6. Tables of Tools to Measure Oncology Nursing-Sensitive Patient Outcome: Dyspnea

These tables include instruments or tools that measure a person's subjective perception of dyspnea. They do not include items or subscales from other multidimensional symptom or quality-of-life instruments. The tables exclude physiologic parameters such as pulmonary function studies or measures of oxygen saturation that assess respiratory compromise. Attempts to correlate physiologic tests with subjective measurement of the severity of dyspnea are many, but no consistent evidence exists across disease entities.

Table 6A. Description of Tools

Name of tool	Author / Year	Domains or Factors	# of Items	Scaling	Scoring	Language
Baseline Dyspnea Index (BDI) or Transition Dyspnea Index (TDI)	Mahler et al., 1984	Severity of dyspnea in three different categories: functional impairment, magnitude of task, and magnitude of effort	3 categorical items assessed by observer interviewer then dyspnea graded from severe to unimpaired	BDI – 5 grade rating from 0 (severe) to 4 (unimpaired) TDI – change in dyspnea rated by seven grades ranging from -3 (major deterioration) to +3 (major improvement)	BDI has baseline focal score range from 0 to12. TDI has a transition focal score range from -9 to +9.	English
British Medical Research Council (BMRC) or Medical Research Council (MRC) Dyspnea scale And Modified MRC scale	Bestall et al., 1999 Mahler et al., 1987, 1988, 1989 (Secondary source)	Grades of breathlessness experienced with physical activities e.g. walking, hurrying on level ground, walking up hill	5 point scale self administered or by an interviewer	Categorical scale quantifying breathlessness in grades: 1 (I only get breathless with strenuous exercise) to 5 (I am too breathless to leave the house).	Grades 1-5	English
Cancer Dyspnoea Scale (CDS) **	Tanaka et al., 2000	Multidimensional nature of dyspnea (sense of effort, sense of anxiety, sense of discomfort)	12 items	5 point scale from 1 (not at all) to 5 (very much)	The maximum total score is 48: 20 points for sense of effort, 16 for sense of anxiety, and 12 for sense of discomfort. The higher the score, the more severe the dyspnea.	English Japanese

Name of tool	Author / Year	Domains or Factors	# of Items	Scaling	Scoring	Language
Chronic Respiratory Disease Questionnaire (CRQ)	Guyatt et al., 1987	Dyspnea, fatigue, emotional function, mastery (the feeling of control over disease)	20 items administered by interviewer	1 (extreme) to 7 (none or not at all) Likert categorical scale	Overall score can be reported for all four components. Author recommends scoring dyspnea separately and not including in overall score.	English
Modified Borg Scale (MBS)	Borg, G.V., 1982	Exertional dyspnea. Rating of perceived exertion (RPE) "suitable for determining other subjective symptoms such as breathing difficulties, aches and pains" (Borg, 1982, p.380)	Vertical 0 - 10+ item scale with words describing degrees of perceived exertion anchored to numbers	Categorical scale with ratio properties	One point in time value indicated by subject	English, French, German, Japanese, Hebrew, Russian
Oxygen-cost diagram (OCD)	McGavin et al. 1978	Daily activities corresponding to perceived increasing oxygen demand	100 mm vertical visual analog scale with 13 activities listed at various points along the line	Patient places mark on line corresponding to point above which they think their breathlessness would not let them go	Score is the distance of the mark in millimeters above zero	English
Pulmonary Function Status and Dyspnea Questionnaire (PFSDQ)	Lareau et al., 1994	Dyspnea intensity with activities and the effect of dyspnea on activities of daily life	164 item paper and pencil self-administered questionnaire	Dyspnea component: 0 to 10 numerical rating scale with the words none, mild, moderate and very severe at numbers 0, 3, 5, and 10 to rate dyspnea with each of 79 activities. Functional ability component: a Likert scale from 1 (as active as I've ever been) to 7 (have omitted entirely) to rate the degree to which activities have been modified at the present time compared with before the onset of COPD	Dyspnea Index is obtained by summing the dyspnea scores rated 7 or greater and an activity index is obtained by adding activity ratings 6 or greater	English

Name of tool	Author / Year	Domains or Factors	# of Items	Scaling	Scoring	Language
University of California, San Diego (UCSD) Shortness of Breath Questionnaire (SOBQ)	Eakin et al., 1998	ADL related shortness of breath	24 items	6 point Likert categorical scaling (0 = not at all to 5 = maximal or unable to do) to indicate severity of shortness of breath during 21 ADLs	Scored by summing responses across all 24 items to form total score (range 0-120)	English
Visual Analog Scale (VAS)**		Symptom intensity	1 item	100 mm line (either vertical or horizontal) with anchors at either end to indicate extremes of the sensation	Measuring the distance from the bottom of the scale (or left if it is horizontal) to the level indicated by the subject	

**This tool has evidence of either reliability or validity in patients with cancer. Most of the included tools report measurement of dyspnea in various respiratory diagnoses. When possible, the tables indicate if the tools measure dyspnea or exertional dyspnea.

