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Outcome Measures to Evaluate Functional Recovery in Survivors of Respiratory Failure:

A Scoping Review

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Abstract

BACKGROUND: Respiratory failure is a life-threatening condition affecting millions of individuals in the United States annually. Survivors experience persistent functional impairments, decreased quality of life, and cognitive impairments. However, no established standard exists for measuring functional recovery among survivors of respiratory failure.

RESEARCH QUESTION: What outcomes are being used to measure and characterize functional recovery among survivors of respiratory failure?

STUDY DESIGN AND METHODS: In this scoping review, we developed a review protocol following International Prospective Register of Systematic Reviews (PROSPERO) guidelines. Two independent reviewers assessed titles and abstracts, followed by full-text review. Articles were included if study participants were aged 18 years or older, survived a hospitalization for acute respiratory failure, and received invasive mechanical ventilation as an intervention; identified function or functional recovery after respiratory failure as a study outcome; were peer-reviewed; and used any type of quantitative study design.

RESULTS: We reviewed 5,873 abstracts and identified 56 eligible articles. Among these articles, 28 distinct measures were used to assess functional recovery among survivors, including both performance-based measures (n = 8) and self-reported and proxy-reported measures (n = 20). Before 2019, 12 of the 28 distinct outcome measures (43%) were used, whereas 25 distinct measures (89%) were used from 2019 through 2024. The 6-min walk test appeared most frequently (46%) across the studies, and only 34 of 56 studies measured outcomes ≥ 6 months after discharge or study enrollment.

INTERPRETATION: Heterogeneity exists in how functional recovery is measured among survivors of respiratory failure, which highlights a need to establish a gold standard to ensure effective and consistent measurement. CHEST Critical Care 2024; 2(3):100084

Keywords

function; functional recovery; outcome measures; respiratory failure

Respiratory failure is a life-threatening condition affecting millions of individuals in the United States annually.[1] Mortality rates resulting from respiratory failure decreased from 34% to 23% between 2002 and 2017[1] before rising again as a result of COVID-19.[2] Survivors of respiratory failure frequently experience persistent impairments in function, cognition, and quality of life.[3,4] New or worsening disabilities in activities of daily living (ADLs), instrumental activities of daily living (IADLs), mobility activities, and endurance have been commonly reported.[3–5] These functional limitations reduce the capacity to work or participate in previous hobbies, which can impact overall well-being significantly.[6] Moreover, functional impairments can last 12 months or longer.[4] Those who were older at the time of illness, underwent sedation for a longer period, or experienced longer lengths of stay in the hospital are more likely to improve at slower rates and are less likely to recover function fully after discharge.[3,7,8]

Function has been described as the “ability to perform both basic and instrumental activities of daily living”[9] and “having the capabilities that enable all people to be and do what they

have reason to value."[10] However, *recovery* is a complex term without a clear definition, although functional recovery has been noted to be an important medical target, defined in part as regaining mobility.[11] Despite the fact that survivors, family members, critical care researchers, and clinicians agree that physical function is an important domain that should be measured,[12,13] no established gold standard exists for measurement of functional recovery.

A scoping review of study designs and instruments used in research on outcomes of ICU survivors between 1970 and 2013 found 17 different measures for physical activity and participation limitations.[14] Based on their findings, the authors called for consensus around a set of core outcomes for use in research on survivors of critical illness. A subsequent modified Delphi consensus to identify outcome measures for research evaluating survivors of acute respiratory failure did not reach consensus for outcomes measuring physical function.[15] Thus, heterogeneity may persist in how function or recovery are defined in critical care research, how functional impairment and recovery are measured, and what information is gathered for each metric.

The development of consensus around key outcome measurements is critical for moving intervention research forward by facilitating synthesis of clinical trial results.[16] To facilitate establishing standardized measures and outcomes, we aimed to estimate the frequency of use of different types of outcome measures and to assess whether these measures have been validated for survivors of respiratory failure.

Study Design and Methods

Search Strategy and Selection Criteria

We developed a protocol based on the International Prospective Register of Systematic Reviews (PROSPERO) guidelines to answer the question: What outcomes are being used to measure and characterize functional recovery among survivors of respiratory failure? *Function* was defined by the authors as the capacity to act or perform a specific task, and *functional recovery* was defined as physiologic improvement that allows for changes in mobility, self-care, housework, and completing errands or physical tasks. This protocol was not preregistered because PROSPERO does not accept registrations for scoping reviews. Because this was a scoping review and involved no human participants, no institutional review board review was required.

