Supplementary Materials

Table S1: Search strategy used for PubMed

No.	Search strategy
1	Accidental falls.mh.
2	Fall*.ti,ab.
3	1 or 2
4	(Aged* or senior* or elderly or older).ti,ab
5	Randomized controlled trial.pt.
6	Controlled clinical trial.pt.
7	Randomized.ti,ab.
8	Placebo.ti,ab.
9	Clinical trials as topic[mesh:noexp]
10	Randomly.ti,ab.
11	Trial.ti.
12	Animals.sh.
13	Humans.sh
14	12 not 13
15	5 or 6 or 7 or 8 or 9 or 10 or 11 not 14
16	3 and 4 and 15
17	Limit 16 to py=" initial to December 31, 2016"

Table S2: Characteristics of studies included in the network meta-analysis

First author, Year	Setting	Comparisons	Follow-up Period (months)	No. of Participants	No. of Fallers	Mean Age (years)	Female (%)	Participants' Criteria
Ansai JH, 2015 [1]	Brazil	Usual care vs EXC	5.5	69	28	82.4	68%	(1)⩾ 80, (2) sedentary, (3) able to walk alone
Barker AL, 2015 [2]	Australia	EDU vs EDU+EXC	6	53	15	69.3	88%	(1)⩾ 60, (2) negotiate a set of 10 stairs independently
Bischoff-Ferrari HA, 2006 [3]	USA	Usual care vs MED	36	445	231	70.8	55%	(1)⩾ 65
Blalock SJ, 2010 [4]	USA	EDU vs EDU+RAS	12	186	105	74.8	71%	(1)⩾ 65, (2)⩾ 1 fall in the past year, (3) ⩾ 4 chronic prescription medications (CNS-active medication ⩾ 1)
Cai Y, 2014 [5]	China	Usual care vs MFI	12	326	38	73.1	56%	(1)⩾ 60
Clemson L, 2004 [6]	Australia	Usual care vs MFI	14	310	171	78.4	74%	(1)⩾ 70, (2)⩾ 1 fall in the past year or concerned about falling
Clemson L, 2010 [7]	Australia	Usual care vs EXC	6	34	17	81.5	47%	(1)⩾ 70, (2)⩾ 2 falls or an injurious fall in the past year
Close J, 1999 [8]	UK	Usual care vs RAS	12	397	170	78.2	67%	(1)⩾ 65, (2) attended emergency department with 1st diagnosis of a fall
Cornillon E, 2002 [9]	France	Usual care vs MFI	12	303	87	71.1	83%	(1)⩾ 65, (2) MMSE* ⩾20, (3) walk at least 6 meters
Cumming RG, 1999 [10]	Australia	Usual care vs HAM	12	530	215	76.8	57%	(1)⩾ 65, (2)community-dwelling within study area
Cumming RG, 2007 [11]	Australia	Usual care vs MED	12	616	354	80.6	68%	(1)⩾ 70
Dorresteijn TA, 2016 [12]	Netherlands	Usual care vs EDU	12	389	200	78.3	70%	(1)⩾ 70, (2) reported at least some concerns about falls
Dukas L, 2004 [13]	Switzerland	Usual care vs MED	9	378	86	75.0	53%	(1)⩾ 70, (2) mobile, (3) independent life style
Elley CR, 2008 [14]	New Zealand	Usual care vs MFI	12	312	204	80.8	69%	(1)⩾ 75, (2)⩾ 1 fall in the past year
Fairhall N, 2014 [15]	Australia	Usual care vs MFI	12	241	139	83.3	68%	(1)⩾ 70, (2)MMSE* >18, (3) life expectancy⩾ 1 year
Fizharris MP, 2010 [16]	Australia	Usual care vs EXC vs MED vs HAM vs EXC+HAM vs MFI	18	1090	606	76.1	60%	(1)⩾ 70
Freiberger E, 2007 [17]	Germany	Usual care vs EXC	12	217	85	75.9	45%	(1)⩾ 70
Gawler S, 2016 [18]	UK	Usual care vs EXC	24	1256	334	73.0	62%	(1) ⩾ 65, (2) physically able to attend group exercise
Gianoudis J, 2014 [19]	Australia	EDU vs MFI	12	162	54	67.5	79%	(1)⩾ 60
Helbostad JL, 2004 [20]	Norway	EXC vs RAS+EXC	12	77	38	81.1	81%	(1)⩾ 75, (2)⩾ 1 fall in the past year or use of some kind of walking aid
Hogan DB, 2001 [21]	Canada	Usual care vs RAS	12	163	115	77.7	72%	(1) ⩾ 65, (2) ⩾ 1 fall in the past 3 months

