

Online Supplement — Table 1. Bivariate analyses of risk factors for 1-year hip fracture in osteoporotic women aged ≥ 65 years*							
Category/Variable/Value		No. of Person-Exams	No. of Hip Fractures	% with Fracture	Hip Fracture		
					HR	95% CI	p-Value
Anthropometry							
Age	65-74 (referent)	935	9	1.0%	---	---	---
	≥ 75 to 79	1904	26	1.4%	1.4	0.7-3.0	0.357
	≥ 80 to 84	1978	47	2.4%	2.5	1.2-5.2	0.011
	≥ 85	1923	68	3.5%	3.8	1.9-7.6	<0.001
Weight (kg)	≤ 63	5055	123	2.4%	1.6	1.1-2.5	0.024
	>63 (referent)	1712	26	1.5%	---	---	---
Bone Density							
Total Hip T-Score	≤ -3.5	1277	52	4.1%	3.0	2.1-4.5	<0.001
	> -3.5 to -3.0	1967	50	2.5%	1.9	1.3-2.8	0.002
	> -3.0 to -2.5 (referent)	3567	49	1.4%	---	---	---
Cognitive Function							
Mini-Mental State Examination (MMSE)	≤ 23	2208	75	3.4%	2.1	1.5-2.9	<0.001
	>23 (referent)	4593	76	1.7%	---	---	---
Comorbid Conditions (vs. referent: without conditions)							
Alzheimer's Disease	Yes	298	15	5.0%	2.9	1.7-4.9	<0.001
	No (referent)	6233	123	2.0%	---	---	---
Hypertension	Yes	2770	63	2.3%	1.1	0.8-1.5	0.560
	No (referent)	3574	75	2.1%	---	---	---
Parkinson's Disease	Yes	114	5	4.4%	2.1	0.9-5.2	0.099
	No (referent)	6697	146	2.2%	---	---	---
Stroke	Yes	736	24	3.3%	1.6	1.0-2.5	0.036
	No (referent)	6075	127	2.1%	---	---	---
Parkinson's or Stroke	Yes	837	29	3.5%	1.7	1.2-2.6	0.007
	No (referent)	5974	122	2.0%	---	---	---
Drug Use							
Anticonvulsant	Yes	185	7	3.8%	1.9	0.9-4.1	0.089
	No (referent)	6057	121	2.0%	---	---	---
Bisphosphonate	Yes	507	5	1.0%	0.5	0.2-1.1	0.086
	No (referent)	5735	123	2.1%	---	---	---
CCB	Yes	1092	24	2.2%	1.1	0.7-1.7	0.720
	No (referent)	5150	104	2.0%	---	---	---
Estrogen	Yes	359	12	3.3%	0.9	0.5-1.6	0.641
	No (referent)	5583	116	2.1%	---	---	---
Nitrate	Yes	474	15	3.2%	1.7	1.0-2.8	0.067
	No (referent)	5768	113	2.0%	---	---	---
NSAID	Yes	1014	13	1.3%	0.6	0.3-1.0	0.059
	No (referent)	5228	115	2.2%	---	---	---
SSRI	Yes	296	7	2.4%	1.2	0.6-2.6	0.241
	No (referent)	5946	121	2.0%	---	---	---
Fracture and Fall History							
No. of Falls in Last 12 Months	0 (referent)	4365	79	1.8%	---	---	---
	1	1343	32	2.4%	1.3	0.9-2.0	0.178
	≥ 2	1068	37	3.5%	2.0	1.4-3.0	<0.001
Prior Fracture (after age 50 years)	Family History Hip Fx	1442	43	3.0%	1.5	1.1-2.1	0.026
	Non-Vertebral Fx	5168	103	2.0%	---	---	---
	Hip Fx	4524	114	2.5%	1.6	1.1-2.3	0.015
	Vertebral Fx	2270	37	1.6%	---	---	---
	Any Fx	905	30	3.3%	1.7	1.1-2.5	0.011
		5894	121	2.1%	---	---	---
		1241	40	3.2%	1.7	1.2-2.4	0.006
		5570	111	2.0%	---	---	---
		4619	115	2.5%	1.5	1.1-2.3	0.022
		2192	36	1.6%	---	---	---
Lifestyle							