Table 6B. Psychometric Properties of Tools

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
Baseline Dyspnea Index (BDI) / Transition Dyspnea Index (TDI)	1. 38 patients with respiratory disease (Mahler et al., 1984) 2. 24 patients with obstructive airway disease (Mahler et al., 1987) 3. 153 patients with shortness of breath in various medical diseases (Mahler & Wells, 1988)	*Reliability* No data available *Validity* 1. Convergent: BDI correlated with 12 minute walk test (12 MW) ($r = 0.60$, $p < 0.001$) TDI correlated with 12 MW ($r = 0.33$, $p = 0.04$) 2. Convergent: Clinical ratings of dyspnea on BDI were highly correlated with Medical Research Council (MRC) and Oxygen-Cost Diagram (OCD) scales (r = 0.79, -0.83 and 0.71 p.< 0.001) (Mahler et al., 1987) 3. Scores from BDI correlated with MRC and OCD scales (r = 0.48 - 0.70, $p < 0.001$) (Mahler & Wells, 1988)		"The BDI is easy to administer and useful for measuring baseline dyspnea. The TDI may be best used to measure the effects of disease progression and the outcomes of treatment" (Scott, 2004, p. 529).	
British Medical Research Council (BMRC) or Medical Research Council (MRC) dyspnea scale and Modified MRC scale	1. 1,030 men answered questions on breathlessness and 994 performed spirometry in a study to determine the effect of inhaled cement dust on ventilatory function (Vestbo et al., 1988) 2. 24 patients with obstructive airway	*Reliability* No data available *Validity* 1. Construct Validity of four BMRC breathlessness questions is determined by multivariate logistic regression analysis with age, occupation category, body mass index (BMI)	Lack of clear limits between grades (American Thoracic Society [ATS], 1999); not sensitive enough to detect small but possibly significant symptomatic changes (van der Molen, 1995)	Assumes patient has some mobility	

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
BMRC or MRC dyspnea scale and Modified MRC scale *(Continued)*	disease (Mahler et al., 1987) 3. 153 patients with shortness of breath in various medical diseases (Mahler & Wells, 1988) 4. 20 patients with interstitial lung disease (Mahler et al., 1989)	and one-second forced expiratory volume (FEV^1). (Vestbo et al., 1988) 2. Convergent: Modified MRC scale was correlated highly (r = 0.79, -0.83 and -0.71 p = 0.001) with OCD and BDI scales (Mahler et al., 1987) 3. Convergent: Dyspnea scores on MRC, OCD, and BDI were significantly correlated (r = 0.48 - 0.70, $p<0.001$) (Mahler & Wells, 1988) 4. Convergent: Values for breathlessness were significantly correlated (MRC vs OCD r = -0.80; MRC versus BDI r = -0.87, and OCD versus BDI r = 0.70; p=0.001) (Mahler et al., 1989).			
Cancer Dyspnoea Scale (CDS)**	1. 166 adults with lung cancer (Tanaka et al., 2000) 2. 157 outpatients with lung cancer (Tanaka et al., 2002)	<u>*Reliability*</u> 1. Internal consistency: average Cronbach's alpha for three factors = 0.86. Test –retest correlation coefficients between each factor and the total score = 0.71, 0.69 and 0.58 respectively ($p < 0.005$) <u>*Validity*</u> 1.Intersubscale: correlations were significant with a mean		Simple and easy to complete. Administration of tool takes average 140 seconds (Tanaka et al., 2000). Difficulty is that it asks patients to rate dyspnea during the past few days which could be variable and confusing to the patient. May not be helpful to rate clinical change caused by treatment	

