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Prevalence and assessment of frailty in interstitial lung disease - a systematic review and meta-analysis

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Abstract

Background: Frailty is a multisystem dysregulation that challenges homeostasis and increases vulnerability towards stressors. In patients with interstitial lung diseases (ILD) frailty is associated with poorer lung function, greater physical impairment, and higher symptom burden. Our understanding of the prevalence of frailty in ILD and consequently its impact on the ILD population is limited.

Objective and Methods: We aimed to systematically review frailty assessment tools and to determine frailty prevalence across different ILD cohorts. Meta-analyses were used to calculate the pooled prevalence of frailty in the ILD population.

Results: We identified 26 studies (15 full-texts, 11 conference abstracts) including a total of 4614 patients with ILD. The most commonly used frailty assessment tools were the Fried Frailty Phenotype (FFP), the Short Physical Performance Battery (SPPB), and the cumulative Frailty Index (FI). Data allowed for meta-analyses of FFP and SPPB prevalence. The pooled prevalence of frailty was 35% (95% CI 25%–45%) by FFP, and 19% (95% CI 12%–28%) by SPPB.

Conclusions: Frailty is common in ILD, with considerable variability of frailty prevalence depending on the frailty assessment tool used. These findings highlight the importance of frailty in ILD and the need for a standardized approach to frailty assessment in this population.

Keywords

Interstitial lung disease, ageing, frailty, multimorbidity, systematic review

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Introduction

Interstitial lung diseases (ILD) are a diverse group of inflammatory and fibrotic disorders that damage the lung parenchyma. The most common ILD subtypes include idiopathic pulmonary fibrosis (IPF),[1,2] hypersensitivity pneumonitis (HP),[3] connective tissue disease (CTD)-associated ILD,[4] and unclassifiable ILD.[5] Patients typically suffer from cough, dyspnoea, and reduced physical performance. Fatigue, malnutrition, and mental health problems such as depression and anxiety are also frequently reported and further contribute to poor quality of life and loss of independence.[6–8] Antifibrotic therapies have improved the treatment of fibrotic ILD over the last few years, however their effect on survival and quality of life has

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not been fully established yet, and adverse effects are common and can be bothersome in many patients.[9–11]

Frailty describes an age-associated state of reduced physiological reserves and increased vulnerability towards stressors. Due to a progressive accumulation of health deficits, individuals with chronic diseases frequently experience an accelerated functional ageing process, which can be quantified by the frailty index.[12,13] Besides this cumulative health deficit model,[12,13] physical frailty models such as the Fried Frailty Phenotype (FFP),[14] and the Short Physical Performance Battery (SPPB)[15] are used for frailty assessment. In the general population and particularly in patients with chronic lung diseases, frailty is associated with medication related harm, increased health care utilisation,[16] hospitalisations, and mortality.[12,17] Consequently, identification of frailty in patients with chronic diseases is useful for prognostication, personalising management, and allocation of health care resources.[18]

Frailty prevalence has not been determined across different ILD cohorts and countries; however single studies suggest frailty is common in ILD. In this systematic review and meta-analysis, we aimed to identify all studies investigating the occurrence and severity of frailty in patients with fibrotic ILD, to review the applied frailty assessment tools and to estimate the prevalence of frailty across ILD cohorts.

Methods

Search strategy and study selection

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,[19] and the protocol published at Prospero (ID: CRD42022262181). The databases Medline, Embase, and the Cochrane Library were searched for all full-text articles and conference abstracts published before December 26, 2022. The initial search (March 15th 2021) was updated once. The complete search strategy is reported in the supplementary material (Figure S1). EndNote 20 and Covidence were used for reference management.[20] After removal of duplicates, titles, abstracts, and full-texts were sequentially screened for eligibility by two reviewers (AW and IM) using predefined criteria. Disagreements were resolved by consensus after assessment by a third reviewer (SAG). Studies meeting the following criteria were included: Cohort studies including ≥10 patients with ILD with reported numbers of adult patients with and without frailty. We excluded studies written in languages other than English, and studies without a provided frailty definition or if frailty was only assessed with a single symptom or measurement. Furthermore, case-control studies with frailty as the exposure and study designs where patients were selected based on the presence or severity of frailty were excluded, cohorts and patients who had undergone lung transplantation were also excluded.

Data extraction and risk of bias assessment

Data from each publication were extracted into a standardized data collection sheet by one author (AW) and checked by a second author for accuracy (SAG). All included studies were assessed using the Hoy et al. risk of bias tool for prevalence studies,[21] which was modified to specifically assess the risk of bias in the estimation of frailty prevalence. Selection bias was considered high if the ILD population was selected for example based on age, referral to lung transplantation, or a specific ILD diagnosis. Three subcategories from the original Hoy et al. tool were not appropriate for our systematic review (study's target population a close representation of the national population, random selection, non-response bias). One risk of bias point was awarded for each subcategory with high or unknown risk of bias and points were added across the 7 subcategories. A total score of 0-3 was considered low risk, 4-6 moderate and 7 high risk of bias Figure S2.