We developed search word criteria by reviewing PubMed Medical Subject Headings and key words. The search included terms focused on respiratory failure and functional recovery to identify relevant articles. A strategy was developed based on PubMed key words and then was adjusted to match search terms in other databases. Five bibliographic databases (MEDLINE/PubMed, CINAHL, Embase/Ovid, Web of Science, Cochrane) were searched from inception through April 16, 2024. The final search for included articles took place on April 16, 2024. All databases were searched using the same strategy (e-Appendix 1).

Inclusion criteria for studies in this review were: the study included participants aged 18 years or older who survived acute respiratory failure and received invasive mechanical

ventilation while hospitalized, the study identified function or functional recovery after respiratory failure as a study outcome, the study included any type of quantitative study design published in a peer-reviewed publication, and the articles were from any period. Exclusion criteria included abstracts and articles not available in English.

The resulting literature was imported into Covidence, a systematic review management application, for screening, full text review, and extraction.[17] Duplicates were removed automatically by the Covidence system when imported or were removed manually by screeners. Two team members (K. P. and L. M.) independently screened articles by title and abstract based on the inclusion criteria. Conflicts with title and abstract screening regarding study exclusion were resolved independently by a third team member (M. A. H.). The full-text review also was conducted by two team members (K. P. and L. M.) independently. Conflicts with full-text review regarding study exclusion were resolved by consensus between the two reviewers.

Data Synthesis

One team member (K. P.) extracted publication year, outcome measure(s), and data collection time points and location. Each outcome measure was catalogued by type of measure, components included, characterization of function, time point(s), and location(s) of administration.

Each measure was categorized as performance based or self-reported and proxy reported. Performance-based measures were defined as quantifiable, impartial, and typically performed with some sort of instrument or guide.[18] To catalog how measure components characterized function, the authors extracted information from foundational studies that described the methods to administer each measure. We also assessed whether included articles provided definitions of function, functional recovery, or both.

We divided our analysis of included articles into two periods: (1) before 2019 and (2) 2019 through 2024. The year 2019 was used as a cut off point to account for a publication lag after the 2017 publication of modified Delphi consensus recommendations.[15] This lag accounts for time needed to integrate the findings into the development of new research. Within the two periods, we assessed the number of distinct measures used to evaluate function or functional recovery and their frequency of use.

Results

Five thousand eight hundred seventy-three studies were screened, with 5,686 studies excluded based on title and abstract and 187 studies assessed for eligibility via full-text review. Of these, 129 studies were excluded for having the wrong patient population (n = 107), wrong study design (n = 19), or no full-text version available (n = 3). Two articles were merged with others because one performed secondary analysis of data[19] and another reported short-term outcomes of data[20] already in included articles. Thus, a total of 56 distinct studies were included in the final review (Fig 1). Among these 56 studies, 48 were published after 2013, which was the end point for article inclusion in the Turnbull scoping review.[14]

Measurement of Function

Among the 56 included articles, 28 different methods were used to assess function and functional recovery among survivors of respiratory failure. Although a variety of outcome measures were used, only 25% of measures were used more than twice across included studies (Fig 2). For the performance-based measures identified (n = 8), assessments were performed by a trained clinician or researcher, whereas self-reported and proxy-reported measures (n = 20) typically were questionnaires that were collected from participants, proxies, or health care providers.

The following outcomes were used to measure function objectively: the 6-min walk test (6MWT) was used in 46% (n = 26) of studies,[3,21–45] muscle strength was used in 34% (n = 19) of studies,[22,27,34,35,39,41,43,44,46–56] gait speed was used in 11% (n = 6) of studies,[34,39,46] the Short Physical Performance Battery[7,47,51] was used in 5% (n = 3) of studies, balance testing[40,41] and the Functional Status Score for the ICU (FSS-ICU)[54,56] each were used in 4% (n = 2) of studies, and the Functional Independence Measure[57] and the Continuous Scale Physical Functional Performance[58] each were used in 2% (n = 1) of studies.

Self-reported and proxy-reported measures used to assess function included the Barthel Index (BI) in 16% (n = 9) of studies,[38,39,48,52,55,57,59–61] the 36-Item Short-Form Physical Function Scale in 13% (n = 7) of studies,[3,22,37,44,47,51,62] and the Borg Rating of Perceived Exertion and the ICU Mobility Score[31,50,52,60,63] each in 9% (n = 5) of studies.[24,36,41,64,65] St. George's Respiratory Questionnaire,[24,36,41,42] the Functional Performance Inventory,[22,34,47,51] and IADL[49,66–68] each appeared in 7% (n = 4) of studies; the Katz Index of Activities of Daily Living (KADL)[44,69,70] and Modified Medical Research Council Dyspnea Scale[36,41,67] each appeared in 5% (n = 3) of studies. The Manchester Mobility Score,[48,71] self-reported mobility activities,[50,72] World Health Organization Disability Assessment Schedule score,[49,66] Functional Ambulation Classification,[64,65] Glasgow Outcome Scale-Extended,[64,65] and Duke Activity Status Index[46,70] each appeared in 4% (n = 2) of studies; and the Perme ICU Mobility Score,[55] Activity Measure for Post-Acute Care "6 Clicks,"[55] International Physical Activity Questionnaire Short Form,[41] and an informal measure for ADLs[72] each appeared in 2% (n = 1) of studies. Finally, elements of the EQ-5D-3L were used to measure function in 2% (n = 1) of studies, including the visual analog scale utility score and individual mobility, self-care, and activities scores.[22]

