there are questions about the manuscript and the first author does not respond or cannot be located (this must be an ARIC investigator).

Name: Elizabeth Selvin

Address: Welch Center for Prevention, Epidemiology, & Clinical Research
Johns Hopkins University
2024 E. Monument, Suite 2-600
Baltimore, MD 21205
Tel: 410-614-3752
Fax: 410-955-0476
lselvin@jhsph.edu

3. Timeline: Data analysis to begin after approval of this manuscript proposal. First draft should be available October, 2015.

4. Rationale:

Falls are a major cause of morbidity and mortality among the US elderly population.^{1,2} It is estimated that 1 in every 3 elderly adults falls each year.^{1,2} Moreover, falls are a significant reason for emergency room visits and fracture,³ posing a substantial burden on the US health system, estimated at about \$23.3 billion yearly.⁴ Furthermore, the rate of falls in the US is rising.² Given the aging US population, fall prevention strategies represent an important public health objective.

Orthostatic hypotension may be a major underlying cause of falls among the elderly. The prevalence of orthostatic hypotension increases with age⁵ and is prevalent in over 25% of adults over 85 years.⁶ Symptoms associated with orthostatic hypotension include: lightheadedness, vision problems, weakness, fatigue, trouble concentrating, and head or neck discomfort.⁷ As a result, orthostatic hypotension is thought to be responsible for a substantial amount of falls in the elderly – as high as 29% in one referral center.⁸ A number of observational studies have shown orthostatic hypotension to be associated with an higher odds of falls.^{9,10} Further, orthostatic hypotension is associated with significant morbidity from falls.⁶ The hypothesis that orthostatic hypotension would contribute to falls does carry some degree of biologic plausibility. In healthy persons, change from a recumbent to standing position causes venous pooling, decreased venous return, a reduce stroke volume.¹¹ The cardiovascular system normally responds with increased heart rate and vasoconstriction to maintain cerebral perfusion.¹¹ In the elderly, these responses are blunted – heart rate is more fixed, blood vessels are less responsive to changes in pressure and hormonal signaling pathways, and often there is less blood volume due to dehydration or blood loss; in addition, older adults are often taking medications that inhibit increases in heart rate.¹¹ These may contribute to orthostatic symptoms and subsequently falls.

The definition of orthostatic hypotension was determined by consensus in 1995 at a conference sponsored by the American Autonomic Society and American Academy of Neurology.¹² The definition has been broadly used clinically and in research,¹³ but different cutpoints for postural changes in systolic or diastolic blood pressure have not been compared with the traditional definition in the context of clinical outcomes of interest. Recent studies have suggested that alternative definitions of orthostatic hypotension may also be informative as to long-term risk.⁵

The ARIC Study affords a unique opportunity to examine the relationship between orthostatic hypotension and falls. Orthostatic hypotension was assessed via high quality, standardized protocols during visit 1 and was derived using standard clinical definition (a decrease of at least 20 mmHg SBP or a decrease of at least 10 mmHg DBP when changing positions from supine to standing) in 681/13,191 (5.2%) of participants. Furthermore, covariates known to be associated with orthostatic hypotension and falls were also assessed at baseline, affording an opportunity to rigorously address confounding. With regards to the outcome of interest, falls, using the rich and thorough hospitalization data (supplemented with CMS data) there were 2,274 /13,191 (17.2%) participants with a fall recorded post Visit 1. Finally, there is an opportunity to complement the hospitalization/CMS data with a self-reported fall assessment administered in 2013-2014 via annual telephone surveys.

5. Main Hypothesis/Study Questions:

Primary study questions:

1. Is orthostatic hypotension as assessed at visit 1 (using a traditional definition) associated with incident and recurrent falls after adjustment for confounding variables?
2. Are alternative definitions of orthostatic hypotension (different cutpoints of systolic or diastolic blood pressure) more strongly associated with risk of falls as compared to the traditional definition?

Secondary study questions:

1. Is orthostatic hypotension associated with fracture, syncope, or death?

Hypotheses:

1. Orthostatic hypotension is associated with an increased risk of falls.
2. Alternative definitions of orthostatic hypotension may better identify persons at risk of falls, fracture, syncope, and/or death.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

Study design: Prospective cohort study with visit 1 as baseline

Inclusion/exclusion: We will include all subjects with an orthostatic hypotension assessment at baseline. We will exclude individuals who were Indian or Asian, non-whites at Washington County and Minnesota, and those missing covariate information.