Meta-analysis

Data from studies with overlapping patient cohorts were excluded from the meta-analysis. Full-text publications, studies with low risk of bias, larger sample sizes, and more recent publications were prioritized. The pooled frailty prevalence was estimated based on a modification of the inverse variance method and an arcsine transformation for proportions was used to account for skewing of the variance toward zero.[22] A random effects model was used for meta-analysis given the heterogeneity of included studies. 95% confidence intervals for individual studies were calculated according to Clopper-Pearson.[23] The presence and extent of heterogeneity between the studies was assessed using the Q and I^2 measures. To examine the abstract publication format as a potential source of heterogeneity, sensitivity analyses were performed excluding abstracts from meta-analyses. R software version 4.1.1 was used for meta-analysis.

Results

Search results and study characteristics

The initial search identified 3764 titles after excluding duplicates. Based on the preselected criteria 131 articles were selected for full-text review, and finally 26 studies (15 full-text and 11 conference abstracts) were included in the systematic review (Figure 1, Table 1, Table S1).

Eleven studies were from the USA, 11 from Canada, two from Australia, and two from the UK. Studies had data collected from 2002 until 2022. Of the identified full-text

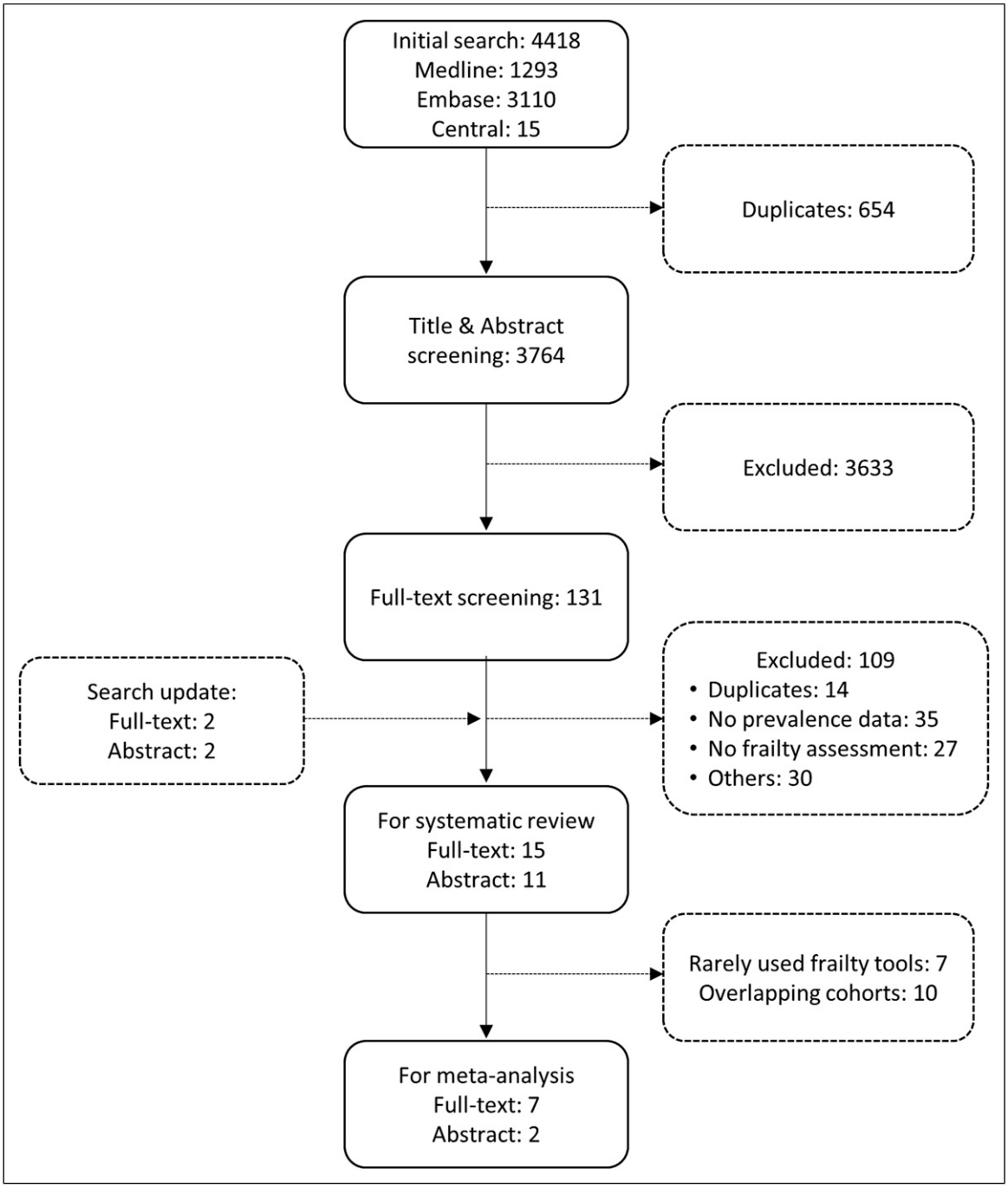

Figure 1. PRISMA flow diagram with search results.