Physical Activity in Past Week	None (referent)	2210	61	2.8%	---	---	---
	Any	4596	90	2.0%	0.7	0.5-1.0	0.032
Physical Activity, No. Flights Up Stairs/Day	≤ 3	3711	100	2.7%	1.7	1.2-2.3	0.003
	>3 (referent)	3100	51	1.6%	---	---	---
Physical Activity, Hours on Feet/Day	≤ 4	1164	39	3.4%	1.7	1.2-2.5	0.003
	>4 (referent)	5646	112	2.0%	---	---	---
Number of Drinks/Week in Past 30 Days	0	4228	104	2.5%	2.0	0.7-5.5	0.198
	1 to 6	2190	43	2.0%	2.5	0.9-6.8	0.072
	≥ 7 (referent)	393	4	1.0%	---	---	---
Smoker, Pack Years (continuous measure)	---	---	---	---	1.0	1.0-1.0	0.159
Other Medical Conditions							
Weakness/Paralysis Left/Right Leg	Yes	538	20	3.7%	1.9	1.2-3.0	0.010
	No (referent)	6103	125	2.0%	---	---	---
Hip/Knee/Ankle Joint Pain	Yes	2823	73	2.6%	1.4	1.0-1.9	0.050
	No (referent)	3818	72	1.9%	---	---	---
Leg/Ankle Swelling	Yes	1419	42	3.0%	1.5	1.1-2.2	0.022
	No (referent)	5223	103	2.0%	---	---	---
Weak Arms/Hands	Yes	2031	55	2.7%	1.4	1.0-2.0	0.047
	No (referent)	4610	90	2.0%	---	---	---
Physical Function							
No. of IADL Impairments**	0 (referent)	3415	56	1.6%	---	---	---
	1 to 3	2376	55	2.3%	1.4	1.0-2.1	0.056
	≥ 4	1020	40	3.9%	2.6	1.7-3.9	<0.001
Total Difficulty with 5 IADL***	---	6811	151	2.2%	1.1	1.0-1.1	<0.001
Degree of Difficulty Walking 2-3 Blocks	None (referent)	4628	85	1.8%	---	---	---
	Some	623	18	2.9%	1.6	1.0-2.7	0.067
	Much	407	11	2.7%	1.5	0.8-2.8	0.194
	Unable	1153	37	3.2%	1.8	1.3-2.7	0.002
Physical Performance							
Use of Arms to Stand Up	Yes	1286	47	3.7%	2.0	1.4-2.8	<0.001
	No (referent)	5525	104	1.9%	---	---	---
Use of Arms to Stand Up 5 Times (always, partial, none)	None (referent)	5941	116	2.0%	---	---	---
	Partial	95	6	6.3%	3.4	1.5-7.7	0.004
	Always	770	29	3.8%	2.0	1.3-3.0	<0.001
Ability to Do Tandem Stand with Eyes Open	Very poor	75	4	5.3%	4.4	1.6-12.4	0.005
	Poor	734	36	4.9%	4.1	2.6-6.4	<0.001
	Fair	2774	70	2.5%	2.0	1.4-3.0	<0.001
	Good (referent)	3225	41	1.3%	---	---	---
Use of Arms for Chair Stands or Poor/Very Poor Tandem Stand	Yes	1754	70	4.0%	2.6	1.9-3.6	<0.001
	No (referent)	5057	81	1.6%	---	---	---
Average Right/Left Grip Strength (kg)	---	---	---	---	1.0	0.9-1.0	0.006
Maximum Right/Left Grip Strength (kg)	---	---	---	---	1.0	0.9-1.0	0.005
Walking Speed (m/s)	>1.0 (referent)	1975	17	0.9%	---	---	---
	≤ 0.70	1635	59	3.6%	4.4	2.6-7.6	<0.001
	0.70 to 1.0	3201	75	2.3%	2.8	1.6-4.7	<0.001
Visual Function							
Lens Implant	Yes	1848	50	2.7%	1.3	1.0-1.9	0.091
	No (referent)	4963	101	2.0%	---	---	---
Average Contrast Sensitivity Score	≤ 40	2499	78	3.1%	1.9	1.4-2.6	<0.001
	>40 (referent)	4247	71	1.7%	---	---	---