Exposure assessment:

Systolic blood pressure, diastolic blood pressure, and heart rate were measured in supine and standing positions at baseline. Orthostatic hypotension will be defined as a dichotomous variable, using the traditional definition of a 20 mm Hg drop in systolic blood pressure or 10 mm Hg drop in diastolic blood pressure upon changing from a supine to standing position.¹³

In addition, we will explore alternative definitions of orthostatic hypotension in the following fashion:

1. Different established dichotomous definition of orthostatic hypotension
 - a. Larger or smaller changes in systolic or diastolic blood pressure
 - i. Systolic blood pressure drops of 5, 10, 15, 20, 25, 30 mm Hg
 - ii. Diastolic blood pressure drops of 0, 5, 10, 15, 20 mm Hg

- b. Definitions defined by single versus composite measures (i.e. systolic blood pressure alone versus diastolic blood pressure alone versus combined definitions)
2. Different definitions of orthostatic hypotension will be compared in relation to relevant clinical outcomes, namely,
 - a. Falls
 - b. Syncope
 - c. Fracture
 - d. All-cause mortality

Primary outcome:

The primary outcome in this study are new falls after visit 1 (incident or first recurrence), which will be ascertained using ICD9 codes from ARIC community surveillance data. These events will be supplemented with falls identified in CMS data. There is evidence that external cause-of-injury codes are an accurate and valid means of disease ascertainment.¹⁴ ICD9 codes used to define falls are located in **Appendix 1**. Sensitivity analyses will be performed to examine alternative definitions of falls (i.e. excluding less relevant ICD9 codes). Furthermore, we will perform a comparative study in the group who reported they had a fall within the last 6 months of the 2013-2014 annual telephone survey. Details of the fall data collected during the annual telephone calls in 2013-2014 may be found in **Appendix 2**.

Secondary outcomes:

We will also examine a number of secondary outcomes to determine different cutpoints for orthostatic hypotension:

- a. Syncope, community surveillance and CMS data (ICD9-CM 780.2)
- b. Fracture, community surveillance and CMS data
- c. All-cause mortality

Other variables of interest:

The following covariates from visit 1 will be utilized in prospective analyses:

- a. Demographic: age, sex, race
- b. Physiologic and lab measures: systolic blood pressure, diastolic blood pressure, heart rate, body mass index, carotid IMT, ankle-brachial index, HDL cholesterol, LDL cholesterol, glucose
- c. Self-reported behaviors/conditions: Sports index, current/former/never alcohol use self-reported health status, dizziness on standing, diabetes, history of cancer, history of stroke, history of CHD
- d. Medications: anti-hypertensives, diuretics, anti-depressants, sedatives, hypnotics, anti-psychotics, anti-cholinergics
- e. Socioeconomic: educational attainment

Data analysis:

Our primary analyses will be as follows:

- Cross-sectional examination of baseline characteristics associated with orthostatic hypotension
 - Means, proportions, P-values (ttests, chi-squared analyses)
- Cross-sectional examination of baseline characteristics associated with incident falls
 - Means, proportions, P-values (ttests, chi-squared analyses)
- Prospective analyses:
 - Absolute risk (cumulative incidence, incidence rates) using follow-up time or age as the time axis
 - Relative risk (Cox proportional hazards models)
 - Nested models adjusted for:
 - Model 1: adjusted for age, sex, race-study center
 - Model 2: Model 1 + systolic blood pressure, diastolic blood pressure, body mass index, ankle-brachial index, carotid IMT
 - Model 3: Model 2 + diabetes, hypertension, hypertension medication use, diuretic use, alcohol use, education level, sports index, leisure index, dizzy upon standing, smoking status, history of CHD, history of CHF, history of stroke, history of cancer
- Spline models: looking at the continuous relationship between postural changes in the following and risk of falls, syncope, and all-cause mortality
 - Systolic blood pressure
 - Diastolic blood pressure
- Effect modification:
 - Hazard ratios in subgroups, using interaction terms to compare strata
 - Demographic characteristics
 - Other factors:
 - Hypertension, hypertensive medication use
 - Diabetes
 - Prior cardiovascular disease (CHD or stroke)
 - Obesity
 - Leisure (sport) activity index
- Alternative definitions:
 - Systolic or diastolic cutpoints, comparison of:
 - Population percentiles
 - Absolute risk
 - Relative risk
 - Metrics of discrimination (C-statistic, sensitivity, specificity)
 - Composite definitions, comparison of:
 - Systolic alone vs. diastolic alone vs. combined alternate definitions

