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Mild, moderate, and severe intensity cut-points for the Respiratory Distress Observation Scale

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ABSTRACT

Background: The Respiratory Distress Observation Scale© (RDOS) is a means for assessing respiratory distress when a patient is unable to give a dyspnea self-report. Cut-point determination was needed to guide clinical application.
Method: A Receiver Operating Characteristic (ROC) curve analysis was conducted in a prospective, observation study with inpatients ranked by nurse practitioners (NP) into levels of respiratory distress. A research assistant simultaneously measured RDOS blinded to NP ranking.
Results: Participants were 84 adults: mean age of 72.6 (SD = 15.2) years, 53.6% male, 77.4% African-American. NP ranking was distributed: none (30%), mild (26%), moderate (31%), and severe (13%) distress. RDOS scores ranged 0–13 ($M = 4.8$, SD = 3). NP ranking was significantly correlated with RDOS ($rho = .91$, $p < .01$). ROC curve analyses yielded cut-points: none = 0–2, any = 3, mild-moderate = 4–6, and severe ≥7 ($p < .01$).
Conclusions: Intensity cut-point enhances the clinical utility of the RDOS.

Introduction

Dyspnea is a subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity and can only be known from a person's self-report.[1] Dyspnea prevalence is quite high among community-dwelling elders and patients with advanced illness, particularly those afflicted with heart or lung conditions.[2–4] Routine dyspnea screening and treatment are important quality indicators for providers of hospice and palliative care.[5,6] Cognitive decline and decreasing consciousness is typical among seriously, critically and/or terminally ill patients, particularly at the nexus to active dying, making an assessment of self-reported dyspnea difficult or impossible. While ability to report distress is lost, the ability to experience unrelieved dyspnea persists until death for patients who retain neurological function above the brainstem. Nurses bear the responsibility for assessment and treatment and evidence suggests that in the absence of a patient report undertreatment occurs.[7] In our own study, we found that more than half of patients who were near death were unable to provide even a simple yes or no response to a query about shortness of breath[8] and of those who were experiencing respiratory distress few were receiving treatment.[9] Use of the Respiratory Distress Observation Scale© (RDOS) is a solution to recognizing respiratory distress when the patient cannot provide a dyspnea report.[9]

In previous studies we established acceptable reliability and validity psychometrics for the RDOS.[9,10] In addition, an initial cut-point for the RDOS was established in a study that used cognitively intact hospitalized patients who could give a dyspnea report as proxies for the intended RDOS population. Receiver Operating Characteristic (ROC) curve analysis determined RDOS score 0–2 suggests little or no respiratory distress; score ≥3 signified any distress. Further cut-point substantiation was needed in order to identify moderate and severe cut points because patients with imminent respiratory failure, as typifies dying patients, were not represented yielding lower than expected RDOS scores. In addition, some patients provided seemingly inconsistent reports, for example, a "no" response to "are you short of breath" with a Numeric Rating Scale of 5 and rank of moderate. Of 72 patients in that sample who reported "no" to "are you short of breath," 38 (53%) reported distress greater than "none" ($\chi^2 = 52.3$, $p < .01$).[11]

Less is known about treating dyspnea at the end of life compared to standard treatment for pain.[12] Pain intensity cut-points are routinely used to guide analgesia regimens[13,14] and similar clinical guidance for dyspnea regimens is needed, particularly to guide care for cognitively impaired patients and those near

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death. The aim of this study was to identify distress intensity cut-points of the RDOS. Little or no distress and any distress have been previously identified by RDOS but the cut-points signifying mild, moderate or severe distress are unknown.

Method

Study design

In a prospective, observational study patients were stratified by level of estimated respiratory distress by two expert palliative care nurse practitioners. Institutional Review Board approval was obtained that included a waiver of written informed consent given the low risk to participants of the observations entailed in the protocol. The seasoned NPs had 7 and 10 years of palliative care experience, respectively. Four levels of respiratory distress were used—none, mild, moderate, and severe that correspond to customary verbal categorizations. RDOS was measured by a Nurse Research Assistant (RA), an expert in using RDOS. The RA and one NP simultaneously observed and rated each patient.

Participants, eligibility and inclusion criteria

Adult inpatients were recruited from an urban hospital in the Midwest U.S. Spontaneously breathing patients at risk for dyspnea with one or more of the following diagnoses: lung cancer, heart failure, chronic obstructive lung disease (COPD) or pneumonia were prospectively enrolled until the desired sample size was achieved. Patients were identified from a pool of inpatients who were estimated to be in the last 2 weeks of life using the Palliative Performance Scale.[15,16] The RDOS is not a valid measure if the patient is quadriplegic or has bulbar amyotrophic lateral sclerosis,[9] thus, we excluded patients with either of those conditions.

