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Multicomponent staging indices for COPD in daily patient care: what’s the yield?

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Chronic obstructive pulmonary disease (COPD) is characterized by airflow limitation that is not fully reversible (1). For years the focus of COPD disease management has been to delay the progression of airflow obstruction. However, this mission was rarely successful since the current pharmacotherapy (i.e., inhaled corticosteroids and bronchodilators) does not result in relevant protective effects in terms of lung function decline (2;3). The only way accelerated lung function decline can successfully be prevented is to persuade and support patients to quit smoking. Unfortunately, many patients with COPD are reluctant or unable to do so (4). Presently COPD is no longer considered to be almost synonymous to chronic progressive airflow obstruction, but is considered to be a multicomponent disease that involves extrapulmonary effects like decreased exercise capacity and peripheral muscle depletion as well. These extrapulmonary effects of COPD also contribute to the progressive nature of the disease (5;6). Moreover, the levels of functional impairment may differ substantially between patients with COPD who have the same level of airflow obstruction (7). To be able to translate this present-day understanding of the disease to daily practice requires a multicomponent staging index that produces a 'composite picture' of COPD disease severity (8). In this perspective paper we discuss the latest developments with regard to staging indexes for COPD and their value for primary care.

Six years ago a first prognostic multicomponent staging index for use in COPD patient management was published, the so-called BODE (*Body Mass Index, Obstruction, Dyspnoea, and Exercise tolerance*) index (9). The BODE index was originally based on an analysis of components that predict prognosis of COPD in terms of mortality, but more recently it has been shown that it also predicts hospitalizations and exacerbations (10;11). After the initial publication of the BODE index various other composite indices that predict COPD prognosis have emerged, like the ADO (*Age Dyspnoea Airflow obstruction*), the TARDIS (*Tayside Allergy and Respiratory Disease Information System*) (12), and CPI (*COPD Prognostic Index*) indices (13) (Table 1). Although among researchers there is no consensus yet about which index is to be preferred or which scoring weights should be applied for different components (14), the multicomponent staging tools – especially the BODE index – have been received with great enthusiasm by health care professionals, and have resulted in renewed optimism about COPD patient management. The notion that not only the level of airflow obstruction is related to prognosis, but that other aspects like exercise tolerance and nutritional status are too may encourage

health care professionals in their efforts to prevent disease progression in their patients with COPD. But is this enthusiasm justified? Should researchers who develop these multicomponent staging indices already be recommending their application in daily patient care, or is it too early for that? And, maybe the most important point to consider, should we guide disease management for patients with COPD on an index that predicts disease progression or should we also take current health state into account?

Application of prognostic multicomponent staging indices in COPD care

It has been suggested that the prognostic multicomponent staging indices can be used to select patients that qualify for intensive treatment (e.g., multidisciplinary pulmonary rehabilitation) (14). Except for the BODE index, all prognostic indices mentioned above consist of one or more components that are fixed demographic characteristics which are not directly related to COPD severity (age, gender). Selection of patients for intensive treatment based on these prognostic staging indices presents a fundamental problem: patients are more likely to qualify for intensive treatment just because they are older. It is true that the risk of dying from COPD or other causes increases with age, but should we really ‘bother’ patients of advanced age with intensive treatment for their COPD just because they are old? We believe that the opposite should be the case, i.e. that younger age combined with an already severe stage of the disease in terms of airflow obstruction and/or functional limitations should justify intensive treatment. Another concern about selecting patients for intensive treatment based on prognostic indices is that all mentioned indices were developed to predict mortality in COPD patients, although some instruments also reflect the risk of exacerbations or hospital admissions in the near future. Although COPD is one of the leading causes of mortality worldwide, for patients it is first and foremost an incapacitating disease that has a strong negative impact on their daily lives (15). Limiting intensive treatment to patients with a high mortality risk will exclude many patients with COPD who experience the progressive nature of this debilitating disease and will continue to do so for many years.

Staging indices could also be used to select specific interventions when the index provides insight in ‘alterable’ determinants of disease progression. The components of the instruments that are eligible for change are usually related to lifestyle, like improving nutritional status, reducing lung function

decline through effective smoking cessation interventions, and improving exercise tolerance through (outpatient) pulmonary rehabilitation. Even while some promising short term results have been reported with regard to improving exercise tolerance (16), reality is that many COPD patients fail to achieve or maintain these essential lifestyle changes. Even when COPD patients are confronted with their degree of airflow obstruction, this does not result in a higher success rate of a smoking cessation intervention (17). The challenge for the upcoming years will be to develop strategies that result in permanent lifestyle changes. This should be a top priority for scientists and health care providers. But even then, it remains to be seen if lowering the 'score' on any staging index wards off the unfavourable future COPD-related events or postpones death.

In contrast, a clear advantage of using the multicomponent staging indices in COPD patient care is that they provide insight in the clinical course of the disease, which is informative for health care professionals (e.g., physicians, nurses, physiotherapists) as well as for patients and their relatives. It should be decided whether or not the value of this prognostic information offsets the efforts and additional medical procedures and costs that are needed to collect the required information. The effort to collect information on the components of the various staging indices varies widely, from just asking some additional (standardized) questions to a six minute walking test. The set up of a walking test track can be a problem when space is limited, like it often is in primary care practices. Therefore, the value of exercise tests - or indices that include the result of such a test - needs to be well established before it should be recommended for use in regular COPD management.

