Appendix

Search terms used

Pubmed

(“hypertension”[MeSH Terms] OR “hyperten*”[Title/Abstract] OR “hypertension”[Title/Abstract] OR “hypertensive”[Title/Abstract] OR “high blood pressure”[Title/Abstract] OR “systolic blood pressure”[Title/Abstract] OR “diastolic blood pressure”[Title/Abstract] OR “raised blood pressure”[Title/Abstract]) AND ("frail elderly"[MeSH Terms] OR "frail*"[Title/Abstract] OR "frailty"[Title/Abstract])

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(“hyperten*” OR “hypertension” OR “hypertensive” OR “high blood pressure” OR “systolic blood pressure” OR “diastolic blood pressure” OR “raised blood pressure”) AND ("frail*" OR "frailty")

Table e1. Characteristics of the studies included in the systematic review.

First Author (year)	Study characteristics	n	Hypertension definition	Hypertension prevalence	Frailty definition	Frailty Incidence (longitudinal studies) or prevalence (cross-sectional studies)	% hypertension in frailty groups	Other results	NOS
LONGITUDINAL STUDIES									
Barzilay (2007)	Country: USA Name: Cardiovascular Health Study (CHS) Setting: community Age: ≥ 65 y	2826	BP ≥ 130/85 mm Hg or treated hypertension	37%	CHS criteria	Prefrail: 66% Frail: 8%	Robust=34% Prefrail=38% Frail=43%	Incident frailty (5 and 9 y follow-up) was not predicted by hypertension diagnosis or blood pressure levels. SBP at baseline was not independently associated with frailty: HR=0.96 (95% CI 0.89-1.04) for prefrailty and HR=1.01 (95% CI 0.88-1.17) for frailty.	7
Bouillon (2013)	Country: UK Name: Whitehall II Study Setting: community Age (range): 45-69 y	2707	BP ≥ 130/85 mm Hg or treated hypertension	40%	CHS criteria	Prefrail: 37% Frail: 3%	Robust=38% Prefrail/frail=43%	-	6
Castrejón-Pérez (2017)	Country: Mexico Name: Mexican Study of Nutritional and Psychosocial Markers of Frailty Setting: community Age (range): 70-95 y	237	Not defined	58%	CHS criteria	Frail=15%	Robust=55% Frail=74%	At univariate analysis hypertension was associated with incident frailty (HR=2.11, 95%CI 1.03-4.31), but this association was not confirmed in the multivariate analysis (HR=1.58, 95%CI 0.83-3.01)	6
Doba (2012)	Country: Japan Name: Japanese Health Research Volunteer Study	351	Not defined	28%	FI	Frail: 16%	Robust=28% Frail=29%	Baseline SBP was lower in persons who developed frailty vs non frail SBP=135±17 vs 140±21 (p=0.046) . In multivariate analyses, no	7

	Setting: community Age (mean±SD): 78±4 y							significant association between SBP and frailty was observed	
CROSS-SECTIONAL STUDIES									
de Albuquerque Sousa (2012)	Country: Brazil Name: Network of Studies on the Frailty of Elderly Brazilians Setting: Community Age (mean±SD): 74±7 y	391	Self-reported	58%	CHS criteria	Prefrail: 60% Frail: 17%	Robust=53% Prefrail=57% Frail=67%	-	5
Ávila-Funes (2008)	Country: France Name: Three-City Study Setting: community Age (mean±SD): 74±5 y	6078	Self-reported or BP≥160/95 or treated hypertension	64%	CHS criteria	Prefrail: 48% Frail: 7%	Robust=64% Prefrail=63% Frail=71%	-	5
Basile (2017)	Country: Italy Setting: community Age (mean): 81±8 y	56	Treated hypertension	100%	FI	-	-	Participants with SBP≥140 mmHg had lower FI compared to those with SBP<140 mmHg (p=0.006)	5
Bastos-Barbosa (2012)	Country: Brazil Name: Research Network of Studies of Brazilian Elderly Individuals Setting: community Age (mean±SD): 74±7 y	77	BP reported as a continuous measure	63%	CHS criteria	Prefrail: 40% Frail: 30%	Not reported	Ambulatory BP of frail group demonstrated significantly higher systolic and diastolic BP values over the 24 h (135/74 mm Hg) than nonfrail group (122/68 mm Hg).	5
Calado (2016)	Country: Brazil Setting: community	385	Self-reported	46%	CHS criteria	Prefrail: 50% Frail: 9%	Robust=44% Prefrail=48% Frail=49%	-	5