- Population percentiles
- Absolute risk
- Relative risk
- Metrics of discrimination (C-statistic, sensitivity, specificity)
- Outcomes examined with alternate definitions:
 - Primary outcome: falls
 - Secondary outcomes:
 - Fractures – clinically relevant sequelae of falls
 - Syncope – similar outcome to falls to examine construct validity
 - Death – object, epidemiology outcome, conveying prognosis

Limitations:

- Fall history was not assessed at baseline. As a result, we are unable to differentiate between participants with recurrent versus incident falls.
- Relying on ICD9-defined falls for the outcome while reportedly valid¹⁴ is likely highly specific but probably associated with substantial under ascertainment
- Incorporating CMS outpatient and inpatient data on falls is complicated by the fact that ARIC participants are not eligible for Medicare until age 65 and only a subgroup of participants have outpatient data available.
- Self-reported information on falls only available in 2013-2014
- OH data not available on all participants
- Residual confounding is always a concern with observational studies.

7.a. Will the data be used for non-CVD analysis in this manuscript? ____ Yes
 ___x___ No

b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = “CVD Research” for non-DNA analysis, and for DNA analysis RES_DNA = “CVD Research” would be used? ____ Yes
 ___ No

(This file ICTDER has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript?
 ____ Yes ___x___ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = “No use/storage DNA”?
 ____ Yes ____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: <http://www.csc.unc.edu/ARIC/search.php>

Yes No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

Orthostatic change in blood pressure and incidence of atrial fibrillation: results from a bi-ethnic population based study. Agarwal SK, Alonso A, Whelton SP, Soliman EZ, Rose KM, Chamberlain AM, Simpson RJ Jr, Coresh J, Heiss G. PLoS One. 2013 Nov 11;8(11):e79030.

Orthostatic hypotension as a risk factor for incident heart failure: the atherosclerosis risk in communities study. Jones CD, Loehr L, Franceschini N, Rosamond WD, Chang PP, Shahar E, Couper DJ, Rose KM. Hypertension. 2012 May;59(5):913-8.

Postural changes in blood pressure and incidence of ischemic stroke subtypes: the ARIC study. Yatsuya H, Folsom AR, Alonso A, Gottesman RF, Rose KM; ARIC Study Investigators. Hypertension. 2011 Feb;57(2):167-73.

Orthostatic hypotension and incident chronic kidney disease: the atherosclerosis risk in communities study. Franceschini N, Rose KM, Astor BC, Couper D, Vupputuri S. Hypertension. 2010 Dec;56(6):1054-9.

Orthostatic hypotension and cognitive function: the Atherosclerosis Risk in Communities Study. Rose KM, Couper D, Eigenbrodt ML, Mosley TH, Sharrett AR, Gottesman RF. Neuroepidemiology. 2010;34(1):1-7.

Orthostatic hypotension predicts mortality in middle-aged adults: the Atherosclerosis Risk In Communities (ARIC) Study. Rose KM, Eigenbrodt ML, Biga RL, Couper DJ, Light KC, Sharrett AR, Heiss G. Circulation. 2006 Aug 15;114(7):630-6. Epub 2006 Aug 7.

Association between the blood pressure response to a change in posture and the 6-year incidence of hypertension: prospective findings from the ARIC study. Rose KM, Holme I, Light KC, Sharrett AR, Tyroler HA, Heiss G. J Hum Hypertens. 2002 Nov;16(11):771-7.

Orthostatic hypotension as a risk factor for stroke: the atherosclerosis risk in communities (ARIC) study, 1987-1996. Eigenbrodt ML, Rose KM, Couper DJ, Arnett DK, Smith R, Jones D. Stroke. 2000 Oct;31(10):2307-13.