Among the 28 outcomes across 56 studies, studies varied in how each measure was applied (Table 1). The KADL (n = 3) and BI (n = 9) include questions on bathing, grooming, dressing, toileting, continence, feeding, and transferring,[73,74] whereas IADLs (n = 4) assess doing laundry and housekeeping, shopping, using the telephone, managing medications, and handling finances.[75] An additional nine outcomes assessed self-care, household management, or both, but did not use complete ADL scales or IADL scales.[72–85] Other measures assessed basic patient mobility, such as rolling in bed, sitting at the edge of the bed, transferring from bed to chair, and transferring from sitting to standing.[76,81–84,86–89] Various measures looked more closely at gait and general ambulation,[34,72,74,79,81–83,86–93] balance and endurance,[92,94] tolerance of activity performance,[76–78,85,95,96] and ease of performance of strenuous activities.[79–81,91,93]

Of these 28 measures, only four have been validated for use with patients in the ICU: the BI, ICU Mobility Score, Manchester Mobility Score, and FSS-ICU.[97–100] Furthermore, only two measures, the 6MWT and 4-m gait speed test, have been validated for use with survivors of acute respiratory failure.[23,101]

Time Points and Location of Data Collection

Studies varied in the timing and location of data collection. Time points for collection included during hospital stay (n = 8),[46,50,52,54–56,69,70] at ICU discharge (n = 10),[18,39,48,50,53,54,56,57,60,71] at hospital discharge (n = 11),[7,39,47,51–53,56,59,60,63,71] and any combination of 1 to 12 months (n = 40)[3,7,22–45,47,49–51,58,61,62,65–68,70,72, 101] or > 1 year (n = 6)[3,21,27,45,68,101] after discharge or study enrollment. More specifically, the end points of data collection varied, with only 34 of 56 studies measuring outcomes ≥ 6 months after discharge or enrollment. An end point of 6 months appeared in 19 studies (34%), an end point of 12 to 23 months appeared in 10 studies (18%), and an end point of ≥ 24 months appeared in five studies (9%) (Fig 3).

Locations of data collection also varied and included: via phone or mail (n = 9),[25,49,50,55,64–67,72] in participant homes (n = 6),[3,22,27,34,35,37] in outpatient clinics (n = 18),[3,21–30,32,37,38,45,61,68,101] in rehabilitation facilities (n = 4),[31,34,35,40] and in hospitals (n = 17)[36,39,46,48,50–57,59,60,63,69,71] (Table 2).

Timing of Outcome Measure Use

Of 56 studies, 17 studies (30%) were published before 2019 and 39 studies (70%) were published from 2019 through 2024. Before 2019, 12 of the 28 distinct outcome measures (43%) were used. From 2019 through 2024, 25 distinct outcome measures (89%) were used. Sixteen of the 26 included articles using the 6MWT (62%) were published from 2019 through 2024.

Definition(s) of Function or Functional Recovery

Three studies (5%) provided definitions of function for selection of outcome measures. Two articles used the World Health Organization's International Classification of Functioning, Disability, and Health framework[37,44] and one used the Nagi Disablement Model[47] to define function. The 53 remaining articles did not define function.

Discussion

In this scoping review, we found 28 distinct approaches measuring functional recovery among survivors of respiratory failure. Inconsistent measurement of survivors' outcomes after respiratory failure creates an uneven landscape in which to evaluate studies of long-term functional recovery and limits understanding of survivor experiences.

National and international groups have endeavored to articulate best practices for measures to assess recovery after critical illness, including the National Heart, Lung, and Blood Institute, the Society of Critical Care Medicine, and the Multisociety Task Force for Critical Care Research. They overwhelmingly recommended that researchers standardize the use of

outcomes across studies of critically ill populations.[102–104] However, a 2017 international modified Delphi consensus study attempted to identify a set of core outcome measures for use in research on survivors of acute respiratory failure, but was unable to reach consensus for physical function outcomes.[15] Our findings suggest that the lack of consensus on approaches to measuring these outcomes is reflected in continuing heterogeneity in study outcomes, limiting the accumulation of harmonized outcome data necessary for systematic review and meta-analysis.

