Are you asking the right admission questions when assessing dyspnea?

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**BACKGROUND:** Dyspnea is an important admission parameter to detect undiagnosed cardiopulmonary conditions. The typical admission question, “Are you short of breath?” can give insufficient or misleading data.

**OBJECTIVES:** A group of clinical research nurses sought to improve dyspnea assessments by using a more accurate measure that would not unduly lengthen the admission process itself. The methodology used to achieve this outcome was research utilization.

**METHODS:** On admission, 103 patients were given the standard question “Are you short of breath?” followed by 4 Visual Analog Scales of Dyspnea (VASD). These response measures assess the degree of dyspnea in relationship to variable exertion activities on a scale of 0 to 10. All responses to VASD were analyzed using descriptive statistics.

**RESULTS:** The results showed that 30% of patients who responded “No” to the shortness of breath query scored 5 or more for dyspnea on the VASD. All scores of 5 or more were reported to the primary care provider for further workup.

**CONCLUSION:** The results from this project gave impetus to designing a more formal research study that could validate VASD use in clinical admission assessments. (Heart Lung® 2005;34:260–9.)

Worldwide health policy and professional groups have placed increasing pressure on health care providers to be research based in their actions and decision making. Nurses are willing, educated, and enthusiastic to have their expertise grounded in research. Yet despite the pressure that has been building for the past 15 years, the “research to practice gap” continues to widen to a “chasm.”¹ A recent report to The Commission for Health Improvement and National Institute for Clinical Evidence in Canada states there are 3 key barriers confronted by a substantial number of nurses implementing research into their practice:

1. Clinical nurses are unable to use their experience and expertise for research acquisition and utilization. This often erodes their confidence and limits their abilities.
2. Clinical nurses often face a lack of organizational support, which decreases the motivation to use and access research. Lack of time to access research or perform research utilization (RU) is the most cited example of lack of organizational support.
3. Clinical nurses have the perception that research findings lack “real world” credibility. Research dissemination is highly technical and erudite. Empiric reports often fail to link the results to clinical solutions or provide clinical context for the findings.²

A dynamic solution that offers hope to narrow the “gap” toward evidence-based practice is the process of RU. This article will describe the process by which a group of pulmonary nurses at the Clinical Center of the National Institutes of Health used RU to begin to alter admission dyspnea assessments in their facility.

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THE CLINICAL PROBLEM

Hospital admission assessments need to be thorough, accurate, and efficient.

Moreover, when the respiratory system is assessed, high-quality information can signal early problems that require further appraisal. Nurses in our facility were aware that the initial pulmonary admission assessment for many patients across the continuum of care was a simple question, “Are you short of breath (SOB)?”

The importance of initial dyspnea assessments tends to be largely ignored, and the critical question “Are you SOB?” provides insufficient data from which cardiopulmonary problems can be identified. Multiple research studies evaluating dyspnea related to specific diseases or procedures have been reported. However, limited knowledge exists regarding the best baseline dyspnea screening instrument to assess a patient’s shortness of breath.

The pulmonary nurses at the National Institutes of Health, aware of the need to base practice on evidence, questioned the traditional admission routine. These nurses saw themselves as independent professionals capable of recommending changes on the basis of research results. They contacted their clinical research specialist to guide them through the RU process. The nurses’ goal was to determine whether a validated measurement other than the traditional qualitative inquiry regarding SOB would yield more accurate information in a simple, brief manner.

RU is a transforming process of reviewing research findings, putting them into action in the clinical setting, and then evaluating the effect of the interventions on the staff, patient, and organization. Research findings are often the result of very controlled studies set in artificial environments. Thus the applicability of research findings to real world situations is indeterminate. The RU process provides the “preparatory steps for research related actions” (p. 8). RU allows bedside nurses to validate the findings in their specific patient environment. RU is a method that assists practitioners to become “evidence-based” clinicians. The experience gained, in combination with research findings, ultimately helps the care provider to construct practice guidelines that are intended to improve patient outcomes.