articles, 10 were prospective and three retrospective cohort studies with one study that collected data pro- and retrospectively and two cross-sectional studies. The conference abstracts included seven prospective and one retrospective cohort studies, two cross-sectional studies, and one with non-specified design (Table 1). The number of ILD patients included in the studies ranged from 39 to 540. Most studies included a mix of different ILDs or did not specify the included ILD subtypes.[6,24–30] One full-text and five abstract publications included IPF patients specifically,[31–36] and one full-text and two abstract publications included patients with CTD-ILD specifically,[36–38] nine full-text and one abstract publication included patients who were referred for lung transplantation assessment.[39–48]

According to our risk of bias assessment full-text studies had a mean (range) of 1.3 (0-3) risk of bias points, with low

Table 1. Study characteristics and frailty prevalence in interstitial lung disease.

Study	Country	Years	Study design	Patient population	Assessment tool (frailty cut-off)	Number of ILD patients	Frailty prevalence *n* (%)	Risk of bias
Full-text articles								
Farooqi 2020[49]	Canada	2015-2020	Pro	Fibrotic ILD	FFP (≥3, prefrail 1-2)	463	123 (26%) frail 258 (56%) prefrail	Low
Guler 2020[6]	Canada	2014-2017	Pro	Fibrotic ILD	FI (>0.21, prefrail 0.1-0.21)	540	272 (50%) frail 119 (22%) prefrail	Low
Guler 2017[38]	Canada	2014-2016	Pro	SSc-ILD	FI (>0.21, prefrail 0.1-0.21)	86	47 (55%) frail 18 (21%) prefrail	Low
				Non-CTD ILD		167	84 (50%) frail 33 (20%) prefrail	
Layton 2017[39]	USA	2010-2015	Cross-sectional	Pre-LTX	FFP (≥4, prefrail 2-3)	39	2 (5%) frail 23 (59%) prefrail	Low
Milne 2017[28]	Canada	2014-2015	Pro	Fibrotic ILD	FI (>0.21, prefrail 0.1-0.21)	129	65 (50%) frail 31 (24%) prefrail	Low
						IPF 41	20 (49%) frail 9 (22%) prefrail	
Montgomery 2022[41]	Australia	2013-2017	Pro	Pre-LTX	mFFP (≥3)	130	34 (26%) frail	Low
Montgomery 2020[40]	Canada	2013-2017	Retro	Pre-LTX	mFFP (≥3)	100	24 (24%) frail	Low
Rozenberg 2018[42]	Canada	2009-2015	Pro + retro	Pre-LTX	FFP (≥3)	80	26 (33%) frail	Low
Sheth 2019[35]	USA	2016	Pro	IPF	FFP (≥3, prefrail 1-2)	50	24 (48%) frail 20 (40%) prefrail	Low
Singer 2018[43]	USA	2010-2017	Pro	Pre-LTX	SPPB (≤7) FFP (≥3)	217 208	47 (22%) frail 70 (34%) frail	Low
Singer 2015[44]	USA	2011-2014	Pro	Pre-LTX	SPPB (≤7) FFP (≥3)	149 208	18 (12%) frail 61 (29%) frail	Low
Tremblay 2022[29]	Canada	2018-2021	Pro	Fibrotic ILD	FFP (≥3, prefrail 1-2)	36	9 (25%) frail 19 (53%) prefrail	Low
Venado 2019[45]	USA	2010-2017	Pro	Pre-LTX	SPPB (≤7) FFP (≥3)	177 121	42 (24%) frail 50 (41%) frail	Low
Wickerson 2020[46]	Canada	2016-2017	Retro	Pre-LTX	SPPB (≤7, prefrail 8-9)	89	10 (11.2%) frail 12 (13.5%) prefrail	Low
Wilson 2016[47]	USA	2002-2013	Retro	Pre-LTX	FI (>0.25)	46	17 (37%) frail	Low
Conference abstracts								
Bhorade 2019[37]	USA	2019	Cross-sectional	SSc-ILD	SPPB[a] FFP[a]	43	9 (21%) frail 30 (69%) frail	Low
				Other ILD	SPPB[a] FFP[a]	77	26 (34%) frail 49 (63%) frail	
Bhorade 2019[26]	USA	2019	Cross-sectional	Fibrotic ILD	SPPB[a] FFP[a]	77	20 (26%) frail 51 (66%) frail	Low
Flack 2022[36]	USA	2017-2021	Retro	CTD-ILD	SSPB[a]	84	16 (19%) frail 13 (16%) prefrail	Low
					FFP[a]	73	24 (33%) frail 41 (56%) prefrail	
				IPF	SPPB	192	33 (17%) frail 21 (11%) prefrail	
					FFP	159	51 (32%) frail 83 (52%) prefrail	

(continued)

Table 1. (continued)