Two-thirds of included studies were published after the publication of the Delphi consensus recommendations. Although no recommendations for measuring physical function emerged, the authors suggested the 6MWT as one suitable metric to assess physical function.[15] Despite this suggestion, our findings suggest that heterogeneity persists in assessment of function. As research in respiratory failure survivorship continues to grow, a need for consensus around measurement of physical function remains.

Our review also identi*fi*ed substantial variation in the application of measures. Some items were assessed independently in a given measure, such as ADLs and IADLs from the KADL and Lawton IADL questionnaires, respectively,[73,75,90] or gait speed in the 6MWT.[90] However, most outcome measures assessed a combination of items derived from multiple scales. Thus, even when established measures such as IADLs and ADLs were used, lack of harmonization prevented comparison across studies.

We further found that most measures used in studies of functional recovery after critical illness have not been validated for use in this population. Of 28 measures, only four—the BI, ICU Mobility Score, Manchester Mobility Score, and FSS-ICU—have been validated independently for use with patients in the ICU.[97–100] More speci*fi*cally, criterion validity was established for the BI by comparing its score with those of the ICU Mobility Score and the FSS-ICU[97] and for the Manchester Mobility Score by comparing it with the BI.[99] The ICU Mobility Score is correlated moderately with muscle strength, demonstrating good construct validity,[98] whereas the FSS-ICU has good convergent and discriminant validity.[100] Furthermore, the BI and FSS-ICU have good internal consistency in the ICU population,[97,100] and the BI and Manchester Mobility Score have high interrater reliability.[97,99]

Only two measures—the 6MWT and 4-m gait speed test—have been validated for use with survivors of acute respiratory failure.[23,101] Both the 6MWT and 4-m gait test have moderate to strong correlations with several physical health measures, indicating good construct validity in this population.[23] The 4-m gait speed test also has weak correlation with mental health measures supporting discriminant validity. Additionally, the 4-m gait speed test has excellent interrater reliability.[101]

Some studies used the 36-Item Short-Form Physical Function Scale (n = 7) or the mobility, self-care, and activities scores of the EQ-5D-3L (n = 1) to measure function. Multiple consensus groups have established that these complete measures are best suited for measuring quality of life among survivors of critical illness, not functional status.[15,105] However, evidence supporting the use of individual mobility or self-care items as valid

measures of physical function is limited.[106] If functional status and functional recovery are not measured comprehensively, the needs of survivors may not be met.

When researchers select outcome measure(s), they should ensure that the instrument(s) is validated to confirm it captures what it intends to measure.[107] Without this validation, it is not certain that the outcome will measure the degree of change that occurs in a critically ill population effectively. For instance, multiple validation studies for the Functional Independence Measure were performed on individuals recovering from a stroke or traumatic brain injury or undergoing neurorehabilitation,[108–111] whereas others have validated the KADL for community-dwelling older adults.[112,113] Individuals recovering from a neurologic event or who are community-dwelling older adults may have different clinical presentations compared with those recovering from acute respiratory failure. Furthermore, reliance on outcomes not validated in a particular population impedes identification of floor or ceiling effects.[114] This is important because it may impact the sensitivity and specificity of functional outcome measures used.

Although a gold standard measurement for functional recovery among survivors of respiratory failure has not yet been established, we found that some measures were used more than others. Among all outcome measures, the 6MWT (n = 26 [46%]) was used most frequently. The 6MWT is a long-standing measure of functional capacity. It has been shown to be valid and responsive among survivors of acute respiratory failure[23] and received the highest score for the physical function outcome in the recent modified Delphi consensus study.[15] Furthermore, the 6MWT is appealing because it requires little time or training to administer. However, the results of the 6MWT are sensitive to peripheral artery disease, musculoskeletal conditions, nutritional status, cognitive function, age, sex, height, and weight. Although prediction equations are available to adjust for the latter four variables, it is unclear if these can provide meaningful insight when evaluating within-group differences in function among survivors of respiratory failure.[115] Self-care also was assessed commonly in included studies. Of these, the BI, which assesses ADLs and basic household mobility,[74] has been validated for use among populations after critical illness.[97]

We also found heterogenous approaches to the timing and setting of functional status measurement. This is presumably in part the result of differences in the research question and study design. Data collection ranged from during hospital stay to 5 years after discharge or study enrollment, and only 34 of 56 studies included follow-up at ≥ 6 months. The 2002 Brussels Roundtable, a consensus conference convened by the European Society of Intensive Care Medicine, American Thoracic Society, and Society of Critical Care Medicine, recommended that all clinical trials should include follow-up of at least 6 months to measure outcomes.[105] However, the optimal follow-up period remains unclear.