*Only results for risk factors with p-value <0.1 for ≥1 level are reported

**No. of IADL impairments (out of 5), with any difficulty, including walking 2-3 blocks, climbing up 10 steps, preparing meal, heavy housework, shopping

***Total difficulty with IADL impairments (0=no difficulty, 3=maximum difficulty)

Online Supplement — Table 2. Bivariate analyses of risk factors for 1-year non-vertebral fracture in osteoporotic women aged ≥ 65 years*								
Category/Variable/Value		No. of Person-Exams	No. of Non-Vertebral Fractures	% with Fracture	Non-Vertebral Fracture			
					HR	95% CI	p-Value	
Anthropometry								
Age	65-74 (referent)	935	46	4.9	---	---	---	
	≥ 75 to 79	1,904	101	5.3	1.1	0.8 - 1.5	0.648	
	≥ 80 to 84	1,978	125	6.3	1.3	0.9 - 1.8	0.114	
	≥ 85	1,985	179	9.0	2.0	1.4 - 2.7	<0.001	
Weight (kg)	≤ 63	5,055	337	6.7	1.1	0.9 - 1.3	0.595	
	>63 (referent)	1,712	109	6.4	---	---	---	
Bone Density								
Total Hip T-Score	≤ -3.5	1,277	131	10.3	2.2	1.7 - 2.8	<0.001	
	> -3.5 to -3.0	1,967	147	7.5	1.6	1.3 - 1.9	<0.001	
	> -3.0 to -2.5 (referent)	3,567	174	4.9	---	---	---	
Cognitive Function								
Mini-Mental State Examination (MMSE)	≤ 23	2,208	166	7.5	1.2	1.0 - 1.5	0.033	
	>23 (referent)	4,593	285	6.2	---	---	---	
Comorbid Conditions (vs. referent: without conditions)								
Alzheimer's Disease	Yes	298	24	8.1	1.4	0.9 - 2.1	0.110	
	No (referent)	6,233	400	6.4	---	---	---	
Hypertension	Yes	2,770	200	7.2	1.2	1.0 - 1.5	0.053	
	No (referent)	3,574	219	6.1	---	---	---	
Parkinson's Disease	Yes	114	15	13.2	2.2	1.3 - 3.7	0.003	
	No (referent)	6,697	437	6.5	---	---	---	
Stroke	Yes	736	67	9.1	1.5	1.1 - 1.9	0.003	
	No (referent)	6,075	385	6.3	---	---	---	
Parkinson's or Stroke	Yes	837	79	9.4	1.6	1.2 - 2.0	<0.001	
	No (referent)	5,974	373	6.2	---	---	---	
Drug Use								
Anticonvulsant	Yes	185	15	8.1	1.3	0.8 - 2.2	0.330	
	No (referent)	6,057	390	6.4	---	---	---	
Bisphosphonate	Yes	507	36	7.1	1.1	0.8 - 1.6	0.553	
	No (referent)	5,735	369	6.4	---	---	---	
CCB	Yes	1,092	85	7.8	1.3	1.0 - 1.6	0.054	
	No (referent)	5,150	320	6.2	---	---	---	
Estrogen	Yes	659	33	5.0	0.7	0.5 - 1.1	0.096	
	No (referent)	5,583	372	6.7	---	---	---	
Nitrate	Yes	474	34	7.2	1.1	0.8 - 1.6	0.469	
	No (referent)	5,768	371	6.4	---	---	---	
NSAID	Yes	1,014	61	6.0	0.9	0.7 - 1.2	0.481	
	No (referent)	5,228	344	6.6	---	---	---	
SSRI	Yes	296	26	8.8	1.5	1.0 - 2.2	0.065	
	No (referent)	5,946	379	6.4	---	---	---	
Fracture and Fall History								
No. of Falls in Last 12 Months	0 (referent)	4,365	247	5.7	---	---	---	
	1	1,343	96	7.1	1.3	1.0 - 1.6	0.040	
	≥ 2	1,068	104	9.7	1.8	1.5 - 2.3	<0.001	
Prior Fracture (after age 50 years)	Family History Hip Fx After 50	Yes	1,442	113	7.8	1.3	1.0 - 1.6	0.039
		No (referent)	5,168	326	6.3	---	---	---
	Non-Vertebral Fracture	Yes	4,524	336	7.4	1.5	1.2 - 1.9	<0.001
		No (referent)	2,270	116	5.1	---	---	---
		Hip	905	80	8.8	1.5	1.2 - 1.9	0.002