There is a perception that RU is an uncomplicated linear process, but in fact RU is nonlinear and multifaceted. A research advisor can provide specific skills needed to identify a clinical problem, evaluate the literature, and decide on how, when, and where to incorporate specific findings. The advisor can also assist the nurses in overcoming educational and institutional barriers.

There are a variety of RU models. Choosing the right model for a particular practice context is the first concrete step in RU. Stetler’s 5-step design was chosen as the one most suitable to this practice setting and clinical problem. The model was adjusted to include addressing the RU barriers at each step to increase the likelihood of successful testing and integration of a change in clinical practice (Fig 1).

STEP ONE: PREPARATION

Dyspnea is a subjective complex constellation of sensations. Despite its prevalence in the population, it is difficult to measure for 2 key reasons. First, many factors unique to the individual can affect the degree of dyspnea. These factors can be past experiences, gender, tolerance to discomfort, cultural norms, and unique dyspnea triggers. The 1998 American Thoracic Society consensus statement stated, “...in the final analysis, a symptom can only be described by the person who experiences it” (p. 322). Second, researchers have not reached agreement on a universal definition of dyspnea. Experts do agree, however, that dyspnea has 3 key dimensions: physiologic, functional, and psychologic. Physiologic parameters include symptoms that can be measured, for example, the rate and depth of breathing, use of accessory muscles, and wheeziness. Functional aspects describe the affect of dyspnea on the individual’s activity (job, daily tasks, or relationships), such as the use of breathing strategies to maintain functioning (ie, slowing the activity and changing the type of job). Psychologic domains describe the many emotions that are produced during dyspeptic episodes or chronic dyspnea (ie, feeling of suffocation, anxiety, fear, and loss of vitality).

The widely variable nature and definition of dyspnea make it impossible for a single question or item to measure all 3 dimensions of this symptom. Consequently, multiple questions or items are needed to fully measure dyspnea. Some can be as straightforward as a patient response using a visual analog scale (VAS) or as extensive as a lengthy patient interview that involves a long series of questions or complex physiologic monitoring.

Our group used a method of synthesizing the research literature outlined by the Scottish Intercollegiate Guidelines Network (SIGN). SIGN’s critical
appraisal method combines the systematic review of the literature, decision analysis, expert opinion, and case reports that include patient preferences. When a practitioner is uncertain as to the best approach for a specific clinical situation, it is helpful to do a review of outcomes of varying research interventions. SIGN’s research synthesis methods are lauded for their ability to summarize the research in a particular area with reduced bias, avoidance of erroneous conclusions, and provision of practice guides. By using this approach, the project group was able to meld the following definition of dyspnea, which exemplified the essence of the concept and was applicable to the clinical practice objectives: Dyspnea is an uncomfortable awareness of breathing exhibited by a variety of subjective sensations that may or may not affect the individual’s ability to perform.

Addressing the barriers

The barrier the nurses identified in step 1 of the RU process was in establishing the clinical relevance of implementing a new admission assessment for dyspnea. This is the “what is the clinical relevance?” aspect of any project. The RU advisor asked the nurses the following questions:

- Does having a better admission dyspnea instrument:
  - have the potential to help the nurse with clinical decision making?
  - help the nurse make the appropriate assessment of the true patient condition?
  - help the nurse identify patient risks?
  - help the nurse select appropriate patient interventions?

The nurses believed that a better initial assessment of dyspnea would prompt one to affirmatively answer all of these questions. The nurse group moved confidently to step 2.