Prognostic multicomponent staging indices in primary care

Based on just their lung function the majority of patients (~80%) is classified as having mild-to-moderate COPD (7;18). It is important to keep in mind that these patients are usually treated by primary care physicians and are not (yet) managed by respiratory specialists. Therefore, the majority of COPD patients are treated in primary care. The current prognostic multicomponent staging indices – except for the TARDIS - have not included primary care COPD patients in their development, and the predictive capacity of the instruments for primary care patients has not been established yet. Because mortality rates of patients with mild to moderate COPD are generally low (18), it is questionable if mortality should be the outcome of choice when developing tools to guide treatment of

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patients in primary care. Moreover, we previously examined the coexistence of three severity components that are often part of prognostic indices (*i.e.*, BMI, level of dyspnoea, and airflow obstruction) in a primary care COPD population (7). In this population, the spectra of the severity components was strongly skewed toward mild outcomes, and the concurrent occurrence of these components was low. This makes it highly unlikely that the current multicomponent staging indices will be applicable for primary care.

Isn't it time for another approach?

COPD disease management is not only directed towards the prevention of disease progression, but also on the alleviation of manifestations of the disease. All aforementioned multicomponent staging indices predict future events (*i.e.*, are 'prognostic' instruments), while other indices have already been developed to collect information on aspects of the current disease state of the patient. For instance, the COPDSS (COPD Severity Score) index has been shown to be able to discriminate between patients with varying degrees of dyspnoea and numbers of exacerbations (19). Moreover, a higher score on the COPDSS was associated with lower quality of life and more impairment in activities of daily live. Another example of an instrument that gathers information about several aspects of COPD and the impact of the disease on a patients' health status is the *Nijmegen Integral Assessment Framework* (NIAF). This instrument provides a detailed assessment of the health status of a COPD patient, which includes physiological functioning, complaints, functional impairment, and quality of life (20).

Some of the concerns that apply for the prognostic indices also apply to the aforementioned 'health state assessment' instruments. Most importantly, it should be established if these instruments can be used to select specific interventions. Moreover, it is sometimes difficult to make a clear distinction between the different types of instruments, since prognostic instruments may also collect information on current health state and *vice versa*. However, there seems room for both types of instruments for use in COPD patient care. It can be argued that 'health state assessment' instruments are more appropriate for patients with less advanced COPD because the outcomes that are predicted by the prognostic instruments (*i.e.*, mortality, exacerbations, and hospitalisations) are rather uncommon in a

large part of the patient population. In patients with advanced COPD both types of instruments could be used side by side, because predicting prognosis as well as assessing health status are indicated.

The development of prognostic multicomponent staging indices and health state assessment instruments is an interesting and promising new development in the management of COPD, but several issues need to be addressed before the widespread and possible costly implementation of these instruments in daily patient care can be justified. It is especially important to gain insight in the effectiveness and local availability of disease management options that could be selected based on the outcome of the indices and that result in relevant improvement of the disease state or prognosis of the patient. For instance, if access to pulmonary rehabilitation for COPD patients is not guaranteed the yield of using any multicomponent staging index is very limited (21). If indices cannot be used to guide COPD disease management, its added value for daily patient care is limited to providing information on the risk for unfavourable events. This seems inappropriate when managing patients with a chronic condition who have to face the consequences of their incapacitating disease today, tomorrow and for years to come. The majority of COPD patients are treated in primary care and many of the selected components and outcomes of the current prognostic indices do not frequently occur in this part of the patient population. It is therefore rather unlikely that these instruments are useful in primary care. The development of prognostic multicomponent indices currently dominates the scientific COPD literature, and outshine the attention for the development of instruments that assess the current disease state (or stage) of patients. In our view COPD patient management decisions should not be based on predicting future clinical events alone, but should also contribute to alleviation of current disease manifestations. 'health state assessment' instruments could be useful for this purpose. Therefore, it may be that we are looking in the wrong direction with the current strong focus on prognostic indices, while many patients with COPD and the professionals who provide the health care for them may benefit from another - or at the least a wider - approach.

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Table 1. Information on the multicomponent staging indices for COPD that were mentioned in the article.

Name	References	Year of publication	First author	Components	Outcome	Focus on	Population
BODE-index	9,10,11	2004	Celli, B	(1) BMI, (2) airflow obstruction, (3) dyspnea, and (4) exercise tolerance	Mortality, hospital admissions and exacerbations	Predicting prognosis	COPD patients treated in the secondary and tertiary care settings
CPI	13	2008	Briggs, A	(1) quality of life, (2) airflow obstruction, (3) age, (4) sex, (5) BMI, (6) history of emergency department visits or exacerbations, (7) history of CVD	Mortality, hospital admissions and exacerbations	Predicting prognosis	Pooled sample of studies with COPD patients treated in the secondary and tertiary care settings
NIAF	20	2008	Vercoulen, J	(1) Physiological functioning, (2) complaints, (3) functional impairment, and (4) quality of life	-	Current disease state	COPD patients treated by pulmonary outpatient centers
ADO-index	14	2009	Puhan, M	(1) Age, (2) dyspnea, (3) airflow obstruction	3-year risk of all-cause mortality	Predicting prognosis	Patients with longstanding and severe COPD and patients with a first hospital admission due to moderate-to-severe COPD
COPDSS	19	2009	Miravittles, M	(1) respiratory symptoms, (2) systemic corticosteroid use, (3) other COPD medication use, (4) previous hospitalization or intubation for respiratory disease, and home oxygen use	discriminate between degrees of dyspnea and number of exacerbations. Higher scores were associated with lower quality of life and more impairment in daily activities	Current disease state	COPD patients treated in primary care
TARDIS	12	2009	Schembri, S	(1) age, (2) BMI, (3) dyspnea, (4) airflow obstruction, (5) respiratory admission, (6) CV admission, (7) influenza vaccination	Mortality or hospital admissions	Predicting prognosis	COPD patients treated in primary care