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
CDS *(Continued)*		value of 0.48 Convergent: Significant correlation with VAS dyspnea (r = 0.57, p<0.001) and with modified Borg scale (r = 0.52, p< 0.001) 2. Correlation between CDS and numerical dyspnea score (1-10) was 0.63 (p<0.001).			
Chronic Respiratory Disease Questionnaire (CRQ)	1. 40 adults with chronic obstructive pulmonary disease (COPD) in a rehabilitation program (Wijkstra et al., 1994) 2. 28 patients with chronic airflow limitation (Guyatt et al., 1987) 3. 89 subjects with severe but stable COPD were randomized to either pulmonary rehabilitation (8 weeks inpatient and 16 weeks outpatient) or standard community care (Goldstein et al., 1994).	<u>*Reliability*</u> 1.Internal consistency: high reliability (a =0.71-0.88) and high test-retest reliability: (r not stated, p>.90) for dimensions fatigue, emotion, and mastery. Low internal consistency reliability (a = 0.53) and test-retest reliability (p = 0.73) for dyspnea dimension (Wijkstra et al., 1994) <u>*Validity*</u> Convergent: Comparison was made between the dimensions of the CRQ and the symptom checklist SCL-90. Significant correlations (p. = 0.001) were found among the dimensions of fatigue, emotions, and mastery and comparable domains	1. Initial testing supported responsiveness when the CRQ was repeated two weeks after discharge from rehabilitation program (Guyatt et al., 1987). 2. After pulmonary rehabilitation, significant mean differences existed for CRQ dyspnea and mastery (p = 0.0061 and 0.0002, respectively) between the treatment and control groups (Goldstein et al., 1994).	Initial administration of questionnaire takes a maximum of 30 minutes and usually 15-25 minutes; follow-up administration takes a maximum of 20 minutes and usually 15-20 minutes (Guyatt et al., 1987). Has potential value in initial assessment, but may not detect small changes in repeated use.	Recommend for use in clinical trials for test-retest situations; the dyspnea-causing activities are identified by individual patients and make comparisons of dyspnea scores with other patients difficult. Wijkstra et al. (1994) suggested scoring the dyspnea items separately and not including dyspnea scores in overall score because of the low internal consistency/reliability of dyspnea items.

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
CRQ *(Continued)*		of the SCL-90. However, the dyspnea dimension showed no significant correlation with the somatization dimension of the SCL-90.			
Modified Borg Scale (MBS)	1. Six outpatient subjects with moderately severe COPD performed exercise testing weekly for 6 weeks (Mador, Rodis, & Magalang, 1995) 2. 45 adults with asthma (13 men, 32 women) attending outpatient asthma clinic (Burdon et al., 1982) 3. Five alert and oriented patients with restrictive, obstructive or both pulmonary disease (one with mesothelioma), who were receiving mechanical ventilation, quantified the severity of their dyspnea using Visual Analog Scale (VAS) and MBS (Lush et al.,1988). 4. Nine older adult patients (age = 678 ± 4 years) with moderate	*Reliability* Derived from original 15 grade Borg scale (6 - 20) with high correlations of heart rates ranging from 0.80 - 0.90 (Borg, 1982) *Reproducibility* 1. Borg scores were not significantly different across study days during both maximal and submaximal exercise (no p value stated). In contrast, Borg score within subject coefficient of variation was significantly greater than physiologic indices (minute ventilation and oxygen consumption) demonstrating MBS measurement of dyspnea perception (Mador et al., 1995) *Validity* 2.Convergent: close linear relationship (mean $r = 0.88 \pm 0.15$ SD) between breathlessness as indicated by MBS and	1. As the 12 MW progressed, mean Borg scores became higher whereas distances walked in two-minute intervals were similar. "Dyspnea as assessed by Borg scale is directly dependent on the duration of exercise" (Bernstein et al., 1994). 2. After bronchodilator, the median Borg score declined from 3 to 1; however, no correlation existed between spirometry (FEV_1) and Borg score ($r = -0.08$), suggesting that Borg dyspnea ratings yield information about bronchodilator responsiveness that are not appreciated by spirometry alone (Wolkove et al., 1989)	Application in assessing reactions to routine activities is uncertain; most studies compare it with physiologic testing (van der Molen, 1995). "Strong positive and significant correlations between VAS and MBS suggest both scales are valid and reliable measures in the ventilated assisted patient in the critical care setting" (Lush et al., 1988 p. 534)	Burdon et al. (1982) was the first to adapt Modified Borg scale to assess the severity of breathlessness. Care must be taken to provide consistent, specific instructions when using the scale (ATS, 1999). Assesses dyspnea at one particular time point by a particular stimulus (Scott, 2004).