Orthostatic blood pressure responses as a function of ethnicity and socioeconomic status: the ARIC study. Clark R, Tyroler HA, Heiss G. Ann N Y Acad Sci. 1999;896:316-7. No abstract available.

11.a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? ___ Yes No

11.b. If yes, is the proposal

___ **A. primarily the result of an ancillary study (list number* _____)**

___ **B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _____)**

*ancillary studies are listed by number at <http://www.csc.unc.edu/aric/forms/>

12a. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is **your responsibility to upload manuscripts to PUBMED Central** whenever the journal does not and be in compliance with this policy. Four files about the public access policy from <http://publicaccess.nih.gov/> are posted in <http://www.csc.unc.edu/aric/index.php>, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to Pubmed central.

13. Per Data Use Agreement Addendum for the Use of Linked ARIC CMS Data, approved manuscripts using linked ARIC CMS data shall be submitted by the Coordinating Center to CMS for informational purposes prior to publication.

Approved manuscripts should be sent to Pingping Wu at CC, at pingping_wu@unc.edu. I will be using CMS data in my manuscript Yes ___ No.

References

1. Stevens JA, Mack KA, Paulozzi LJ, Ballesteros MF. Self-reported falls and fall-related injuries among persons aged ≥ 65 years--United States, 2006. *J Safety Res.* 2008;39(3):345-349. doi:10.1016/j.jsr.2008.05.002.
2. Hu G, Baker SP. Recent increases in fatal and non-fatal injury among people aged 65 years and over in the USA. *Inj Prev.* 2010;16(1):26-30. doi:10.1136/ip.2009.023481.
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5. Finucane C, O'Connell MD, Fan CW, et al. Age Related Normative Changes in Phasic Orthostatic Blood Pressure in a Large Population Study: Findings from the Irish Longitudinal Study on Ageing (TILDA). *Circulation.* October 2014. doi:10.1161/CIRCULATIONAHA.114.009831.
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11. Feldstein C, Weder AB. Orthostatic hypotension: a common, serious and underrecognized problem in hospitalized patients. *J Am Soc Hypertens.* 2012;6(1):27-39. doi:10.1016/j.jash.2011.08.008.

12. Kaufmann H. Consensus statement on the definition of orthostatic hypotension, pure autonomic failure and multiple system atrophy. *Clin Auton Res.* 1996;6(2):125-126.
13. Freeman R, Wieling W, Axelrod FB, et al. Consensus statement on the definition of orthostatic hypotension, neurally mediated syncope and the postural tachycardia syndrome. *Clin Auton Res.* 2011;21(2):69-72. doi:10.1007/s10286-011-0119-5.
14. McKenzie K, Enraght-Moony EL, Walker SM, McClure RJ, Harrison JE. Accuracy of external cause-of-injury coding in hospital records. *Inj Prev.* 2009;15(1):60-64. doi:10.1136/ip.2008.019935.

Appendix 1: ICD9 Codes related to falls

E804.0 FALL IN ON OR FROM RAILWAY TRAIN INJURING RAILWAY EMPLOYEE
E804.1 FALL IN ON OR FROM RAILWAY TRAIN INJURING PASSENGER ON RAILWAY
E804.2 FALL IN ON OR FROM RAILWAY TRAIN INJURING PEDESTRIAN
E804.3 FALL IN ON OR FROM RAILWAY TRAIN INJURING PEDAL CYCLIST
E804.8 FALL IN ON OR FROM RAILWAY TRAIN INJURING OTHER SPECIFIED PERSON
E804.9 FALL IN ON OR FROM RAILWAY TRAIN INJURING UNSPECIFIED PERSON
E833.0 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT UNPOWERED
E833.1 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT POWERED
E833.2 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- CREW
E833.3 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- OTHER THAN CREW
E833.4 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING WATER SKIER
E833.5 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING SWIMMER
E833.6 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING DOCKERS STEVEDORES
E833.7 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT, OCCUPANT OF MILITARY WATERCRAFT, ANY TYPE
E833.8 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING OTHER SPECIFIED PERSON
E833.9 FALL ON STAIRS OR LADDERS IN WATER TRANSPORT INJURING UNSPECIFIED PERSON
E834.0 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT UNPOWERED
E834.1 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT POWERED
E834.2 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- CREW
E834.3 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- OTHER THAN CREW
E834.4 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING WATER SKIER
E834.5 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING SWIMMER
E834.6 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING DOCKERS STEVEDORES
E834.7 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT, OCCUPANT OF MILITARY WATERCRAFT, ANY TYPE
E834.8 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING OTHER SPECIFIED PERSON