Study	Country	Years	Study design	Patient population	Assessment tool (frailty cut-off)	Number of ILD patients	Frailty prevalence *n* (%)	Risk of bias
Guler 2018[25]	Canada	2018	Pro	Fibrotic ILD	FI (>0.21)	540	272 (50%) frail	Low
Guler 2018[24]	Canada	2018	Pro	Fibrotic ILD	FI (>0.21)	486	247 (51%) frail	Low
Luckhardt 2017[32]	USA	2017	Pro	IPF	EFS (>7) SHARE-FI	70 70	5 (7.1%) frail 24 (34%) frail 28 (40%) prefrail	Low
Maddocks 2017[31]	UK	2017	Not defined	IPF	FFP (≥3)	121	27 (22%) frail	Low
Montgomery 2018[48]	Australia	2013	Pro	Pre-LTX	mFFP (≥3)	88	21 (23%) frail	Low
Nolan 2018[34]	UK	2018	Pro	IPF	FFP (≥3)	150	38 (25%)	Low
Sheth 2019[33]	USA	2019	Pro	IPF	FFP (≥3)	50	24 (48%)	Low
Tremblay 2021[30]	Canada	2021	Pro	ILD	FFP (≥3, prefrail 1-2)	33	6 (18%) frail 18 (55%) prefrail	Low

CTD: connective tissue disease; EFS: edmonton frail scale; FFP: fried frailty phenotype; FI: frailty index; ILD: interstitial lung disease; IPF: idiopathic pulmonary fibrosis; mFFP: modified FFP; pre-LTX: referred or on the waiting list for lung transplantation; Pro: prospective; Retro, retrospective; SPPB: short physical performance battery; SSc-ILD: systemic sclerosis-ILD.
[a]no cut-off stated.

risk of bias in all 15 studies. Abstracts had a mean (range) of 2.2 (1-3) risk of bias points, with low risk of bias in all 11 studies (Figure 2).

Patient characteristics

A total of 4614 patients with ILD were included in the 26 studies. Mean/median age ranged from 55 to 74 years, with 20 to 82% of the ILD population being men. Among the publications with reported pulmonary function mean/median FVC ranged from 46% to 80% predicted (10 full-texts and 5 abstracts) and DLCO ranged from 25 to 73 %-predicted (10 full-texts and four abstracts). In all studies with the available information, FVC and DLCO were lower in frail compared to non-frail patients.[33,35,39–41,43,44,49]

Mean/median body mass index (BMI) ranged from 22.5 to 31 kg/m^2 with some studies reporting higher BMI,[47,49] and other studies lower BMI in the frail compared to the non-frail patients (Table S2).[33,35,39–41,43–45,47]

Assessment of frailty

The most frequently used frailty assessment tools are described in Table 2. The FFP assesses the frailty criteria weight loss, weakness, slowness, exhaustion, and low physical activity. If three or more criteria are present an individual is considered frail, if one or two criteria are present prefrail. The FFP was used in 10 full-text and eight abstract publications.[26,29–31,33–37,39–45,48,49] The SPPB determines physical frailty and includes tests of physical functioning (gait speed, sit-to-stand test, and balance tests). The SPPB was used in four full-text and three abstract publications.[26,36,37,43–46]

Three studies used a slightly modified FFP with low appetite instead of weight loss.[40,41,48] The cumulative frailty index (FI) equals the proportion of health-related deficits that are present divided by the total number of assessed deficits. Four full-text and two abstract publications used the FI.[6,24,25,28,38] The Edmonton Frail Scale and the SHARE-Frailty Instrument were used in one full-text study.[32]

Prevalence and severity of frailty in ILD

Studies using the same frailty assessment tools were pooled for meta-analysis due to the heterogeneity introduced by different methods of frailty assessment. Furthermore, data from overlapping cohorts were excluded from meta-analysis. The low number of studies only allowed for meta-analysis of studies using the FFP (eight studies) and the SPPB (three studies). Two studies provided data for meta-analysis of FFP and SPPB data (Figure 1, Table S1).[37,43] The eight publications assessing FFP included 1194 patients with ILD. The pooled prevalence of frailty was 35% (95% CI 25%–45%) based on the random effects meta-analysis (Figure 3). A sensitivity analysis with only full-text publications showed a pooled frailty prevalence of 31% (95% CI 26%–36%) with a lower heterogeneity compared to the meta-analysis including also abstract publications (I^2 60% vs 87%). The three publications assessing SPPB included 383 patients with ILD. The pooled prevalence of frailty was 19% (95% CI 12%–28%) based on the random effects meta-analysis (Figure 4). A sensitivity analysis excluding the abstract showed a pooled frailty prevalence of 17% (95% CI 8%–28%) with similarly high heterogeneity (I^2 80% vs 72%).