STEP TWO: VALIDATION

It has been suggested that a good dyspnea measure possesses the following characteristics:16

1. The ability to measure the perception of dyspnea and the reaction to it
2. Ease of administration
3. Choices related to the situation
4. Few required instructions
5. Can be completed in less than 5 minutes
6. Measures what it is intended to measure (validity)
7. Measures the dyspnea dimensions
A systematic literature review, using the SIGN’s revised grading system for levels of evidence (Appendix A), yielded more than 100 journal publications that compared, categorized, and/or critiqued dyspnea measurements. The Pulmonary-Allergy Drug Advisory Committee noted in a September 2002 meeting with the Food and Drug Administration that dyspnea indices are as numerous and varied as the sensations; no one scale can encompass all the dimensions of a dyspnea experience. Therefore, when selecting a scale, the purpose of the assessment and the condition of the patient must be considered.

Instruments may focus on symptoms at the present moment or may require the individual to recall symptoms for some previous time interval. The ability of the patient to complete the tool also must be well thought out. Our goal was to assess dyspnea at the time of admission with a tool that measured the elements of sensation, activity, and function. The group wanted the tool to be applicable to a variety of clinical settings: in-patient, day hospital, and ambulatory services. The project group consulted 3 leading dyspnea researchers across the country and the highly regarded Dyspnea Clinic in Michigan. Dialog with these experts aided the design of the RU project. From the literature review and the recommendations of experts, the group chose the VAS of Dyspnea (VASD) response measure. It should be noted that the most widely used clinical tool to assess dyspnea is the Baseline and Transitional Dyspnea Indexes, but because the project group was seeking measures that could be completed in seconds, the more lengthy Baseline Dyspnea Index was eliminated from consideration.

VASs are good instruments when undertaken for repeated measurements, such as acute changes in the seriously ill and/or for the modifications of therapy. VASs are one of the most frequently used response scales in health care research. Their chief advantage is that they are quick to administer and easily understood by nearly all types of patients. VASs are scales that have a vertical or horizontal line that is 10 cm in length. At each end of the line are anchor descriptors. The validity and reliability of the VAS as used for subjective measures are well documented. The earliest VAS, also known as the graphic rating scale, was used in 1921. The first documented study using a VAS to measure dyspnea was performed in 1969 by Aitken. The VASD is a VAS that measures dyspnea and meets the criteria of good validity and reliability dyspnea measures. VASD is highly correlated with expiratory flow rates ($r = .85$). When VASD is compared with other scales such as Borg and Leikert in healthy subjects during exercise, the VASD’s ability to measure the degree of breathlessness is high with correlational scores ranging from .73 to .82. Studies addressing the best method of presenting the VASD suggest that a vertical line is easier for patients to see, especially if stress is narrowing their visual field. Moreover, when the vertical VASD is compared with the horizontal VASD (in reference to peak expiratory flow rate) the vertical VASD correlates slightly better than the horizontal. When repeated VAS measures are used, it is recommended that a separate sheet of paper be used for each scale to prevent responder bias. The VAS has a psychometric limitation in that it does not reflect the degree of dyspnea at the current moment but only measures the intensity of dyspnea related to certain activities. It is reported that 7% of respondents simply do not understand how to use the measure correctly, despite several “how to” explanations.

For this project, the patients were asked to recall specific activities within the last week and make a mark along the vertical 10-cm line that equated with the amount of breathlessness they experienced between the anchor descriptors (Fig 2). The chosen activities are performed by at least 80% of the general population on a daily basis. The activities re-
quire varying physiologic workloads and ventilation exertion. Measuring the degree of breathlessness with these activities provides an indication of the functionality of the individual. Four VASs were administered (in addition to the SOB inquiry), 1 for each of type of activity. All of the activities paralleled Knebel and colleagues’ study of patients with chronic dyspnea, which identified 29 effectiveness behaviors or activities that are desirable for work, family, or self. Listed next are the activities for each VASD:

- VASD1: getting dressed for the day
- VASD2: climbing 2 flights of stairs
- VASD3: carrying a 10-pound weight the distance of 100 yards
- VASD4: routine daily work

The recall time for each VASD was limited to the past week. The majority of dyspnea measures ask “Have you ever experienced...” or “in the last year have ever experienced...” Newer research reveals that recall is dependent in large part on the length of time between the occurrence of dyspnea and the recall of the event, the importance/emotion of the event, and the difficulty of the task that caused dyspnea. The greatest precision of recall of events is days from the event. Thus, the extent of accurate recall is approximately only 1 week.