	Vertebral	Yes	5,894	372	6.3	---	---	---
		No (referent)	1,241	108	8.7	1.5	1.2 - 1.8	<0.001
Any Site	Yes	5,570	344	6.2	---	---	---	
	No (referent)	4,616	344	7.5	1.6	1.3 - 1.9	<0.001	
---	---	2,195	108	4.9	---	---	---	
Lifestyle								
Physical Activity in Past Week	None	2,210	158	7.1	1.1	0.9 - 1.4	0.212	
	Any (referent)	4,596	294	6.4	---	---	---	
Physical Activity, No. Flights Up Stairs/Day	≤ 3	3,711	264	7.1	1.2	1.0 - 1.4	0.059	
	>3 (referent)	3,100	188	6.1	---	---	---	
Physical Activity, Hours on Feet/Day	≤ 4	1,164	98	8.4	1.4	1.1 - 1.7	0.003	
	>4 (referent)	5,646	354	6.3	---	---	---	
Number of Drinks/Week in Past 30 Days	0	4,228	286	6.8	1.2	0.8 - 1.8	0.399	
	1 to 6	2,190	143	6.5	1.1	0.7 - 1.8	0.569	
	≥ 7 (referent)	393	23	5.9	---	---	---	
Smoker, Pack Years (continuous measure)	≥ 7 (referent)	---	---	---	1.0	1.0 - 1.0	0.027	
Other Medical Conditions								
Weakness/Paralysis Left/Right Leg	Yes	538	41	7.6	1.2	0.9 - 1.7	0.264	
	No (referent)	6,103	397	6.5	---	---	---	
Hip/Knee/Ankle Joint Pain	Yes	2,823	199	7.0	1.1	0.9 - 1.4	0.176	
	No (referent)	3,818	239	6.3	---	---	---	
Leg/Ankle Swelling	Yes	1,419	111	7.8	1.3	1.0 - 1.6	0.033	
	No (referent)	5,223	327	6.3	---	---	---	
Weak Arms/Hands	Yes	2,031	128	6.3	0.9	0.8 - 1.2	0.569	
	No (referent)	4,610	310	6.7	---	---	---	
Physical Function								
No. of IADL Impairments**	0 (referent)	3,415	191	5.6	---	---	---	
	1 to 3	2,376	162	6.8	1.2	1.0 - 1.5	0.042	
	≥ 4	1,020	99	9.7	1.9	1.5 - 2.4	<0.001	
Total Difficulty with 5 IADL***	0	6,811	0	0.0	1.1	1.0 - 1.1	<0.001	
	None (referent)	4,628	277	6.0	---	---	---	
	Some	623	45	7.2	1.2	0.9 - 1.7	0.186	
	Much	407	33	8.1	1.4	1.0 - 2.0	0.062	
Unable	1,153	97	8.4	1.5	1.2 - 1.9	<0.001		
Physical Performance								
Use of Arms to Stand Up	Yes	1,286	116	9.0	1.5	1.2 - 1.9	<0.001	
	No (referent)	5,525	336	6.1	---	---	---	
Use of Arms to Stand Up 5 Times (always, partial, none)	None (referent)	5,941	370	6.2	---	---	---	
	Partial	95	9	9.5	1.6	0.8 - 3.1	0.177	
	Always	770	73	9.5	1.6	1.2 - 2.0	<0.001	
Ability to Do Tandem Stand with Eyes Open	Very poor	75	5	6.7	1.3	0.5 - 3.1	0.597	
	Poor	734	72	9.8	1.9	1.4 - 2.5	<0.001	
	Fair	2,774	198	7.1	1.3	1.1 - 1.6	0.006	
Use of Arms for Chair Stands or Poor/Very Poor Tandem Stand	Good (referent)	3,225	177	5.5	---	---	---	
	Yes	1,754	159	9.1	1.6	1.3 - 2.0	<0.001	
No (referent)	5,057	293	5.8	---	---	---		
Average Right/Left Grip Strength (kg)	---	---	---	---	1.0	1.0 - 1.0	0.003	
Maximum Right/Left Grip Strength (kg)	---	---	---	---	1.0	1.0 - 1.0	0.007	
Walking Speed (m/s)	>1.0 (referent)	1,635	145	8.9	2.2	1.7 - 2.9	<0.001	
	≤ 0.70	3,201	222	6.9	1.6	1.3 - 2.1	<0.001	
	0.70 to 1.0	1,975	85	4.3	---	---	---	
Visual Function								
Lens Implant	Yes	1,848	143	7.7	1.3	1.0 - 1.5	0.023	
	No (referent)	4,963	309	6.2	---	---	---	
Average Contrast Sensitivity Score	≤ 40	2,499	197	7.9	1.4	1.1 - 1.7	<0.001	
	>40 (referent)	4,247	249	5.9	---	---	---	