E834.9 OTHER FALL FROM ONE LEVEL TO ANOTHER IN WATER TRANSPORT INJURING UNSPECIFIED PERSON

E835.0 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT UNPOWERED

E835.1 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING OCCUPANT OF SMALL BOAT POWERED

E835.2 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- CREW

E835.3 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING OCCUPANT OF OTHER WATERCRAFT -- OTHER THAN CREW

E835.4 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING WATER SKIER

E835.5 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING SWIMMER

E835.6 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING DOCKERS STEVEDORES

E835.7 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT, OCCUPANT OF MILITARY WATERCRAFT, ANY TYPE

E835.8 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING OTHER SPECIFIED PERSON

E835.9 OTHER AND UNSPECIFIED FALL IN WATER TRANSPORT INJURING UNSPECIFIED PERSON

E843.0 FALL IN ON OR FROM AIRCRAFT INJURING OCCUPANT OF SPACECRAFT

E843.1 FALL IN ON OR FROM AIRCRAFT INJURING OCCUPANT OF MILITARY AIRCRAFT ANY

E843.2 FALL IN ON OR FROM AIRCRAFT INJURING CREW OF COMMERCIAL AIRCRAFT (POWERED) IN SURFACE TO SURFACE TRANSPORT

E843.3 FALL IN ON OR FROM AIRCRAFT INJURING OTHER OCCUPANT OF COMMERCIAL AIRCRAFT (POWERED) IN SURFACE TO SURFACE TRANSPORT

E843.4 FALL IN ON OR FROM AIRCRAFT INJURING OCCUPANT OF COMMERCIAL AIRCRAFT (POWERED) IN SURFACE TO AIR TRANSPORT

E843.5 FALL IN ON OR FROM AIRCRAFT INJURING OCCUPANT OF OTHER POWERED AIRCRAFT

E843.6 FALL IN ON OR FROM AIRCRAFT INJURING OCCUPANT OF UNPOWERED AIRCRAFT EXCEPT PARACHUTIST

E843.7 FALL IN ON OR FROM AIRCRAFT INJURING PARACHUTIST (MILITARY) (OTHER)