Hornbrook MC, 1994 [22]	USA	EDU vs MFI	23	3182	1319	73.2	62%	(1)⩾ 65
Huang TT, 2011 [23]	Taiwan	EDU vs EDU+EXC	5	186	19	NR	59%	(1)⩾ 60
Jin X, 2009 [24]	China	EDU vs MFI	12	1703	107	73.2	59%	(1)⩾ 60
Logghe IH, 2009 [25]	Netherlands	EDU vs EDU+EXC	12	269	117	77.2	71%	(1)⩾ 70, (2) having a high fall risk
Lord SR, 2005 [26]	Australia	Usual care vs RAS vs MFI	12	620	90	80.4	66%	(1)⩾ 75, (2) low score on physiological profile assessment
Luukinen H, 2007 [27]	Finland	Usual care vs RAS+EXC	16	486	262	88.0	79%	(1)⩾ 85 (2)⩾ 1 risk factor for falling
McMurdo ME, 2000 [28]	UK	Usual care vs EXC+HAM	12	133	42	84.0	81%	(1)⩾ 70
Palvanen M, 2014 [29]	Finland	EDU vs MFI	12	1314	645	77.6	86%	(1)⩾ 70, (2)⩾ 1 risk factor for falling
Perula LA, 2012 [30]	Spain	EDU vs MFI	12	404	87	76.4	53%	(1)⩾ 70, (2) walk independently
Pighills AC, 2011 [31]	UK	Usual care vs HAM	12	238	154	79.0	67%	(1)⩾ 70, (2)⩾ 1 fall in the past year
Robson E, 2003 [32]	Canada	Usual care vs MFI	4	471	96	73.0	81%	(1)⩾ 65, (2) walk ⩾20 minutes and get down and off floor independently
Salminen MJ, 2009 [33]	Finland	EDU vs MFI	12	591	271	NR	84%	(1)⩾ 65, (2)⩾ 1 fall in the past year, (3) MMSE* ⩾17, (4) walk ⩾ 10m independently
Shumway-Cook A, 2007 [34]	USA	EDU vs EDU+EXC	12	453	254	75.6	77%	(1)⩾ 65, (2) primary care physician visit ⩾ 1 in the past 3 years, (3) no regular exercise in the past 3 months
Siegrist M, 2016 [35]	Germany	Usual care vs EXC	12	378	143	78.0	75%	(1)⩾ 65, (2) increased physical fall risk
Spice CL, 2009 [36]	UK	Usual care vs MFI	12	516	409	82.2	72%	(1)⩾ 65, (2)⩾ 2 falls in the past year
Tinetti ME, 1994 [37]	USA	Usual care vs MFI	12	301	120	77.9	69%	(1)⩾ 70,(2) ambulation (3) MMSE* ⩾20
Trivedi DP, 2003 [38]	UK	Usual care vs MED	60	2686	515	74.0	24%	(1)⩾ 65
Trombetti A, 2011 [39]	Switzerland	Usual care vs EXC	12	134	51	75.5	96%	(1)⩾ 65, (2) at increased risk of falling
Voukelatos A, 2007 [40]	Australia	Usual care vs EXC	6	702	152	69.0	84%	(1)⩾ 60, (2) had not practiced tai chi in the past year
Voukelatos A, 2015 [41]	Australia	Usual care vs EXC	12	386	122	73.2	74%	(1)⩾ 65, (2) inactive, mobile
Wagner EH, 1994 [42]	USA	Usual care vs RAS vs MFI	24	1559	469	72.5	59%	(1)⩾ 65, (2) ambulatory, (3) independent in activities of daily living
Weerdesteyn V, 2006 [43]	Netherlands	Usual care vs EXC	7	113	40	73.9	79%	(1)⩾ 65, (2)⩾ 1 fall in the past year, (3) walk independently ⩾ 15 min
Wolf SL, 2003 [44]	USA	EDU vs EXC	12	311	154	80.9	94%	(1)⩾ 70, (2) transitioning to frailty
Wu C, 2010 [45]	China	Usual care vs MFI	12	248	27	69.9	77%	(1)⩾ 60

Xia Q, 2010 [46]	China	Usual care vs MFI	12	2310	227	72.1	53%	(1)⩾ 60
Xie X, 2016 [47]	China	EDU vs MFI	6	280	29	NR	NR	(1)⩾ 65
Zhan J, 2013 [48]	China	Usual care vs EDU	12	112	33	75.4	42%	(1)61~90
Zhan P, 2010 [49]	China	Usual care vs EXC	12	100	25	67.6	39%	(1)⩾ 65

Notes: MMSE means mini-mental state examination score; NR means not reported. USA means United States of America. UK means United Kingdom.

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

Table S3: Contribution of direct evidence to the network

No.	Comparison	Number of trials	Contribution to the network (%)
1	Usual care vs. MFI	10	20.41
2	Usual care vs. EDU	2	4.08
3	Usual care vs. RAS	2	4.08
4	Usual care vs. RAS vs. MFI	2	4.08
5	Usual care vs. EXC	10	20.41
6	Usual care vs. EXC vs. MED HAM vs. EXC+HAM vs. MFI	1	2.04
7	Usual care vs. MED	4	8.16
8	Usual care vs. HAM	2	4.08
9	Usual care vs. RAS+EXC	1	2.04
10	Usual care vs. EXC+HAM	1	2.04
11	EDU vs. MFI	7	14.29
12	EDU vs. EXC	1	2.04
13	EDU vs. EDU+RAS	1	2.04
14	EDU vs. EDU+EXC	4	8.16
15	EXC vs. RAS+EXC	1	2.04

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

Table S4: Changes in rank based on SUCRA and Mean rank of 11 comparator groups after excluding studies with high-risk biases or unclear bias

Analysis strategies	Usual Care	EDU	RAS	EXC	MED	HAM	EDU+RAS	EDU+EXC	RAS+EXC	EXC+HAM	MFI
All 49 studies	11	7	5	4	10	6	8	2	9	3	1
Exclude Ref [1]	11	8	4	5	10	6	7	2	9	3	1
Exclude Ref [2]	11	7	5	4	10	6	8	3	9	2	1
Exclude Ref [8]	11	6	7	4	10	5	8	2	9	3	1
Exclude Ref [39]	11	7	5	4	10	6	8	2	9	3	1
Exclude Ref [41]	11	7	5	3	10	6	8	2	9	4	1
Exclude Refs A	11	7	6	4	10	5	8	3	9	2	1
Exclude Refs B	10	9	3	2	11	6	8	4	7	1	5
Exclude Refs C	11	8	4	3	10	6	7	5	9	2	1

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions)

Refs A: references 1, 2, 8, 39 and 41 had ≥ 2 high-risk biases.