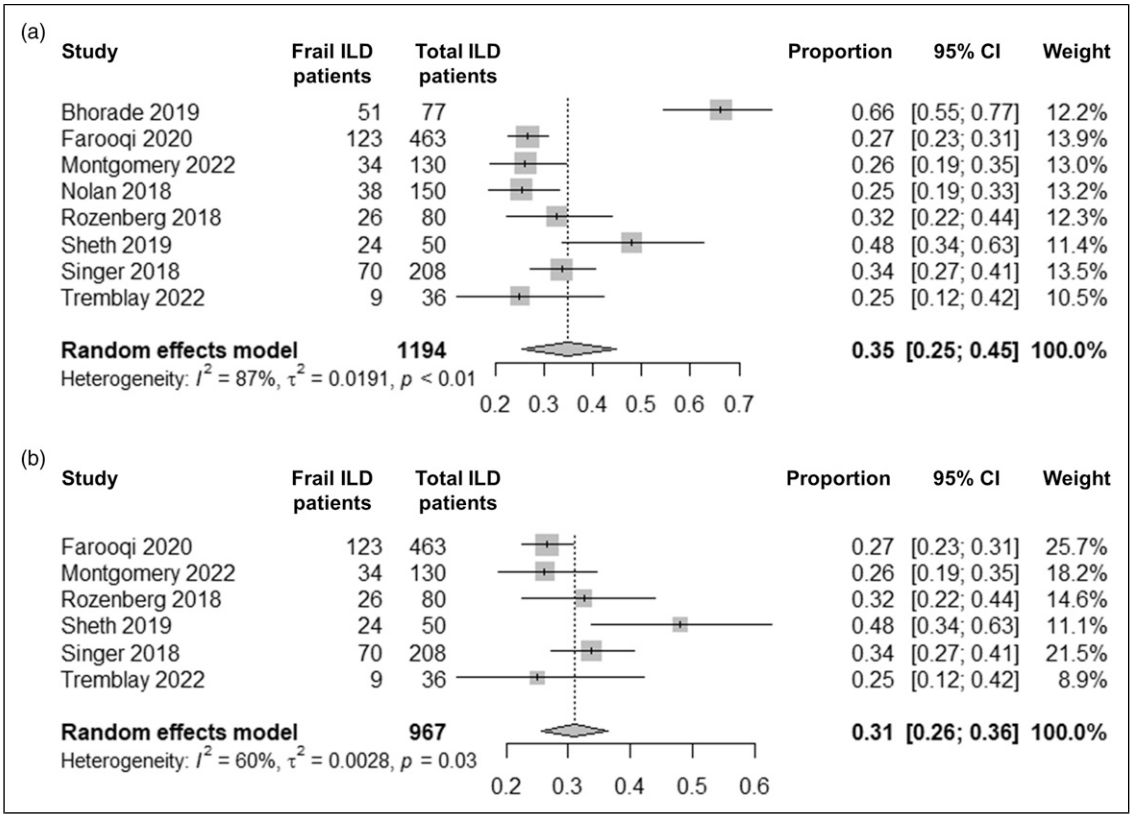

Figure 2. Prevalence of frailty in interstitial lung disease assessed by the Fried Frailty Phenotype in all studies (a) and in full-text studies only (b).

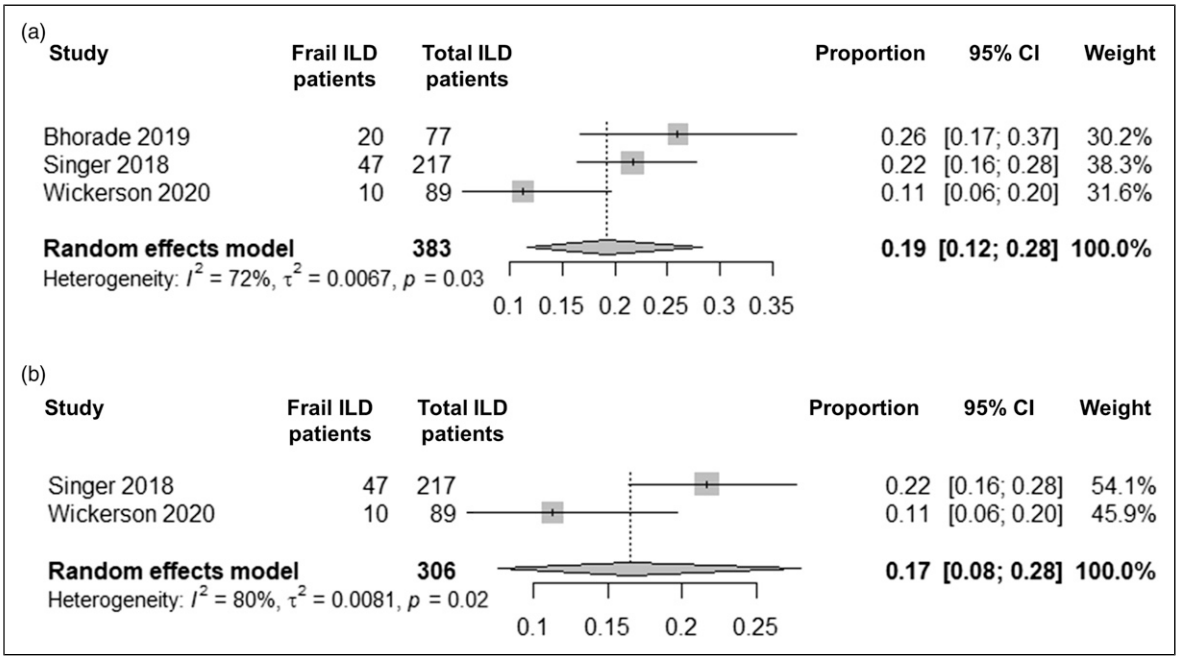

Figure 3. Prevalence of frailty in interstitial lung disease assessed by the Short Physical Performance Battery in all studies (a) and in full-text studies only (b).