Finally, although mortality rates resulting from respiratory failure declined in recent decades,[1] disparities in mortality by race and ethnicity persist.[8,116,117] Research has demonstrated that Black patients have higher rates of in-hospital mortality than non-Hispanic White patients.[116,118] Hispanic patients and patients who identify as Asian and Pacific Islander also have been shown to have higher odds of in-hospital mortality resulting from respiratory failure.[8,116,117] These trends continued among patients who were

hospitalized with respiratory failure because of COVID-19.[119] However, a dearth of studies have examined racial and ethnic disparities in morbidity after discharge. None of the studies included in this review examined whether functional outcomes differed by race, ethnicity, or both.

Our findings expand and deepen those of a 2016 scoping review that identified outcome measures used in research on critical illness. In their conclusion, the authors called for further work to facilitate consensus on a core set of measures that accurately assess the outcomes among survivors. The present review of measures used to assess functional recovery among survivors of respiratory failure suggests that consensus remains elusive. Nonetheless, by analyzing the frequency and validity of heterogenous measures that appear in the literature, we provide the foundation for an emerging consensus that the 6MWT is a reliable and frequently used option for assessing functional recovery. The 2016 review noted that 16 of 20 included articles looking at physical activity limitations used the 6MWT.[14] This is consistent with the finding in our review that the 6MWT was the most frequently used outcome measure. Furthermore, 50% of the modified Delphi consensus panel agreed that the 6MWT was “critical” for inclusion as a core outcome of survivors of respiratory failure.[15]

This scoping review has several strengths. To our knowledge, this is the first review of functional recovery outcomes in survivors of acute respiratory failure. Our team included a research librarian and content experts, ensuring a thorough review. Our approach included multiple independent reviews for screening and full-text review, with high interrater reliability, and provided clear documentation of articles included. Finally, we found that 85% of studies in the present review postdated the influential 2016 review by Turnbull et al.[14]

This review also has some limitations. Although the search process was thorough, eligible studies may have been excluded inadvertently. However, we developed specific inclusion and exclusion criteria, and all abstracts and full-text articles were reviewed in duplicate to minimize this risk. We did not include studies that assessed functional recovery using qualitative methods. Although we acknowledge qualitative methods are important to the development of valid and reliable outcomes for survivors of respiratory failure, we limited this review to include only quantitative outcomes because they can be compared, reviewed, and aggregated for meta-analysis easily. Finally, although acute respiratory failure is one of the most common reasons for admission into neonatal and PICUs,[120] our review was limited to measurement of functional impairment among adults.

Interpretation

Among 56 studies that evaluated functional impairment of survivors of respiratory failure, we found 28 distinct approaches to measurement. The 6MWT was the most commonly used validated outcome measure in this population. Among measures relying on patient self-report, the BI was the most commonly used and has been validated for survivors of critical illness. A need exists to establish a gold standard for the evaluation of functional recovery among survivors of respiratory failure to ensure effective and consistent measurement.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ABBREVIATIONS:

6MWT	6-min walk test
ADL	activity of daily living
BI	Barthel Index
FSS-ICU	Functional Status Score for the ICU
IADL	instrumental activity of daily living
KADL	Katz Index of Independence in Activities of Daily Living

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Take-home Points

Study Question:

What outcomes are being used to measure and characterize functional recovery among survivors of respiratory failure?

Results:

We identified 56 eligible articles. Among these articles, 28 distinct measures were used to assess functional recovery among survivors, including both performance-based measures (n = 8) and self-reported and proxy-reported measures (n = 20). Before 2019, 12 of the 28 distinct outcome measures (43%) were used, whereas 25 distinct measures (89%) were used from 2019 through 2024. The 6-min walk test appeared most frequently (46%) across the studies, and only 34 of 56 studies measured outcomes ≥ 6 months after discharge or study enrollment.

Interpretation:

Heterogeneity exists in how functional recovery is measured among survivors of respiratory failure, which highlights a need to establish a gold standard to ensure effective and consistent measurement.