Refs B: references 5, 24, 32 and 45-49 had ≥5 unclear biases.

Refs C: references 1, 23 and 32 had a follow-up period of <6 months.

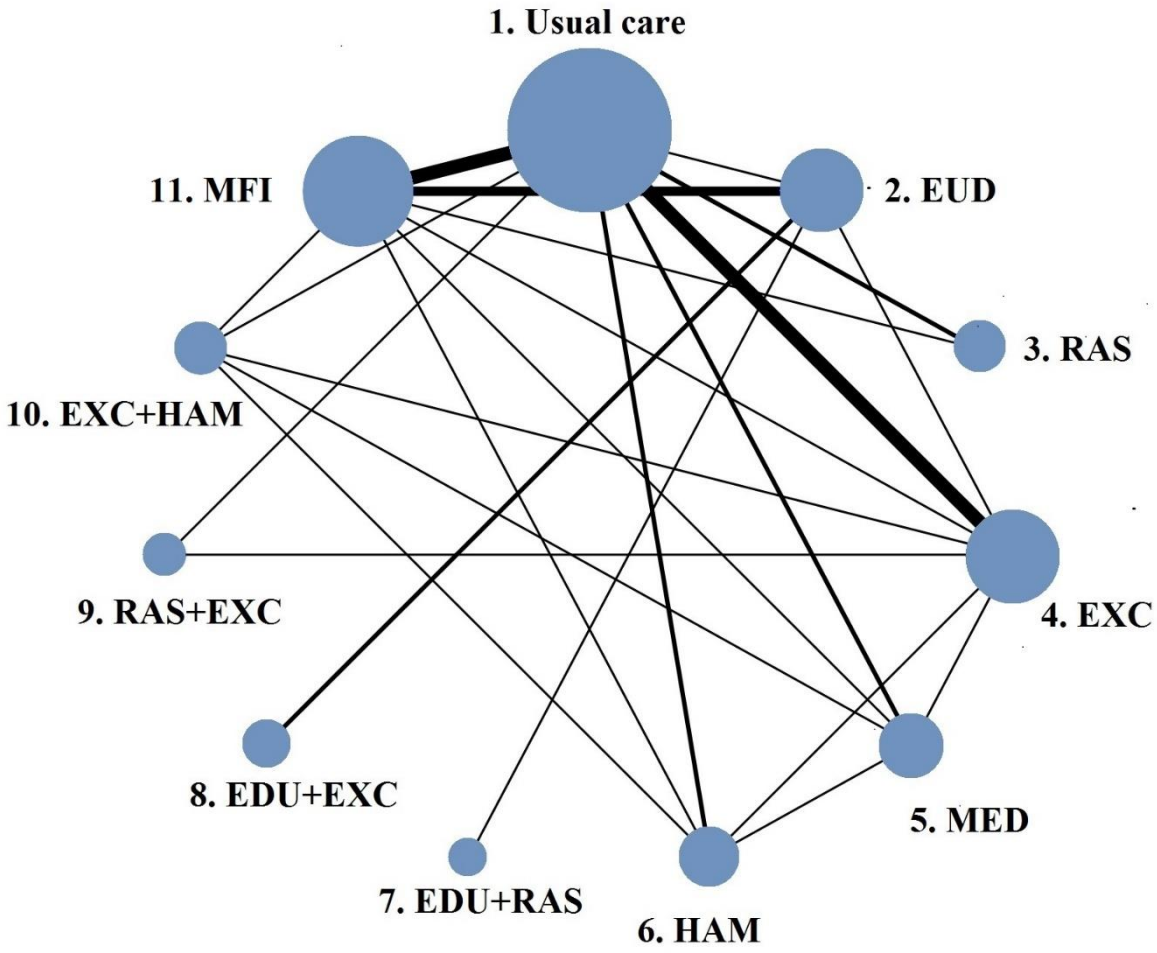

Figure S1: Network of interventions to prevent falls in the elderly

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

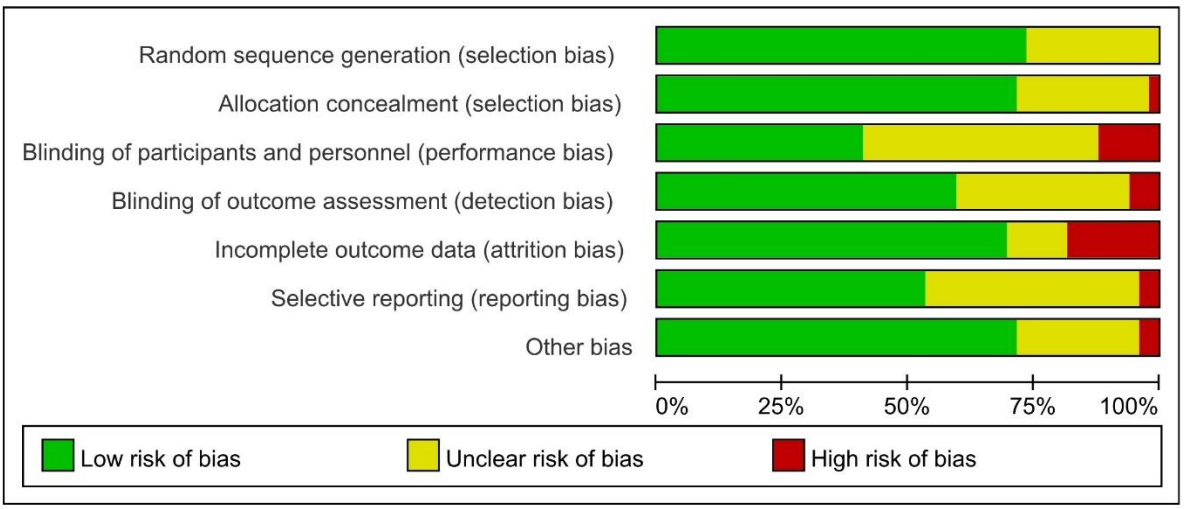

Figure S2: Judgments of risk for 7 items of bias in all 49 included studies