Addressing the barriers

The project group had some difficulty with interpreting the statistics and deciphering the applicability of study results to the clinical world. During the first 15 minutes of each RU meeting, the RU advisor briefly interpreted the statistics in plain language and explained how statistical analysis gives validity to clinical findings. These sessions were helpful and prepared the group to implement step 3.

STEP THREE: DECISION MAKING

Time is a precious commodity for health care clinicians. The decision-making step naturally included feasibility considerations. Would testing a dyspnea measure fit into the clinical setting? How many additional resources would the testing require? Would there be any cost involved? The project group met with each individual nurse manager to explain the new process to assess the patients on admission with minimal disruption of the unit routine. No additional personnel were needed beyond the project group.

Addressing the barriers

The nursing leadership was supportive of RU and viewed the project as a win-win situation. The project represented an approach by which nurses could learn more about research and evidence-based practice while improving patient care.

STEP FOUR: APPLICATION

Admissions to the clinical center characteristically occur Sunday afternoons and Monday mornings in both in-patient and day hospital units. For this project, admission was defined as within ±4 hours of the patient arriving at the clinical center. The team performed admission dyspnea assessments on adult patients each Sunday and Monday for 3 consecutive weeks on 8 separate units.

Reproducible and consistent collection of measurements is critical for the integrity of the databases; thus, the data collectors were trained by the leader of the project and followed defined guidelines. Each data collector quantified the VASD responses (marks on the VAS scale made by the patient) using a standard 150-mm ruler. 2 additional reviewers validated these measures. A common problem when using VASD instruments was identified early on. Lengths of the VASD can vary by 0.1 to 0.3 mm depending on the photocopy machine used to reprint the original 10-cm line. To address this issue, a biostatistician was consulted and an analysis revealed the distortion did not invalidate any findings. In addition, each VASD response was measured from the bottom of the line and not measured beyond 10 cm.

The project group asked, “What mark on a 10-cm line would be considered dyspneic?” From the synthesis of the literature we assigned a score of 5 cm or greater to be an indication of dyspnea (scores were recorded metrically, ie, 5 cm = a score of 5). Both the modified Borg and VASD measure perceptions and magnitude of breathlessness in the context of daily activities. The Borg is also a scale rated from 0 to 10 with descriptors at fixed intervals. A 3 to 5 rating indicates moderate to severe breathlessness. Other well-used dyspnea instruments (ie, Baseline Dyspnea Index, American Thoracic Society Scale, and Transition Dyspnea Index) group responses into 5 grades of severity (0–4). Grades 1 and 2 correspond to the dyspneic experience and relate to the Borg 3 to 5 rating. One strength of the VASD is its measure of continuous data, that is, the responder determines the level of breathlessness rather than choosing a category.
Any score of 5 or more was reported to the primary care provider for follow-up or to alert the provider that a more in-depth respiratory assessment was warranted.

All data were entered into Excel spreadsheets and then imported into the statistical software package STATVIEW. Descriptive statistics were used to analyze all data.

### Addressing the barriers

The project group did not anticipate that several patients would not be able to perform the chosen activities. For example, wheelchair-bound patients naturally cannot climb stairs. For this project these patients were not included, although the RU advisor informed them that they could have substituted an activity that would equate to the physical exertion of climbing stairs, such as wheelchair basketball for 5 minutes.

