

Supplementary Data

Table 1: Prospective studies evaluating associations between frailty and outcomes after general surgery.

Author and location	Study population	Frailty Measure Used	Association of Frailty with Surgical Outcome
*Robinson et al, 2009 ⁽¹⁾	110 patients undergoing major elective colorectal or cardiac surgery.	Novel point-based risk score combining frailty (cognition, albumin, falls, haematocrit), disability (Katz score) and co-morbidity (Charlson index)	A frailty score of ≥ 4 points was associated with higher 6-month mortality. Each component also strongly associated with discharge to institutional care.
USA	Age group: ≥ 65 years; 95% men		
*Robinson et al., 2011 ⁽²⁾	223 patients undergoing major elective colorectal or cardiac surgery.	Novel point-based risk score combining frailty (cognition, albumin, falls, haematocrit, timed-up-and-go), disability (Katz score) and co-morbidity (Charlson index)	A frailty score of ≥ 3 points was associated with discharge to institutional care.
USA	Age group: ≥ 65 years; 96% men		
*Robinson et al., 2013 ⁽³⁾	201 patients admitted for elective colorectal or cardiac surgery.	Novel point-based risk score combining frailty (cognition, albumin, falls, haematocrit, timed-up-and-go), disability (Katz score) and co-morbidity (Charlson index)	A frailty score of ≥ 4 points was associated with higher incidence of at least 1 post-operative complication.
USA	Age group: ≥ 65 years; 98% men		
*Robinson et al., 2013 ⁽⁴⁾	272 patients admitted for elective colorectal and cardiac surgery.	Timed-up-and-go test (seconds): fast: ≤ 10 s, intermediate: 11-14s & slow: ≥ 15 s	Slower performance was associated with higher incidence of post-operative complications.
USA	Age group: ≥ 65 years; 98% men		For colorectal surgery the timed-up-and-go was more able to predict post-operative complications than a standard surgical risk calculator.
Hewitt et al., 2014 ⁽⁵⁾	325 patients admitted to acute surgical units in 3 centres.	7-point clinical frailty scale (Rockwood)	Frailty was associated with longer hospital length of stay and higher 30 and 90 day mortality.
UK	Age group: ≥ 65 years; 43% men		Re-admission rates did not differ.
Revenig et al., 2013 ⁽⁶⁾	189 patients undergoing elective inpatient abdominal surgery	Fried-Hopkins Physical Frailty Phenotype	Frailty and pre-frailty was associated with higher incidence of post-operative complications.
USA	Age group: ≥ 18 years; 59.8% men		The ASA grade was not associated with post-operative complications.
Kim et al., 2014 ⁽⁷⁾	275 patients undergoing elective intermediate-high risk elective surgery	New multi-dimensional frailty score (MFS) based on: comprehensive geriatric assessment	The MFS was associated with higher mortality at 1 year, higher post-operative complications and institutionalisation on discharge.
Republic of Korea			

	Age group: ≥ 65 years; 54.9% men	patient characteristics laboratory values	
Joseph et al, 2014 ⁽⁸⁾	250 patients admitted to a trauma unit as an emergency.	Canadian Study of Health & Aging Frailty Index (FI; 50 item)	The MFS was superior to the ASA grade in terms of predicting these outcomes. A FI of ≥ 0.25 was associated with a higher odds of in-hospital complications and death/ institutionalisation.
USA Pol et al., 2011 ⁽⁹⁾ The Netherlands	Age group: ≥ 65 years; 69.2% men 142 patients admitted for elective vascular surgery.	The Groningen Frailty Indicator (a 15 item questionnaire assessing mobility, vision, hearing, nutrition, co-morbidity, cognition and physical fitness) Grip strength, slow walking speed, self-reported exhaustion, weight loss, Vulnerable Elders Survey-13 (a function based frailty screening tool), and the Short Physical Performance Battery (a series of objective tests of lower extremity function) 20ft gait speed test (meters/second)	A frailty score of ≥ 4 points was associated with higher odds of post-operative delirium.
Dale et al., 2014 ⁽¹⁰⁾	Age group: ≥ 18 years; 70% men 76 patients referred for elective pancreaticoduodenectomy		Only self-reported exhaustion was consistently associated with adverse outcome after surgery, longer hospital stay and intensive care unit admission.
USA	Age group: ≥ 18 years; 55.3% men		The ASA grade was not associated with any of the outcomes considered.
Odonkor et al., 2013 ⁽¹¹⁾	602 patients admitted for elective ambulatory surgery.		Gait speed was associated with the probability of being ready for discharge home within 90 minutes of surgery. Those with fast (≥ 1.0 m/s) gait speed also had a lower probability of unplanned admission following surgery.
USA	Age group: ≥ 18 years; 46% men		
Lasithiotakis et al., 2012 ⁽¹²⁾	57 patients admitted for elective laparoscopic cholecystectomy.	Comprehensive geriatric assessment (frailty was defined as being 'unfit' in 1 or more domains of the assessment).	No association with post-operative complications. The probability of post-operative complication was higher in those who were frail vs non-frail (OR 6.0 95% CI 1.2, 30.4). Frail patients also had longer in-patient stay (OR 4.2, 95% CI 1.3, 13.5).
Crete	Age group: ≥ 65 years; 49.1% men		
Leung et al., 2011 ⁽¹³⁾	63 patients undergoing non-cardiac surgery with an anticipated length of stay >48 hours.	Fried physical frailty phenotype (but used as a continuous score: 0-5)	The ASA grade was not associated with either outcome measure. Higher frailty score was associated with higher odds of post-operative delirium
USA	Age group: ≥ 65 years; 46% men		

ASA: American Society of Anaesthesiologists classification system;

*same study population

References

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Search Strategy

PubMed was last searched on 21st November 2014 using the following search strategy:

(((((frailty OR frail OR sarcopenia))) OR (((walking speed OR gait speed)) OR ((grip strength OR hand strength OR chair rise* OR chair stand OR postural control OR standing balance)))))) AND (surgery OR peri-operative)