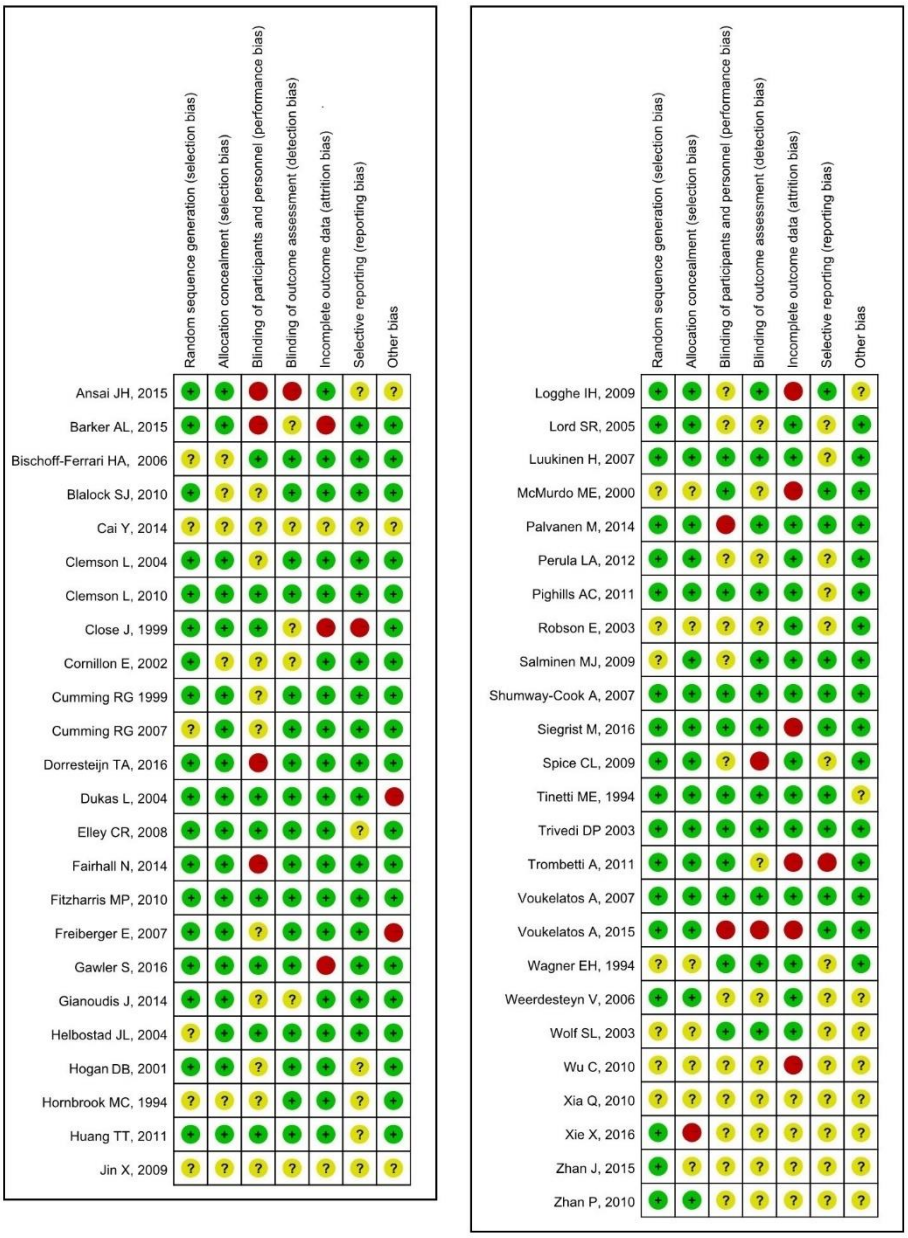

Figure S3: Risk summary of 49 studies included in NMA by item and article

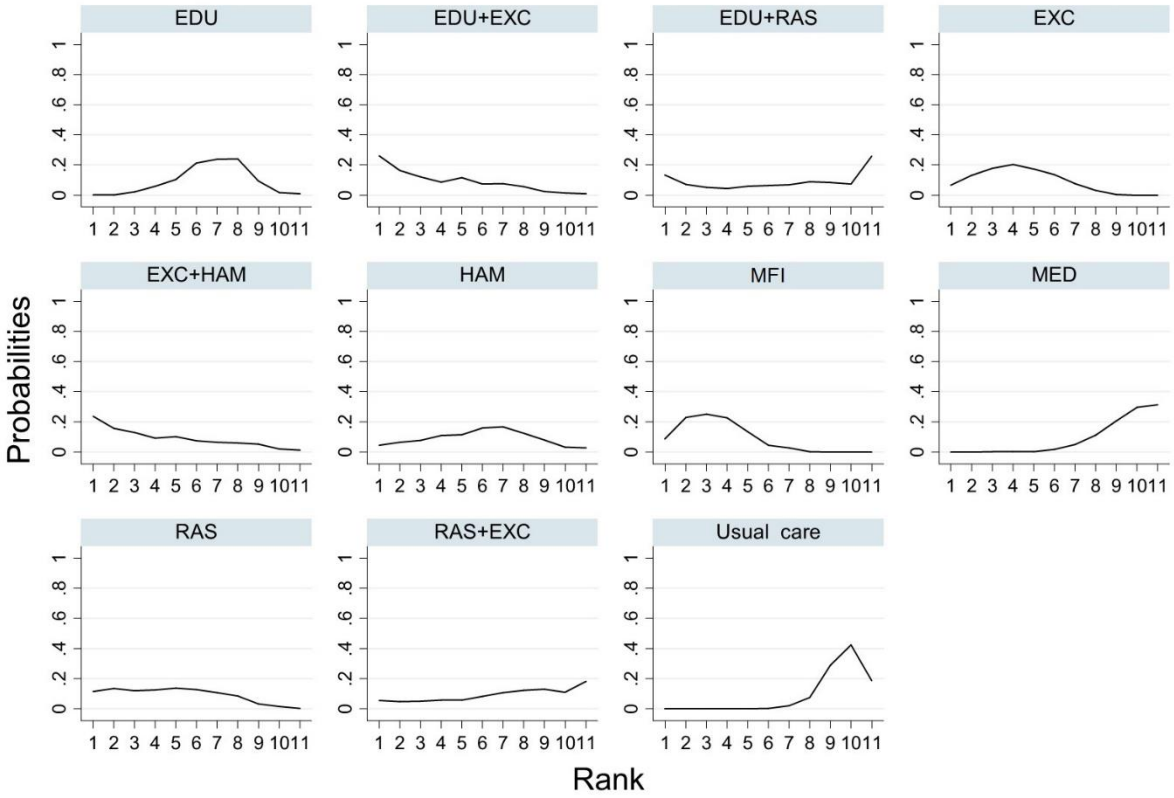

Figure S4: Ranking of intervention strategies based on probability of their effects on outcome of falls (Rankogram)

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

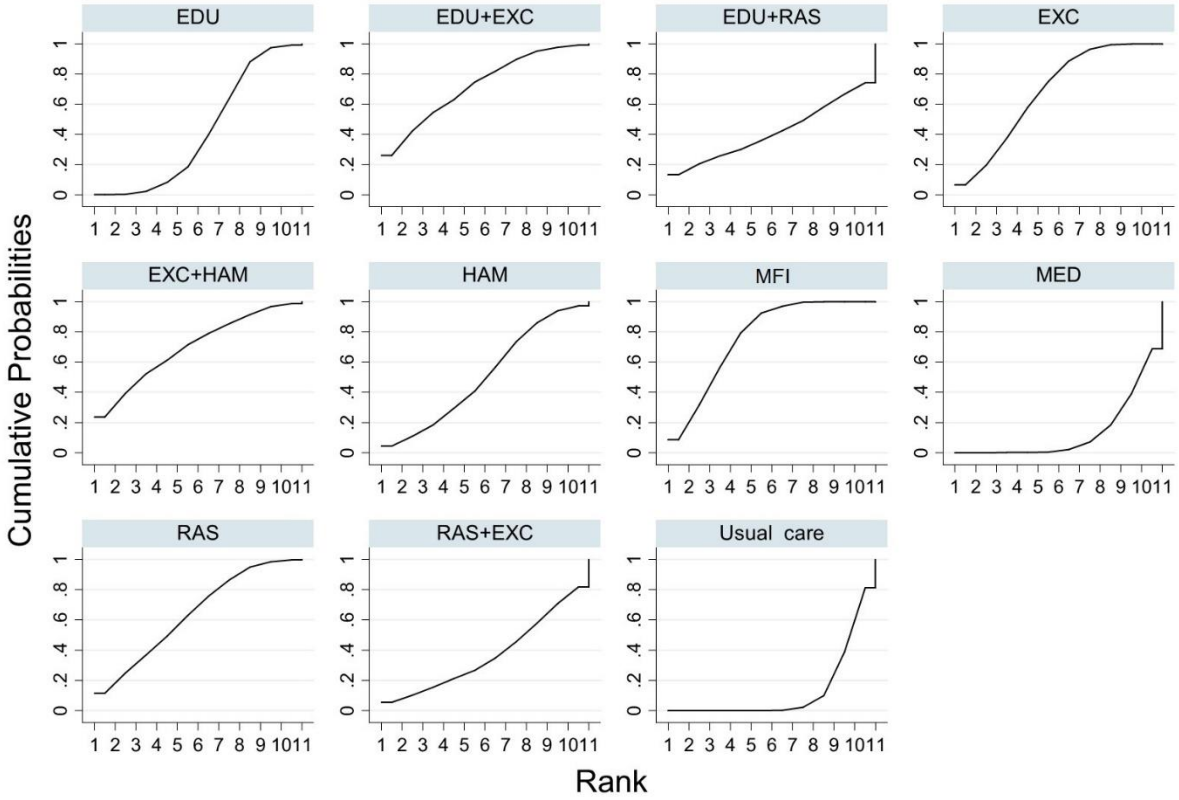

Figure S5: Surface under the cumulative ranking curve (SUCRA) probabilities diagram

Note: Surface under the cumulative ranking curve (SUCRA) probabilities is a percentage of the efficacy or safety of every intervention relative to an imaginary intervention that is always the best without uncertainty [50, 51]. Larger SUCRA scores indicate a more effective intervention.