### STEP 5: EVALUATION

A total of 103 patients completed the traditional SOB query and the 4 VASD measures. The mean age of the patient sample was 47 years, with females accounting for 57% of the total. See Table I for demographic data. The majority of the sample responded “No” to the SOB query. It would be expected that if the response is “No,” the VASD responses would also be negative and vice versa. However, of the 79 who responded “No,” 30% had a score of 5 or more on at least 1 VASD. It was interesting to note that 21% of the individuals who responded “Yes” to the SOB question had a score of less than 5 on all of the VASD measures. Statistically these were considered to be discrepant values. Table II represents a summary of the descriptive statistics for each VASD. The activity of climbing stairs had the greatest mean score (3.82) among the 4 VASD. There was surprisingly little variation in the patients’ responses concerning what was done to cope with the degree of breathlessness. All of the responses consisted of stopping the activity to recover or to simply slow the action to complete the activity (Table III).

Overall, this RU process successfully provided us with a realistic dyspnea measure that could be used during an initial screening. One major benefit of VASD was its ease of administration. Patients required few instructions, and the mean time to administer the 4 VASD was 90 seconds.

### Addressing the barriers

None of the VASD measured the psychologic aspects of dyspnea. The data collectors did ask the patients how they coped with the breathlessness. Although this question could possibly be construed as measuring a psychologic dimension, it really addresses the effect of dyspnea on the activity the patient was performing. Five people stated they were SOB, but each VASD was negative. Three possible explanations for this discrepancy include (1) the individuals were experiencing the psychologic effect of dyspnea, anxiety, fearfulness, or loss of vitality; (2) those individuals may have adapted to their continued dyspneic state and were able to perform the activities, especially ones that had meaning for them; and (3) there could be a relationship between the diagnosis and the dyspnea response (Table IV). According to Meek and colleagues, “sensations, perceptions, and interpretations of breathing vary both across persons and across . . . conditions” (p. 355). 30

The data collectors reported all VASD scores of 5 or more to the primary health care team but did not follow the patient through the referral process. Knowing the results of the referral would provide information regarding the sensitivity of the VASD to alert undiagnosed conditions or symptoms requiring further management. Anecdotally, patients with chronic illnesses provided us with positive feedback about using the VASD. Many stated, “Why haven’t you used this (response measure VASD) before?”

Our RU group wanted to determine whether our sample could possibly be representative of all hospital admissions in general. The RU advisor referred them to the Healthcare Cost and Utilization Project (HCUP) data. 31 Our sample was not equivalent in many of the categories. For exam-
ple, the largest admission category in the HCUP data is cardiovascular (19.5%), whereas it was the smallest of our sample (1.9%). Likewise, our largest category was oncology (22.33%), and it represented only 6.5% of the HCUP data. The generalizability of data could thus be limited and should be further explored.

DISCUSSION

Despite the small admission sample, the project team found that 30% responded negatively on the SOB measure but that they had a VASD score of 5 or more. This represents an important group who required further evaluation for diagnosis or symptom management. Dyspnea can be an early indication for chronic obstructive pulmonary disease, cardiac ischemia, morbid obesity, asthma, cancer, anemia, malnutrition, pulmonary embolism, changes in the oncologic state, deconditioning, and so forth. As the population ages, the incidence of patients with chronic problems is anticipated to increase. This population is known to adapt their lifestyle to reduce stress, which includes the experience of shortness of breath. In fact “overprotection” is often the case with older people. Overprotection takes the form of a sedentary lifestyle, which brings its own

<table>
<thead>
<tr>
<th>Physical activity</th>
<th>Number (%) of patients</th>
<th>Stop activity n</th>
<th>Slow activity n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dressing for the day</td>
<td>8 (8%)</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Climbs 2 flights of stairs</td>
<td>34 (33%)</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>Carry 10 lb while walking 100 yd</td>
<td>24 (23%)</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Routine daily work</td>
<td>17 (17%)</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

VASD, Visual Analog Scale of Dyspnea.
*A mark > 5 cm on the VASD is considered dypsneic.
set of complications—progressive weakness and deconditioning.\textsuperscript{33}