	Age (mean): 74±6 y								
Castrejón-Pérez (2017)	Country: Mexico Name: Mexican Health and Nutrition Survey Setting: community Age (mean±SD): 71±8 y	7164	Not defined	38%	FI	Mean FI score=0.18	-	Multiple linear regression for FI for hypertension only (without diabetes) Beta: 0.31 (0.55-0.69)	5
Chang (2014)	Country: Taiwan Setting: community Age: ≥65 y	234	Not defined	43%	CHS criteria	Frail: 39%	Robust=33% Frail=58%	Hypertension significantly associated with frailty OR=2.21 (1.16–4.21) in multivariate analysis.	4
Chung (2016)	Country: Taiwan Name: I-Lan Longitudinal Aging Study Setting: community Age (mean±SD): 62±9 y	962	Self-reported or BP≥140/90 or treated hypertension	37%	CHS criteria	Prefrail: 33% Frail: 3%	Robust=34% Prefrail=42% Frail=53%	-	6
Fattori (2013)	Country: Brazil Name: Research Network of Studies of Brazilian Elderly Individuals Setting: community Age: ≥65 y	900	BP ≥ 140/90 mm Hg	52%	CHS criteria	Prefrail: 52% Frail: 8%	Not reported	Hypertension not associated with frailty OR=0.78 (0.60–1.03) in univariate analysis.	7
Frisoli (2015)	Country: Brazil Name: FRAgilidade em idosos com doenças CardiOvasculaRes Setting: outpatient	172	Not defined	84%	CHS criteria	Prefrail: 51% Frail: 38%	Robust=100% Prefrail=83% Frail=81%	-	4

	clinic Age (mean±SD):77±6 y								
Guessous (2014)	Country: Switzerland Name: BusSante´study Setting: community Age (mean): 60 y	2930	BP ≥ 140/90 mm Hg or treated hypertension	47%	Frailty scale based on 4 indicators (weakness, shrinking, exhaustion, and low activity)	1 indicator=29% ≥2 indicators=8%	0 indicators =42% 1 indicator =54% ≥2 indicators =65%	Hypertension significantly associated with frailty indicators in multivariate analyses. OR for 1 indicator (vs. 0 indicators) 1.40 (1.15-2.68)- OR for ≥2 indicators 1.88 (1.32-2.68).	7
Kang (2017)	Country: Korea Name: Korea National Health and Nutrition Examination Survey Setting: community Age (mean±SD): 73±5 y	4352	BP ≥ 140/90 mm Hg or treated hypertension	62%	FI	Prefrail: 39% Frail: 44%	Robust=49% Prefrail=61% Frail=68%	-	6
Klein (2005)	Country: USA Name: Beaver Dam Eye Study Setting: community Age (range): 53-86 y	2515	BP ≥ 160/95 mm Hg or treated hypertension	47%	Frailty scale based on 5 indicators (gait speed, peak expiratory flow rate, hand grip strength, chair stand test and visual acuity)	Not reported	-	In multivariate analysis hypertension significantly associated with frailty scale in men OR for 1-point increment in scale =1.22 (1.00-1.49) and women OR=1.22 (1.02-1.46)	6
Lahousse (2014)	Country: The Netherlands Name: Rotterdam Study Setting: community Age (median): 74 y	2833	BP ≥ 160/100 mm Hg or treated hypertension	75%	CHS criteria	Prefrail: 51% Frail: 6%	Robust=71% Prefrail=77% Frail=85%	-	6

Lee (2011)	Country: China Setting: community Age (mean±SD): 72±5 y	4000	Medical records	43%	Composite frailty score (range 0-20)	Mean frailty score=12.2	-	In multivariate analysis hypertension not significantly associated with composite frailty score	5
Nadruz 2017)	Country: USA Name: Atherosclerosis Risk in Communities Study Setting: community Age (mean±SD): 76±5 y	3991	BP ≥ 160/100 mm Hg or treated hypertension	82%	CHS criteria	Frail=5%	Robust=81% Frail=92%	-	6
Ng (2014)	Country: Singapore Name: Singapore Longitudinal Ageing Studies I and II Setting: community Age (mean±SD): 67±8 y	1685	Not defined	62%	CHS criteria	Prefrail: 42% Frail: 5%	Robust=58% Prefrail=64% Frail=80%	Hypertension not associated with frailty in multivariate analysis (data not provided)	6
O'Connell (2015)	Country: Republic of Ireland Name: Irish Longitudinal Study on Aging Setting: community Age (mean±SD): 63±9 y	5692	BP reported as a continuous measure	-	CHS criteria & FI	CHS criteria Prefrail: 34% Frail: 4% Mean FI score=0.10	-	In adjusted linear regression analyses, frailty significantly associated with lower seated and standing SBP and DBP. Seated SBP -1.9 (-2.52to-1.27), standing SBP -1.79 (-2.46 to-1-13), seated DBP -1.14 (-1.51to-0.77), standing DBP -1.10 (-1.48to-0.73).	7
Ramsay (2015)	Country: UK Name: British Regional Heart Study Setting: community Age (range): 71-92 y	1622	BP ≥ 160/90 mm Hg or treated hypertension	72%	CHS criteria	Prefrail: 54% Frail: 19%	Robust=65% Prefrail=74% Frail=78%	Hypertension associated with frailty age-adjusted OR=1.79 (1.27-2.54)	6