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

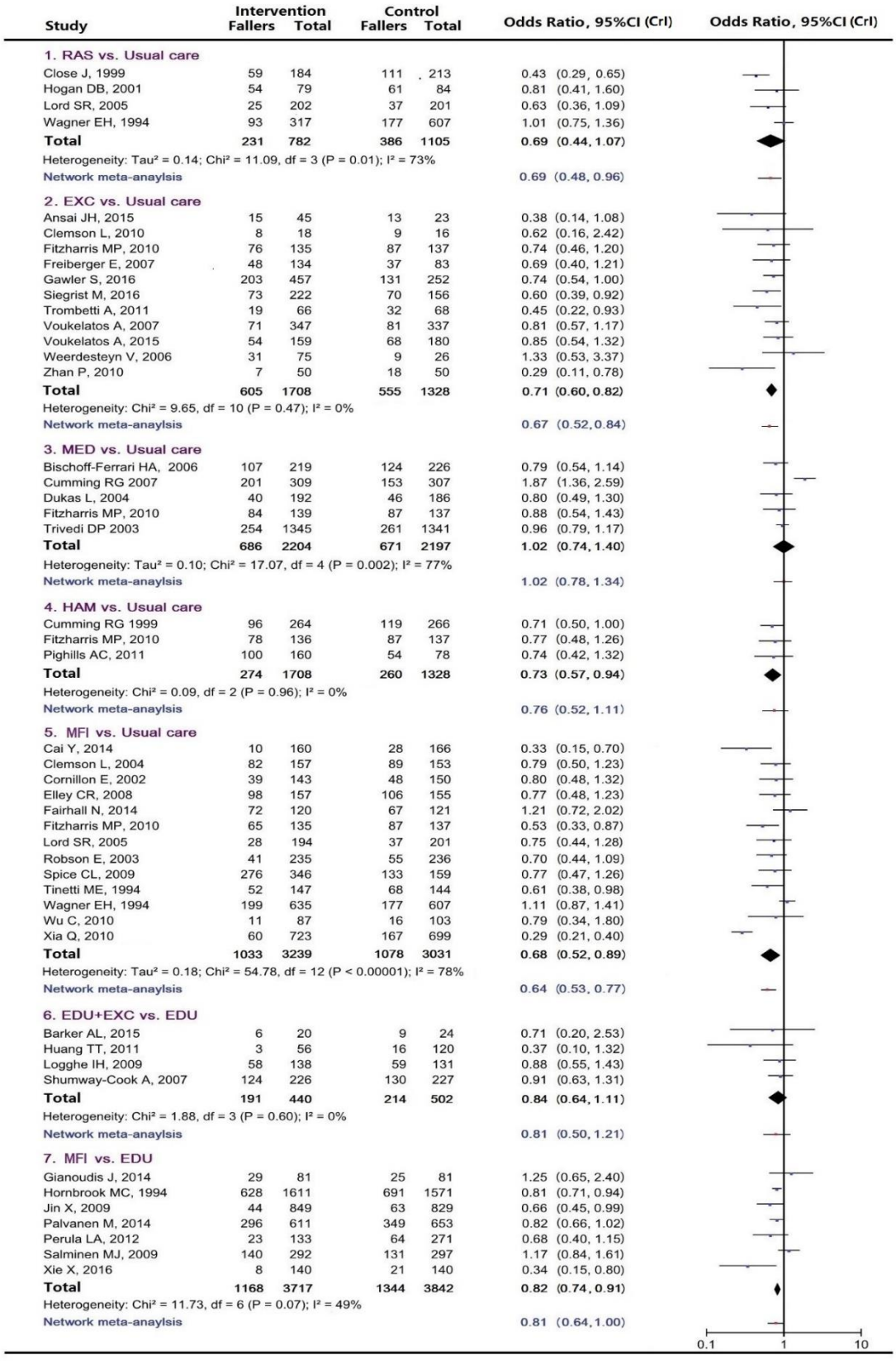

Figure S6: Pooled odds ratios for fall incidence by Bayesian network meta-

analysis and pairwise meta-analysis

Note: Only the comparisons reported in 3 studies or more were analyzed.

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

95% CI: 95% confidence interval in meta-analysis, 95% CrI: 95% credible intervals in NMA.