Procedures

The RA underwent RDOS training with the PI and practiced scoring until an intra-class correlation of $>.90$ between the RA and the PI was achieved. The PI made rounds with each of the NPs with five of the first enrollees to establish intra-rater congruence; agreement was established.

Eligible patients were identified by the RA in review of the palliative care nurse practitioner's caseload of referred patients and from hospital walking rounds. The NP and RA simultaneously observed the patient; the NPs were blinded to the recruitment stratification and the RDOS score to minimize bias; the RA was blinded to the NP ranking. The RA scored the RDOS and the NP made note of her own estimation of respiratory distress using a verbal categorization. Patients were passive participants.

Variables and measures

Patient demographics included age, gender, race, ethnicity and diagnosis. The Palliative Performance Scale was used to estimate duration of survival. This scale grades a patient's general condition as 0 (dead) to 100 (normal) in increments of 10 points. The scale incorporates five observer-rated parameters: ambulation, activity, self-care, intake, and level of consciousness. The PPS has been validated with patients with cancer (all types), patients in an acute tertiary hospital setting, home care setting, and heterogeneous diagnoses.[15,17–19] Reliability with predicting nearness to death has been established.[16] A PPS score of 20 is associated with a mean survival of 15 days and a median survival of 5 days, which is consistent with our conceptual definition of nearness to death. Chart review and discussion with the assigned staff nurse contributed to PPS estimation.

RA measurement of respiratory distress used the RDOS an eight-item ordinal scale to measure the presence and intensity of respiratory (Table 1).[9] The RDOS was originally developed in an observation study of mechanically ventilated patients undergoing a ventilator weaning trial.[20] Patients were videotaped as naturally occurring respiratory distress developed. Subsequent tests for inter-rater reliability, scale reliability, construct, convergent and discriminant validity were done.[9,10] Patient oxygenation was measured with peripheral oxygen saturation (SpO_2) using non-invasive pulse oximetry. This measure afforded confirmation of RDOS construct validity. FiO_2 was established based on delivery device and flow rate.

Results

Participants included 84 adult inpatients ranging in age from 21 to 102 years ($M = 72.6$, S.D. $= 15.2$) with 53.6% male and 77.4% African-American. Patients were near death with a mean PPS 12 (S.D. $= 4.6$). Most had pneumonia (47.6%) followed by heart failure (14.3%), COPD (14.3%), and lung cancer (3.6%) with 20.2% having more than one of these conditions. SpO_2 ranged 60–100% ($M = 95\%$, S.D. $= 6$) and FiO_2 ranged .21–1.0 ($M = .44$, S.D. $= .28$).

Respiratory distress NP ranking was distributed: none (29.8%), mild (26.2%), moderate (31%), and severe (13.1%) (Fig. 1). RDOS scores ranged 0–13 ($M = 4.8$, S.D. $= 3$). A strong, significant correlation was found between NP ranking and RDOS ($rho = .91$, $p < .01$). A moderate correlation between RDOS and FiO_2 ($rho = .42$, $p < .01$) and an inverse correlation with SpO_2 ($rho = -.24$, $p < .05$) supports construct validity of the RDOS.

ROC curve analyses were used to determine the optimal cut-points to distinguish clinically meaningful categories of respiratory distress—none, mild, moderate, severe. For each of the category boundaries we determined RDOS sensitivity, specificity, and area under the curve (AUC). We used the empirical (nonparametric) approach to ROC analysis because it does not make normality assumptions.[21] This approach is generally recommended when the test scores are continuous (Fig. 2 and Table 2).

Table 1
Respiratory Distress Observation Scale© (Margaret L. Campbell).

Variable	0 points	1 point	2 points	Total
Heart rate per minute	<90 beats	90–109 beats	≥110 beats	
Respiratory rate per minute	≤18 breaths	19–30 breaths	>30 breaths	
Restlessness: non-purposeful movements	None	Occasional, slight movements	Frequent movements	
Paradoxical breathing pattern: abdomen moves in on inspiration	None		Present	
Accessory muscle use: rise in clavicle during inspiration	None	Slight rise	Pronounced rise	
Grunting at end-expiration: guttural sound	None		Present	
Nasal flaring: involuntary movement of nares	None		Present	
Look of fear	None		Eyes wide open, facial muscles tense, brow furrowed, mouth open, teeth together	
Total				