Ravindrarajah (2017)	Country: UK Name: Clinical Practice Research Datalink Setting: community Age: ≥80 y	144403	SBP values classified as follows (mmHg): <110, 110-119, 120-139, 140-159, ≥160	<110 =3% 110-119=7% 120-139=37% 140-159=41% ≥160=12%	FI	Mild frailty=40% Moderate frailty=21% Severe frailty=7% Any frailty=68%	Any frailty: <110 =78% 110-119=77% 120-139=72% 140-159=64% ≥160=58%	Frailty was associated with lower BP. In participants with SBP <110 mmHg, 22% were fit, 28% had moderate frailty, and 12% had severe frailty. In those with SBP ≥160 mm Hg, 42% were fit, 16% had moderate frailty, and 4% had severe frailty.	7
Ricci (2014)	Country: Brazil Name: Fragilidade em Idosos Brasileiros Network Study Setting: community Age (mean±SD): 72±6 y	761	Self-reported or BP≥140/90 or treated hypertension	84%	CHS criteria	Prefrail: 48% Frail: 10%	Robust=81% Prefrail=87% Frail=84%	-	5
Serra-Prat (2016)	Country: Spain, Setting: community Age (mean±SD): 80±3 y	324	Not defined	71%	CHS criteria	Prefrail: 54% Frail: 14%	Robust=66% Prefrail=70% Frail=82%	Hypertension associated with frailty OR=2.24 (1.00-4.99) at univariate analysis. Association not confirmed in multivariate analysis (data not provided).	5
Tavares (2016)	Country: Brazil Name: Study of Frailty in Elderly People Setting: hospital Age: ≥ 60 y	205	Self-reported	66%	CHS criteria	Prefrail: 52% Frail: 26%	Robust=62% Prefrail=62% Frail=76%	-	4
Vaingankar (2016)	Country: Singapore Name: Well-being of the Singapore Elderly study Setting: community Age (mean): 69 y	2102	Not defined	59%	CHS criteria	Prefrail: 40% Frail: 6%	Robust=55% Prefrail=62% Frail=70%	Hypertension not associated with frailty in multivariate analysis (data not provided)	4

Watanabe (2017)	Country: Japan Name: Obu Study of Health Promotion for the Elderly Setting: community Age (mean): 71 y	4720	Self reported	46%	CHS criteria	Prefrail: 57% Frail: 11%	Robust=39% Prefrail=47% Frail=55%	Hypertension significantly associated with frailty in multivariate analysis (OR 1.43, 95% CI = 1.14–1.78)	4
Wong (2010)	Country: Canada, Name: Montreal Unmet Needs Study Setting: community Age (mean±SD): 80±4 y	740	Self-reported	52.3%	CHS criteria	Prefrail: 50% Frail: 7%	Robust=47% Prefrail=55% Frail=60%	-	5
Wu (2009)	Country: Taiwan Setting: community and hospital Age (mean±SD): 77±6 y	90	Not defined	58%	CHS criteria	Prefrail: 62% Frail: 23%	Robust=69% Prefrail=48% Frail=76%	No significant association between frailty and hypertension at univariate analysis, OR=1.23 (0.76–1.98)	4
Yanagita (2017)	Country: Japan Setting: hospital Age (mean±SD): 78±8 y	132	BP reported as a continuous measure	-	Clinical Frailty Scale	Frail=42%	-	Frail participants had lower SBP values. In multivariate analyses frailty associated with significantly lower SBP values.	4

NOS = Newcastle-Ottawa Scale; CHS = Cardiovascular Health Study; OR = Odds Ratio; FI = Frailty Index; BP=Blood Pressure; SBP=Systolic Blood Pressure; DBP=Diastolic Blood Pressure