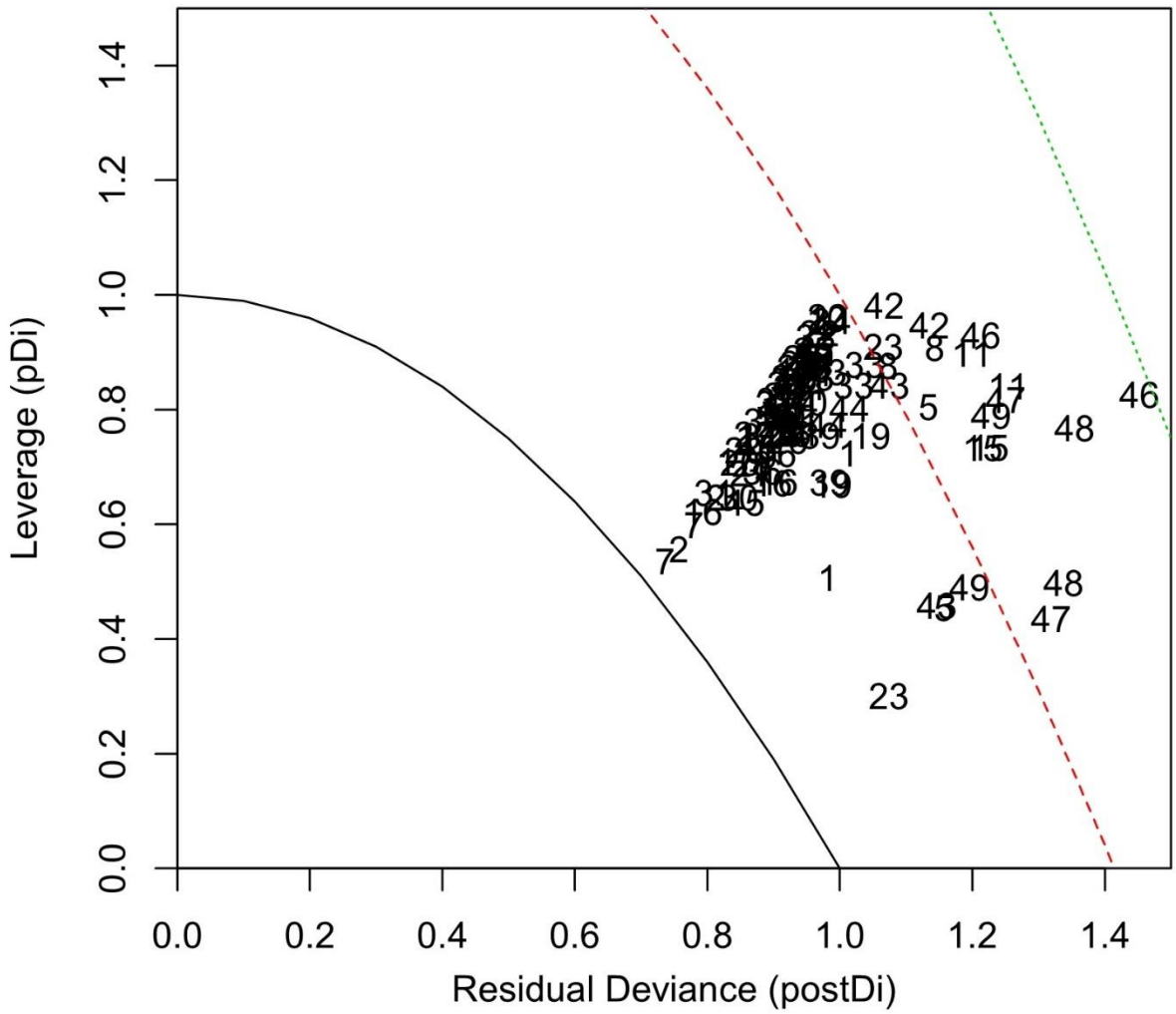

Figure S7: Benchmark effect diagram

Note: Residual deviance = 101.88, Data points =104 (Note that total residual deviance should approximate the number of data points for a good fit), Effective number of parameters= 64.04, DIC=165.92.

The diagram was calculated using code proposed by Georgia Salanti [52]. For an adequately fitting model, it will be approximately equal to the unconstrained data points [53]. From the diagram, we find that all arms of studies are in the $x^2+y=3$, meaning the model fit well.