Much has been written about the changing nature of health care. Hospital length of stay has significantly shortened, from 6 days in 1999 to 3.5 days today.\textsuperscript{34} Patients are admitted for emergencies or for very specific treatments, screening, or related issues. Hospital care is usually focused to the admission presentation, and the patient is discharged as soon as possible; thus, latent problems can be easily overlooked. The resources for hospital care continue to become more scarce and expensive, which has created numerous global initiatives to focus on prevention rather than disease management. The United Kingdom has a Hospital Admission Risk Program (HARP) that exemplifies these changes. HARP aims to improve health by reducing and avoiding emergency hospital admissions through risk screening, multidisciplinary assessments, and preventive models of care.\textsuperscript{35} HARP has a Rapid Assessment Service, composed of hospital nurses who complete comprehensive assessments at the point of contact. This process in a 6-month period prevented 58 hospital admissions and 6 emergency department presentations in 1 community alone.

Scott Weingarten,\textsuperscript{36} from the Cedars-Sinai Health System states, “Missed opportunities to provide preventive care can cause substantial human consequences” (p. 454). Most researchers believe that 70% of disease is preventable.\textsuperscript{37} If there are early warnings of potential problems and those problems are addressed, the number of emergency admissions and the economic burden for the patient could be reduced. If treatment is successful, early detection of dyspnea could prevent lengthy hospital admissions and suffering.

Effective assessment of dyspnea is critical to clinical decision making.\textsuperscript{38} The initial evaluation should include both qualitative and quantitative aspects of dyspnea because these vary considerably among individuals and may reflect different pathophysiologic mechanisms.\textsuperscript{39} Accurate hospital assessment provides better continuity of care between primary and secondary health provision. The hospital health care providers can report the dyspneic symptomatology immediately to the primary care giver for additional testing and follow-up care.

Nurses are often the first group of care providers to interact with the patient and begin the admission assessment. It is crucial that they have accurate and easily used assessment instruments available to them. This RU project provided our nurses with evidence that the admission question of “Are you SOB?” should be coupled with the 4 VAS scales. The results provide impetus to conduct a powered formal study that would test the validity of using VAS scales to assess dyspnea on admission. The design would also follow the patients with scores of 5 or more to determine whether underlying condi-

### Table IV

<table>
<thead>
<tr>
<th>Patient diagnosis</th>
<th>N</th>
<th>Discrepancy%</th>
<th>No to SOB and VASD ≥ 5† n</th>
<th>Yes to SOB and VASD &lt; 5 n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oncology</td>
<td>23</td>
<td>38%</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Cardiorespiratory</td>
<td>15</td>
<td>33%</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Infection</td>
<td>8</td>
<td>38%</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>4</td>
<td>75%</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Autoimmune</td>
<td>17</td>
<td>35%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Endocrine</td>
<td>10</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>11</td>
<td>9%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Neurologic</td>
<td>9</td>
<td>11%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Eye</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SOB, Shortness of breath; VASD, Visual Analog Scale of Dyspnea.

*Values should be interpreted with caution because of the relatively small sample sizes.
†A mark > 5 cm on the VASD is considered dyspneic.
tions were discovered and treated. Results from this project suggest the need for further research in baseline dyspnea measurement issues.

**APPENDIX A**

Revised Scottish Collegiate Guideline Network grading system: Quality of evidence*

<table>
<thead>
<tr>
<th>Levels of evidence:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ++</td>
<td>High-quality meta analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.</td>
</tr>
<tr>
<td>1 +</td>
<td>Well-conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.</td>
</tr>
<tr>
<td>1 −</td>
<td>Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.</td>
</tr>
<tr>
<td>2 ++</td>
<td>High-quality systematic reviews of case-control or cohort studies.</td>
</tr>
<tr>
<td>2 +</td>
<td>High-quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal.</td>
</tr>
<tr>
<td>2 −</td>
<td>Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal.</td>
</tr>
<tr>
<td>3</td>
<td>Nonanalytic studies, eg, case reports, case series.</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion</td>
</tr>
</tbody>
</table>


**REFERENCES**