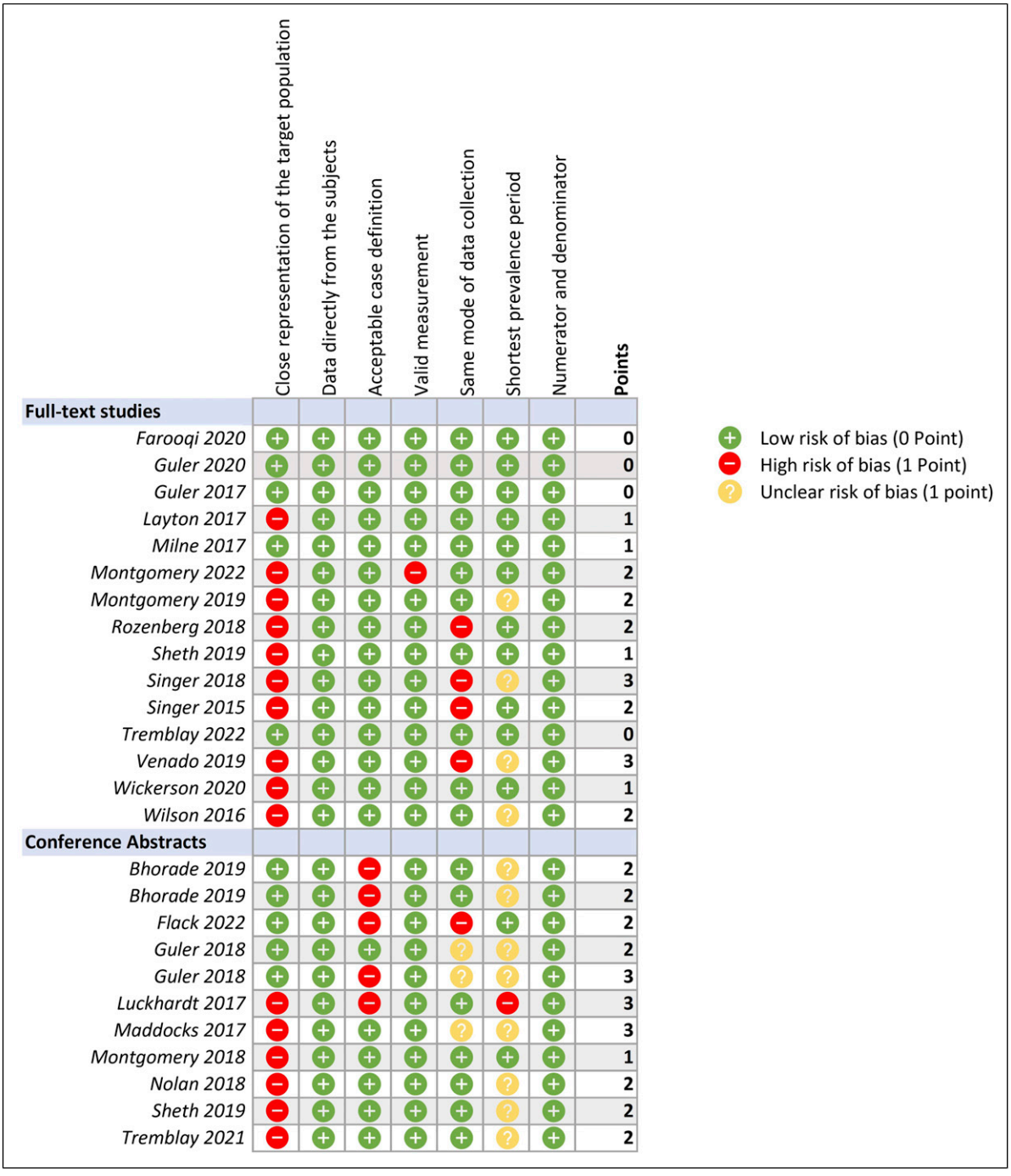

Figure 4. Risk of bias assessment.