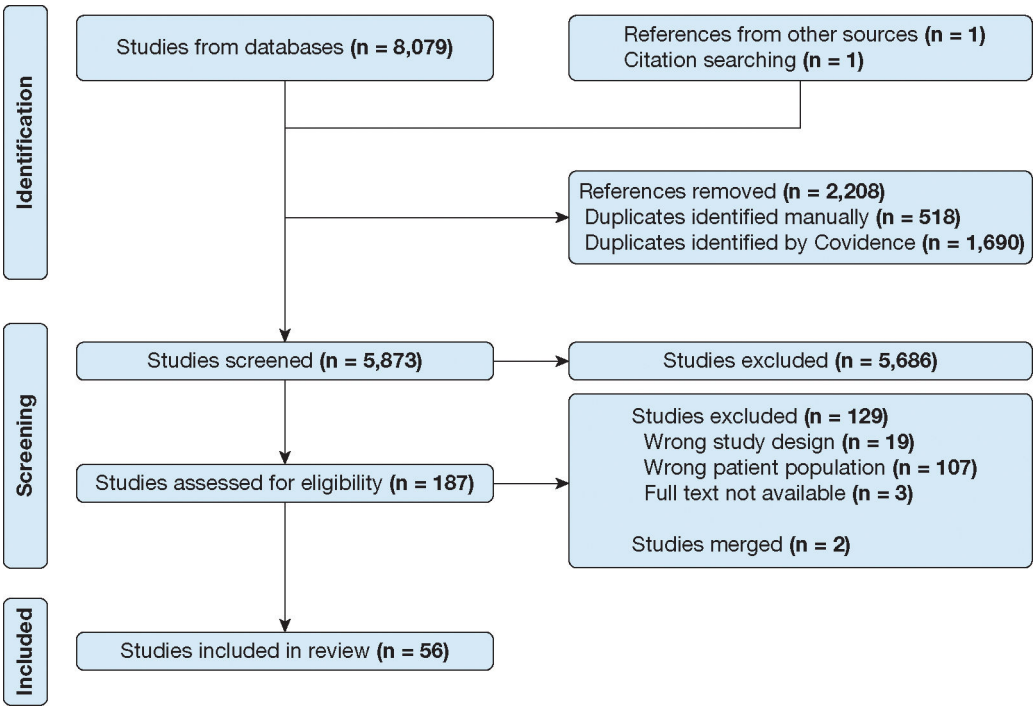

Figure 1 –.
Flow chart showing study process.

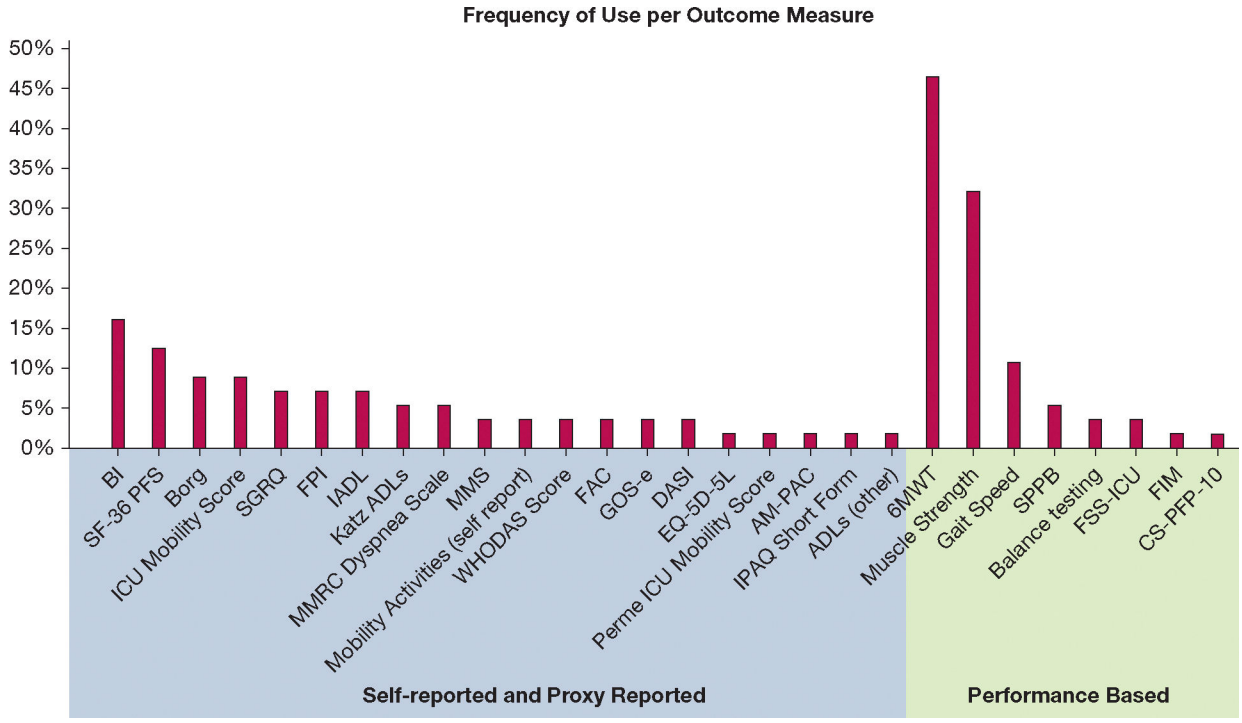

Figure 2 –.