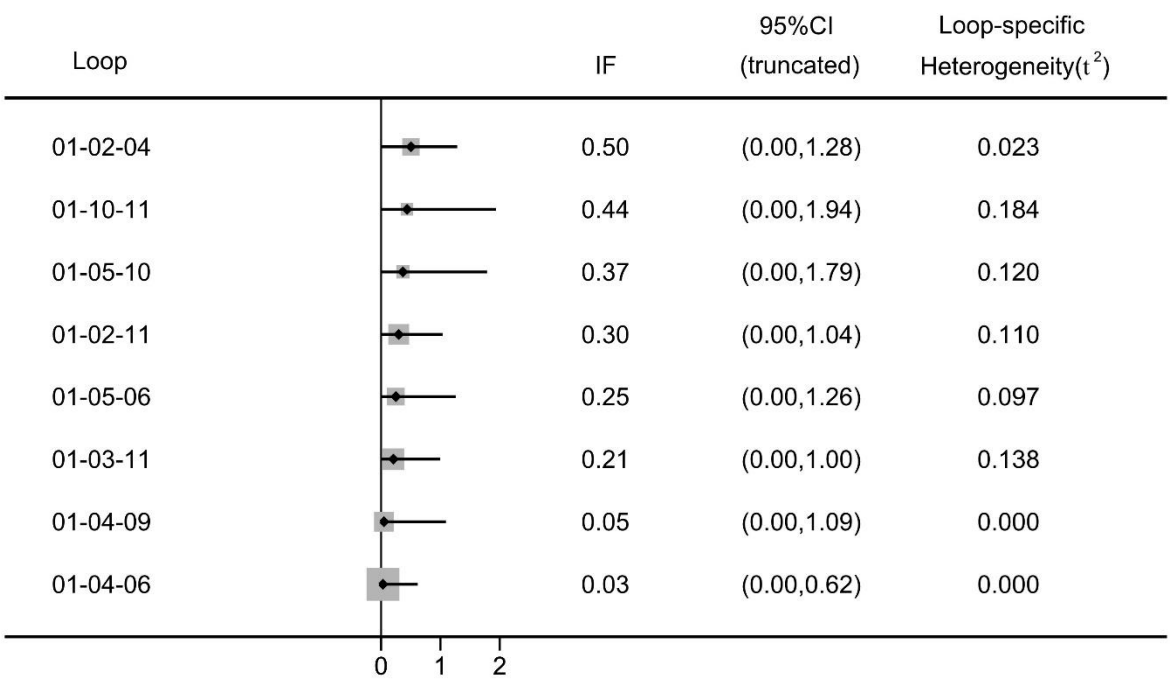

Figure S8: Inconsistency analysis using loop-specific heterogeneity estimate

Note: 8 triangular loops found.

IF*: inconsistency factor (IF), which is the absolute difference between direct and indirect estimates for one of the comparisons. Confidence intervals truncated at zero indicate no statistical significance of inconsistency [50].

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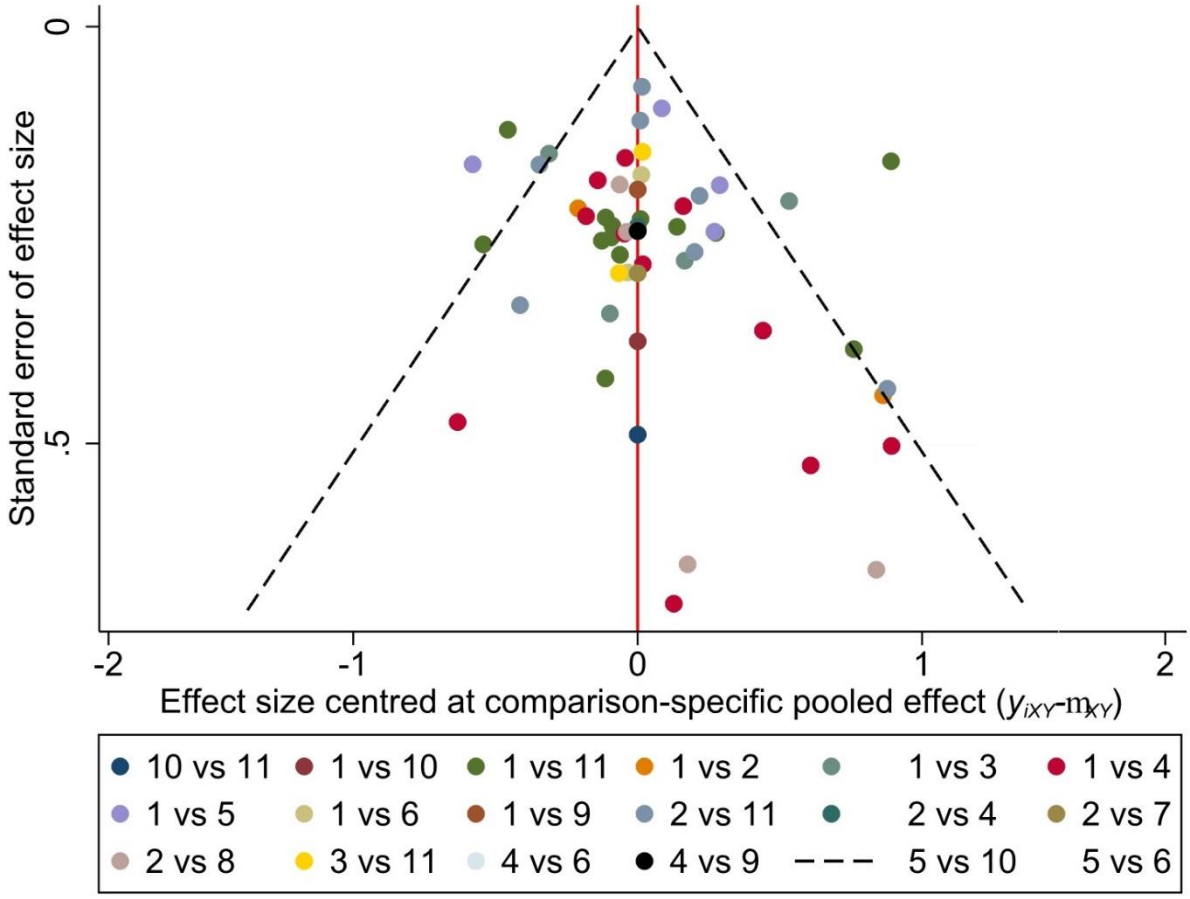

Figure S9: Comparison-adjusted funnel plot

Notes: The red full line represents the null hypothesis that the study-specific effect sizes do not differ from the respective comparison-specific pooled effect estimates. The two black dashed lines represent a 95% CI for the difference between study-specific effect sizes and comparison-specific summary estimates. Different colors correspond to different comparisons.

Labels of interventions: 1. Usual care (Namely without any specific fall intervention); 2. EDU (Education); 3. RAS (Risk assessment and suggestions); 4. EXC (Exercise); 5. MED (Medical care) 6. HAM (Hazard assessment and modification); 7. EDU+RAS (Education + risk assessment and suggestions); 8. EDU+EXC (Education + exercise); 9. RAS+EXC (Risk assessment and suggestions + exercise); 10. EXC+HAM (Exercise + hazard assessment and modification); 11. MFI (Multifactorial interventions).

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