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
MBS *(Continued)*	COPD performed 12 MW in two-minute intervals with Borg score obtained at end of each two-minute walk (Bernstein et al., 1994) 5. 93 patients with obstructive lung disease rated breathlessness along with spirometry at rest and after bronchodilator (Wolkove et al., 1989)	decreased FEV_1 (Burdon et al., 1982) 3. Convergent: VAS and MBS were highly correlated (r = 0.92, p = 0.001) in 189 pooled data points from the five patients (Lush et al., 1988)			
OCD	62 adult patients (44 with airway obstruction and 18 with pulmonary infiltration) (McGavin et al., 1978).	*Reliability* No data available *Validity* Distance walked in 12 MW correlated well with subjective assessments on OCD (r = 0.68; p < 0.001) (McGavin et al. 1978).	Discriminative measure to collect patient data that are quantified and interpreted as comparisons for ADL as well as between patient benchmarks (Cullen & Rodak, 2002)	Easily used; has pragmatic utility (ATS, 1999)	Not all patients engage in the activities listed on the continuum (ATS, 1999). Emphasizes ambulation and under-represents other ADL.
Pulmonary Function Status and Dyspnea Questionnaire (PFDSQ)	131 male patients with COPD admitted to a pulmonary rehabilitation program, average age 63.7 years (± 6.2 years) (Lareau et al., 1994)	*Reliability* Internal consistency: Total scale Cronbach's alpha coefficient for combined dyspnea and functional component was 0.91. Alpha coefficients for the dyspnea component Scales ranged from 0.88 – 0.94 (Lareau et al., 1994) *Validity* 1. Convergent validity: Patients reporting severe		"Useful to follow the progression of symptoms and their impact on functional ability and quality of life"(Lareau et al.,1994, p.249)	Further testing is needed in a heterogeneous sample that includes women.

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
PFDSQ *(Continued)*		extremes of dyspnea and functional impairment (most or least) were compared with pulmonary function parameters using student t test. Those with significantly greater (no p value stated) dyspnea and functional loss had greater airway obstruction and lower exercise tolerance (as measured by Vo^2 max) (Lareau et al., 1994)			
University of California, San Diego Shortness of Breath Questionnaire (SOBQ)	54 subjects (32 men, 22 women) in a pulmonary rehabilitation program with a variety of pulmonary diagnoses: COPD (n = 28), cystic fibrosis (n = 9), and post-lung transplant (n = 17) tested current SOBQ with previous version (Eakin et al., 1998)	*Reliability* Internal consistency: coefficient a = 0.96, item total correlations ranged from 0.49 - 0.87. *Validity* Correlation of new and previous versions of SOBQ was excellent (0.96). Convergent validity: moderate to strong correlations with Borg scale ratings (previous SOBQ r = 0.42; new SOBQ r = 0.45)		"Useful clinical instrument to assess dyspnea during common ADLs in order to set goals for improvement in specific activities through pulmonary rehabilitation or other interventions" (Eakin et al., 1998, p.623)	
VAS**	1. 30 adult outpatients (17 men, 13 women) with lung cancer (Brown et al., 1986) 2. 68 adult inpatients and outpatients with	*Reliability* 1. Test-retest: by Wilcoxon signed ranks no significant difference between time 1 (T1) and time 2 (T2) for dyspnea	VAS demonstrates ability to detect small changes (ATS, 1999)	Suited to within subject repeated measures (vander Molen, 1995) 3. In comparing horizontal and vertical	Common problems encountered with administering the VAS are difficulty seeing line and anchors, as well as, forgetting how scale is

Name of tool	Populations	Reliability &Validity	Sensitivity	Clinical utility	Comment
VAS** *(Continued)*	documented pulmonary disease who experienced shortness of breath (Janson-Bjerklie, et al., 1986) 3. 11 asthmatic subjects who presented to the emergency department to be treated for an acute asthma attack (Gift, Plaut & Jacox, 1986) 4. 6 male subjects with COPD rated both the sense of effort required to breathe and the degree of discomfort associated with breathing on a vertical VAS during exercise on a braked cycle (Mador & Kufel, 1992).	worst (z = -1.83 p = 0.07) and dyspnea usual (z = -1.58 p = 0.13) (Brown et al., 1986). *Validity* 1.Convergent: moderate correlations with Karnofsky performance status usual dyspnea (T1 r = 0.48, p = 0.007, T2 r = 0.45, p = 0.02) and worst dyspnea (T1 r = 0.50, p = 0.005, T2 r = 0.52, p = 0.002) (Brown et al., 1986) 2.Convergent: correlation with ATS 1978 Grade of Breathlessness Scale (r =0.40, p = 0.001) (Janson-Bjerklie et al., 1986) 3. convergent: correlation between horizontal VAS and vertical VAS (4 =0.52 – 0.99) (Gif et al., 1986) 4. Convergent: VAS ratings of the sense of respiratory effort and discomfort were highly correlated in each subject (r = 0.99±0.006) (Mador & Kufel, 1992)		VAS, both considered valid measures of dyspnea intensity. 4 of 11 patients had difficulty using the horizontal scale, asking researcher to repeat directions whereas only one of these had difficulty with the vertical scale. (Gif, 1986; Gif et al., 1986).	ordered (ATS, 1999, p. 327)

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