Severity of frailty was inconsistently reported across studies; however, some studies reported the proportion of ILD patients with prefrailty. For the FFP, scores of 1-2 are considered prefrail. In addition to frailty, prefrailty was present in 53%–59% of the patients with fibrotic ILD.[29,30,32,36] Prefrailty was also reported in 40%-52% of IPF patients,[35,36] and in 56% of CTD-ILD patients.[36] For the SPPB, scores of 8-9 are considered prefrail. In addition to the frail patients, 14% of patients with fibrotic ILD,[46] 11% of patients with IPF, and 16% of patients with CTD-ILD were identified as prefrail.[36]

Studies using the FI reported frailty prevalences ranging between 37% and 55% in their ILD cohorts, with an additional 20%–24% of the cohorts with prefrailty.[6,24,25,28,38,47] The abstract publication using the SHARE-FI in a cohort of IPF patients reported 34% with

Table 2. Frailty assessment tools used in fibrotic interstitial lung disease.

Frailty assessment tool	Components	Scoring	References
Fried frailty phenotype	Weight loss (shrinking), weakness, slowness, exhaustion, low physical activity	Range: 0-5 points Frail: ≥ 3 Prefrail: 1-2	**Singer 2015**[44]**; Layton 2017**[39]**;** Maddocks 2017[31]; Nolan 2018[34]; **Rozenberg 2018**[42]**;** Bhorade 2019[26,37]; **Sheth 2019**[35]**; Farooqi 2020**[49]**; Tremblay 2022**[29]**;** Flack 2022[36]
Modified FFP	Low appetite instead of unintentional weight loss		Montgomery 2018[48]; **Montgomery 2020**[40]**; Montgomery 2022**[41]
Short physical performance battery	4MGS, 5R-STS, balance tests	Range: 0-12 points Frail: ≤7 points Prefrail: 8-10	**Singer 2015**[44]**; Singer 2018**[43]**; Venado 2019**[45]**;** Bhorade 2019;[26,37] **Wickerson 2020**[46]**;** Flack 2022[36]
Frailty index	32-42 health-related deficits	Range: 0-1 points 0 no deficits 1 all deficits present Frail: >0.21 Prefrail: 0.1-0.21	**Wilson 2016**[47]**; Milne 2017**[28]**; Guler 2017**[38]**;** Guler 2018[24,25]; **Guler 2020**[6]
Edmonton frail scale	Clock test, timed get up and go, mood, functional independence, medication, social support, nutrition, health attitudes, continence, burden of medical illness, quality of life	Range: 0-17 points Frail: >7 Mildly frail: 8-9 Moderately frail: 10-11 Severely frail: 12-17	**Luckhardt 2017**[32]
SHARE-frailty instrument	5 FFP domains, weight loss replaced by low appetite; slowness by self-report	Frail (women): <2.13 Prefrail (women): <6 Frail (men): <3 Prefrail (men): <7	**Luckhardt 2017**[32]

Bold references are full-text publications.
4MGS: four-meter gait speed; 5R-STS: five-repetition sit-to-stand test; FFP: Fried Frailty Phenotype.

frailty and an additional 40% of patients with prefrailty. The group suggested that the Edmonton Frail Scale, which identified frailty only in 7% of the same cohort, was less well suited for frailty assessment in IPF.[32]

Discussion

This systematic review includes 15 full-text and 11 abstract publications addressing frailty in 4614 patients. We found a wide variability in the approach to frailty diagnosis which highlights the need for standardisation and recommendations on how to assess frailty in patients with ILD. In studies using the FFP, the pooled prevalence of frailty in ILD was 35% (95% CI 25%–45%), while studies using the SPPB reported a prevalence of 19% (95% CI 12%–28%). Across-study heterogeneity was substantial and only reduced marginally when abstract publications were excluded. Therefore, caution is needed when interpreting our findings.

In the general population the prevalence of physical frailty is estimated at 3%,[50] with a gradually increasing prevalence in older populations,[12] and higher proportion of frailty in individuals with chronic diseases. For example, a large meta-analysis including more than 1 million people with diabetes identified 13% (interquartile range 9%–21%) who were diagnosed with frailty by the FFP. The frail diabetes patients had a higher risk for mortality, hospitalisations, and medication adverse events.[51] A recent meta-analysis reported 32% (95% CI 27%–37%) of patients with chronic obstructive pulmonary disease (COPD) to be affected by frailty, for this analysis studies using different frailty assessment tools including FFP and the Frailty Index were pooled.[52] Taken together, the pooled frailty prevalence we

established across ILD cohorts was substantially higher compared to the general population and patients with non-respiratory diseases, and is probably also higher compared to other respiratory diseases such as COPD. Few studies explored the prevalence of frailty in specific ILD subgroups. In the three studies comparing frailty prevalence in CTD-ILD versus other ILDs, a higher frailty prevalence in CTD-ILD was reported.[36–38] The frequent extrapulmonary symptoms and deficits might contribute to this higher frailty prevalence in CTD-ILD. Furthermore, women have more frequently CTD-ILD and less frequently non-CTD ILDs such as IPF compared to men, and women are consistently reported to be at a higher risk for frailty compared to men.[14]

In addition to the generic age-associated functional decline, patients with ILD are also exposed to several risk factors for accelerated ageing and frailty. Pulmonary and extrapulmonary symptoms, psychological deficits, comorbidities, a high treatment burden, and physical inactivity which can lead to sarcopenia, contribute to the development of frailty.[53–57] Furthermore, ILD patients frequently have biological features of accelerated ageing,[58,59] such as telomere shortening and senescence,[27,60,61] which might be even more important in ILD compared to other chronic lung diseases such as COPD.[61] In patients with fibrotic ILD, frailty is strongly associated with quality of life and a relevant predictor of mortality and frequent hospitalisations, independent of ILD severity.[27] Preoperative frailty is also associated with a 4-times higher risk of death after lung transplantation.[43] This emphasizes the importance for early recognition of frailty for prognostication, individual goal setting, allocation of health care resources, and interprofessional support.