E843.8 FALL IN ON OR FROM AIRCRAFT INJURING GROUND CREW AIRLINE EMPLOYEE

E843.9 FALL IN ON OR FROM AIRCRAFT INJURING OTHER PERSON

E880.0 ACCIDENTAL FALL ON OR FROM ESCALATOR

E880.1 ACCIDENTAL FALL ON OR FROM SIDEWALK CURB

E880.9 ACCIDENTAL FALL ON OR FROM OTHER STAIRS OR STEPS

E881.0 ACCIDENTAL FALL FROM LADDER

E881.1 ACCIDENTAL FALL FROM SCAFFOLDING

E882 ACCIDENTAL FALL FROM OR OUT OF BUILDING OR OTHER STRUCTURE

E883.1 ACCIDENTAL FALL INTO WELL

E883.2 ACCIDENTAL FALL INTO STORM DRAIN OR MANHOLE

E883.9 ACCIDENTAL FALL INTO OTHER HOLE OR OTHER OPENING IN SURFACE
E884.0 ACCIDENTAL FALL FROM PLAYGROUND EQUIPMENT
E884.1 ACCIDENTAL FALL FROM CLIFF
E884.2 ACCIDENTAL FALL FROM CHAIR
E884.3 ACCIDENTAL FALL FROM WHEELCHAIR
E884.4 ACCIDENTAL FALL FROM BED
E884.5 ACCIDENTAL FALL FROM OTHER FURNITURE
E884.6 ACCIDENTAL FALL FROM COMMUNE
E884.9 OTHER ACCIDENTAL FALL FROM ONE LEVEL TO ANOTHER
E885.0 ACCIDENTAL FALL FROM (NONMOTORIZED) SCOOTER
E885.1 ACCIDENTAL FALL FROM ROLLER SKATES
E885.2 ACCIDENTAL FALL FROM SKATEBOARD
E885.3 ACCIDENTAL FALL FROM SKIS
E885.4 ACCIDENTAL FALL FROM SNOWBOARD
E885.9 ACCIDENTAL FALL FROM OTHER SLIPPING TRIPPING OR STUMBLING
E886.0 ACCIDENTAL FALL ON SAME LEVEL FROM COLLISION PUSHING OR SHOIVING BY
OR WITH OTHER PERSON IN SPORTS
E886.9 OTHER AND UNSPECIFIED ACCIDENTAL FALLS ON SAME LEVEL FROM COLLISION
PUSHING OR SHOIVING BY OR WITH OTHER PERSON
E888.0 ACCIDENTAL FALL RESULTING IN STRIKING AGAINST SHARP OBJECT
E888.1 ACCIDENTAL FALL RESULTING IN STRIKING AGAINST OTHER OBJECT
E888.8 OTHER ACCIDENTAL FALL
E888.9 UNSPECIFIED ACCIDENTAL FALL
E913.3 ACCIDENTAL MECHANICAL SUFFOCATION BY FALLING EARTH OR OTHER
SUBSTANCE
E916 STRUCK ACCIDENTALLY BY FALLING OBJECT
E917.0 STRIKING AGAINST OR STRUCK ACCIDENTALLY IN SPORTS WITHOUT
SUBSEQUENT FALL
E917.1 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY A CROWD BY COLLECTIVE FEAR
OR PANIC WO SUBSEQUENT FALL
E917.2 STRIKING AGAINST OR STRUCK ACCIDENTALLY IN RUNNING WATER WITHOUT
SUBSEQUENT FALL
E917.3 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY FURNITURE WITHOUT
SUBSEQUENT FALL
E917.4 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY OTHER STATIONARY OBJECT
WITHOUT SUBSEQUENT FALL
E917.5 STRIKING AGAINST OR STRUCK ACCIDENTALLY IN SPORTS WITH SUBSEQUENT
FALL
E917.6 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY A CROWD BY COLLECTIVE FEAR
OR PANIC WITH SUBSEQUENT FALL
E917.7 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY FURNITURE WITH
SUBSEQUENT FALL
E917.8 STRIKING AGAINST OR STRUCK ACCIDENTALLY BY OTHER STATIONARY OBJECT
WITH SUBSEQUENT FALL

E917.9 OTHER ACCIDENT CAUSED BY STRIKING AGAINST OR BEING STRUCK
ACCIDENTALLY BY OBJECTS OR PERSONS WITH/WITHOUT SUBSEQUENT FALL

E929.3 LATE EFFECTS OF ACCIDENTAL FALL

E987.0 FALLING FROM RESIDENTIAL PREMISES UNDETERMINED WHETHER
ACCIDENTALLY OR PURPOSELY INFLICTED

E987.1 FALLING FROM OTHER MAN-MADE STRUCTURES UNDETERMINED WHETHER
ACCIDENTALLY OR PURPOSELY INFLICTED

E987.2 FALLING FROM NATURAL SITES UNDETERMINED WHETHER ACCIDENTALLY OR
PURPOSELY INFLICTED

E987.9 FALLING FROM UNSPECIFIED SITE UNDETERMINED WHETHER ACCIDENTALLY OR
PURPOSELY INFLICTED

V15.88 HISTORY OF FALL

Appendix 2: Fall Measures (from 2013-14 Semi-Annual Telephone Interview)

Var	Description	
GNB19	Fall in prior 6 months (yes/no)	Fall (yes/no)
GNB20	Number of Falls in Prior 6 Months	Frequency (0, 1-2, >2)
GNB21	Injured from fall/Restricted Activity for at Least One Day	Injurious fall: (No fall, fall with no injury, fall resulted in restricted activity and/or MD visit)
GNB22	Injury severe enough that they needed to see MD	
GNB23	Circumstances of falls	Coded text into 5 variables: Location (inside/outside) Place (home/not at home) Task when fall occurred (e.g., walking, yard work) Physical factors (e.g., tripped, legs gave out, fainted) Contributing factors (e.g., uneven ground, wet floor, dark)