Bar graph showing the frequency of outcome measures used in included studies. 6MWT = 6-min walk test; ADL = activity of daily living; AM-PAC = Activity Measure for Post-Acute Care “6 Clicks”; BI = Barthel Index; Borg = Borg Rating of Perceived Exertion; CS-PFP-10 = Continuous Scale Physical Functional Performance Short Form; DASI = Duke Activity Status Index; FAC = Functional Ambulation Classification; FIM = Functional Independence Measure; FPI = Functional Performance Inventory; FSS-ICU = Functional Status Score for the ICU; GOS-e = Glasgow Outcome Scale; IADL = instrumental activity of daily living; IPAQ = International Physical Activity Questionnaire; MMRC = Modified Medical Research Council; MMS = Manchester Mobility Score; SF-36 PFS = 36-Item Short-Form Physical Function Scale; SGRQ = St. George’s Respiratory Questionnaire; SPPB = Short Physical Performance Battery; WHODAS = World Health Organization Disability Assessment.

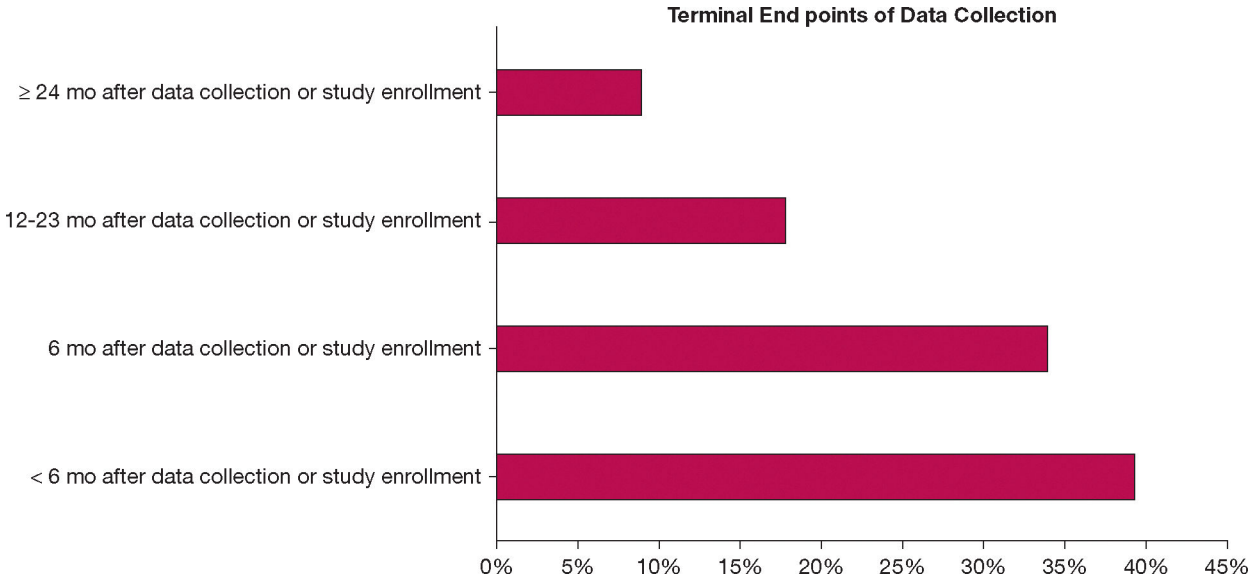

Figure 3 –.

Bar graph showing the proportion of studies with terminal end points of data collection at ≥ 24 months (9% [n = 5]), at 12 to 23 months (18% [n = 10]), at 6 months (34% [n = 19]), and at < 6 months (39% [n = 22]).

table 1]