*Only results for risk factors with p-value <0.1 for ≥ 1 level are reported

**No. of IADL impairments (out of 5), with any difficulty, including walking 2-3 blocks, climbing up 10 steps, preparing meal, heavy housework, shopping

***Total difficulty with IADL impairments (0=no difficulty, 3=maximum difficulty)

1-Year Osteoporotic Hip Fracture Risk Prediction Model

Change "Value" to calculate fracture risk for individual patient (value =1 means patient has that characteristic)

Characteristic	Value	Model Coeff.	mean value	beta*mean value	beta*(X-mean value)
Short MMSE ≤23 (vs. referent: >23)	1.0	0.52669	0.0000	0	0.526693927
Total Hip T-Score (vs. referent: > -3.0 to -2.5)	1.0	0.82185	0.0000	0	0.821853829
≤ -3.5	0.0	0.46790	0.0000	0	0
> -3.5 to -3.0	1.0	0.46217	0.0000	0	0.462165214
Prior Non-Vertebral Fracture (vs. referent: none)	1.0	0.46217	0.0000	0	0.462165214
Walking Speed (m/s) (vs. referent: >1.0)	1.0	1.07273	0.0000	0	1.072726839
≤ 0.70	0.0	0.95427	0.0000	0	0
0.70 to 1.0	1.0	0.54676	0.0000	0	0.546757575
Use of Arms for Chair Stands or Poor/Very Poor Tandem Stand (vs. referent: no use of arms)	1.0	0.54676	0.0000	0	0.546757575
			sum of neg. beta*mean	3.430197384	
			Score	30.88273789	
			Prob. Fracture	0.088317319	

1-Year Osteoporotic Hip Fracture Risk Scoring Sheet

Sum individual characteristic scores for given patient → and then find corresponding probability of fracture

IF	then score=	If score=	The probability of fracture=
Short MMSE ≤23 (vs. referent: >23)	0.52669 5.3	5	0.3%
Total Hip T-Score (vs. referent: > -3.0 to -2.5)			0.3%
≤ -3.5	0.82185 8.2	8	0.4%
> -3.5 to -3.0	0.46790 4.7	5	0.4%
History of Non-Vertebral Fracture (vs. referent: no history of fracture)	0.46217 4.6	5	0.4%
Walking Speed (m/s) (vs. referent: >1.0)			0.5%
≤ 0.70	1.07273 10.7	11	0.5%
0.70 to 1.0	0.95427 9.5	10	0.6%
Use of Arms for Chair Stands or Poor/Very Poor Tandem Stand (vs. referent: no use of arms)	0.54676 5.5	5	0.7%
			0.7%
			0.8%
			0.9%
			1.0%
			1.1%
			1.2%
			1.3%
			1.5%
			1.6%
			1.8%
			2.0%
			2.2%
			2.4%
			2.7%
			2.9%
			3.2%
			3.6%
			4.0%
			4.4%
			4.8%
			5.3%
			5.8%
			6.4%
			7.1%
			7.8%
			8.6%

Example: MMSE ≤23, T-score >-3.5 to -3.0, Hx of NVT Fx, Walking Speed >1.0, and No Use of Arms

Total Score = 5 + 5 + 5 + 0 + 0 = 15
 1-Year Probability of Hip Fracture = 1.3%