The included studies used several different frailty assessment tools, with fairly consistent cut-offs for the definition of frailty and prefrailty. The most frequently used frailty tools both focus on physical frailty. The FFP describes a phenotype characterised by shrinking, weakness, slowness, exhaustion and low physical activity,[14] and the SPPB consists of a series of functional tests including gait speed, sit-to-stand test, and balance tests.[15] The cumulative Frailty Index is based on the concept of accumulation of health deficits that lead to a decrease in physiological reserves and increased vulnerability toward even minor stressors.[13] Different frailty assessment tools have different strengths and weaknesses and are useful for different clinical and research questions. The FFP and the SPPB for example have been demonstrated as valid tools to compare frailty before and after pulmonary rehabilitation,[62] as well as before and after lung transplantation.[45] In contrast, the Frailty Index is more suited to predict adverse outcomes in ILD.[27,63] In the general population,[50] in patients with COPD,[63] and consistently in our analyses the prevalence of frailty is lowest in studies that use the SPPB (pooled prevalence 19%), intermediate where the FFP is used (pooled prevalence 35%), and highest in studies using the cumulative Frailty Index (prevalence range 37%–55%). This variability highlights the importance of recognising the different aspects of frailty and choosing the frailty assessment tool that suits the clinical or research question.

This is the first systematic review on the prevalence of frailty in ILD. Due to the limited number of studies reporting the prevalence of frailty in ILD populations and the heterogeneity in frailty assessment methods, the extracted data allowed only for meta-analyses in the studies using the FFP and the SPPB. Furthermore, the few studies in the meta-analyses did not allow for meta-regression or further exploration of the causes for heterogeneity. Overall risk of bias was low in all identified studies; however, we identified a selection bias in 16 out of 26 publications, which might have impacted the estimated frailty prevalence. Selection bias was mainly due to inclusion of patients referred for lung transplantation evaluation or specific subgroups of ILD patients such as IPF or CTD-ILD.

There is a range of interventions to prevent and treat frailty in the general outpatient population, including physical exercise (specifically strength training) and nutritional counselling (specifically protein supplementation).[64] In COPD patients with frailty, pulmonary rehabilitation improves physical performance and symptoms possibly even more effectively compared to COPD patients without frailty,[62,65] with one study showing a reversal of frailty in more than 60% of pulmonary rehabilitation participants.[62] However, on average completion of programs is more challenging for frail individuals,[62] suggesting that these participants need additional support and possibly tailored programs.[66] In patients with ILD, pulmonary rehabilitation improves dyspnoea and physical performance,[67,68] which are important determinants of frailty in this population.[56] This suggests that pulmonary rehabilitation could serve as a promising intervention for frailty in patients with ILD. In the selected subgroup of ILD patients who undergo lung transplantation, a reversal of frailty is observed in more than 80% of transplant survivors,[45] which suggest that the severity of ILD itself is the major driver of frailty in this population, and might potentially also improve with effective pharmacological ILD treatment.

Frailty has generated a growing interest within the ILD community, presenting an opportunity to adopt a more holistic approach to ILD management. As our patient population ages and becomes increasingly complex with multiple concurring health problems, prioritizing the overall health state, rather than focusing solely on individual deficits (e.g., lung function), becomes increasingly important. However, our systematic review demonstrates the lack of consensus on how to assess frailty in ILD, and the currently used frailty assessment tools might be too complex and time-consuming for clinical practice in most

settings. The Clinical Frailty Scale is a short and simple 9-point scale administered by health care professionals and specifically designed for clinical practice.[69] Even though the CFS might not capture the complex state of frailty in full, studies including patients with lung diseases suggest a similar validity compared to the more complex frailty assessment tools.[70,71] This systematic review did not identify any published studies using the CFS in patients with ILD yet.

In summary, this systematic review and meta-analysis demonstrate that frailty is very common across ILD cohorts, but frailty assessment methods are used inconsistently, which reflects the lack of guidance on how to approach this common phenomenon in patients with ILD. With several frailty assessment tools available for research purposes, we also need simple but accurate tools to determine the overall health state in clinical practice. Management of frailty in chronic lung diseases might be most promising by individualized and multidisciplinary programs with flexible delivery approaches that target physical, mental, and social impairments.[66]

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Supplemental Material

Supplemental material for this article is available online.

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