Components of Outcome Measures Used in Included Studies

Outcome Measures	IADLs								ADLs					
	Use of Telephone	Shopping	Food Preparation	House keeping	Doing Laundry	Using Transportation	Handling Medications	Maintaining Finances	Dressing	Bathing	Grooming	Feeding	Toileting	Continence
36-Item Short-Form PFS	…	X	…	X	…	…	…	…	X	X	…	…	…	…
Barthel Index	…	…	…	…	…	…	…	…	X	X	X	X	X	X
SGRQ	…	…	…	X	…	…	…	…	X	X	…	…	…	…
Borg Rating of Perceived Exertion	…	…	…	…	…	…	…	…	…	…	…	…	…	…
ICU Mobility Score	…	…	…	…	…	…	…	…	…	…	…	…	…	…
KADL	…	…	…	…	…	…	…	…	X	X	…	X	X	X
IADL	X	X	X	X	X	X	X	X	…	…	…	…	…	…
FPI	…	X	X	X	…	…	…	…	X	X	X	…	…	…
MMRC dyspnea scale	…	…	…	…	…	…	…	…	…	…	…	…	…	…
MMS	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Mobility activities (self-report)	…	…	…	…	…	…	…	…	…	…	…	…	…	…
WHODAS score	…	…	…	…	…	…	…	…	X	X	…	X	…	…
EQ-5D-3L	…	…	…	…	…	…	…	…	X	X	…	…	…	…
DASI	…	…	…	X	…	…	…	…	X	X	…	…	X	…
Functional Ambulation Classification	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Perme ICU Mobility Score	…	…	…	…	…	…	…	…	…	…	…	…	…	…
AM-PAC	…	…	…	…	…	…	…	…	…	…	…	…	…	…

IPAQ Short Form	…	…	…	…	…	…	…	…	…	…	…	…	…	…
ADLs (other)	…	X	X	X		X	X		X	X	X	X	X	…
6MWT	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Muscle strength	…	…	…	…	…	…	…	…	…	…	…	…	…	…
SPPB	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Gait speed	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Balance testing	…	…	…	…	…	…	…	…	…	…	…	…	…	…
FSS-ICU	…	…	…	…	…	…	…	…	…	…	…	…	…	…
FIM	…	…	…	…	…	…	…	…	X	X	X	X	X	X
CS-PFP-10	…	X	…	X	X	X	…	…	X	…	…	…	…	…

Mobility		Gait					Balance and Endurance				General Activities		
Transfers	**Bed Mobility**	**Timed Walk**	**Walking Distance**	**Walking Environment**	**Ease of Walking or Exertion**	**Stair Negotiation**	**Stabilimeter**	**Semitandem or Tandem Stance**	**Timed Up and Go**	**Timed Sit to Stand**	**Leisure Activities or Exercise**	**Work Activities**	**Strength**
…	…	…	X	…	X	X	…	…	…	…	…	…	…
X	…	…	…	…	X	X	…	…	…	…	…	…	…
…	…	…	…	X	X	X	…	…	…	…	X	…	…
…	…	…	…	…	X	…	…	…	…	…	…	…	…
X	X	…	…	…	X	…	…	…	…	…	…	…	…
X	…	…	…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	X	X	…	…	…	…	X	…	…
…	…	…	X	…	X	X	…	…	…	…	X	…	…
X	X	…	X	…	X	…	…	…	…	…	…	…	…
…	…	…	X	X	X	X	…	…	…	…	…	…	…
X	…	…	X	X	X	…	…	…	…	…	X	X	…
…	…	…	…	…	X	…	…	…	…	…	X	X	…
…	…	…	X	X	…	X	…	…	…	…	X	…	…
…	…	…	…	…	…	…	…	…	…	…	…	…	…
X	X	…	…	…	X	…	…	…	…	…	…	…	X

X	X	...	X	...	X	X	...	...	...	...	...	...	...
...	...	...	X	X	X	...	...	...	...	...	X	X	...
...	...	...	...	...	X	...	...	...	...	...	...	...	...
...	...	X	X	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	X
...	...	X	...	...	...	...	...	X	...	X	...	...	...
...	...	X	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	X	...	X	...	...	...	...
X	X	...	...	...	X	...	...	...	...	...	...	...	...
X	...	...	...	...	X	X	...	...	...	...	...	...	...
X	...	X	X	...	...	X	...	...	...	...	...	...	...

Table showing components of outcome measures used in included studies. Included components annotated with X. 6MWT = 6-min walk test; ADL = activity of daily living; AM-PAC = Activity Measure for Post-Acute Care “6 Clicks”; CS-PFP-10 = Continuous Scale Physical Functional Performance Short Form; DASI = Duke Activity Status Index; FPI = Functional Performance Inventory; FSS-ICU = Functional Status Score for the ICU; FIM = Functional Independence Measure; IADL = instrumental activity of daily living; IPAQ = International Physical Activity Questionnaire; KADL = Katz Index of Independence in Activities of Daily Living; MMRC = Modified Medical Research Council; MMS = Manchester Mobility Score; PFS = Physical Function Scale; SPPB = Short Physical Performance Battery; SGRQ = St. George’s Respiratory Questionnaire; WHODAS = World Health Organization Disability Assessment.

table 2]

Frequency of Location for Data Collection in Included Studies

Location of Data Collection	No. (%)
In outpatient clinc	18 (32)
In hospital	17 (30)
Via phone or mail	9 (16)
Not specified	9 (16)
In participant's home	6 (11)
Other	5 (9)
In rehabilitation facility	4 (7)