

Integrating Quantitative Preference-Related Evidence into HTA: The Case of Ventilation for COPD*

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*updates to our analysis have been made.
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EXECUTIVE SUMMARY

Background

Recently, there has been increased effort to formally consider patient values and preferences in health technology assessment (HTA). Incorporating systematic reviews on patient preferences is one way of achieving this goal.

Purpose

i. To explore and discuss the feasibility of including systematic literature reviews on patient preferences within HTA; ii. To develop an appropriate search strategy for finding quantitative research on patient preferences; iii. To summarize the literature on patient preferences for ventilation among COPD patients; and iv. To discuss the advantages and disadvantages of including patient preference data within HTA.

Data Sources

Medical and economic databases were searched for studies published in English from 1990 through March 4, 2011 for preference-relevant studies.

Study Selection

Studies were selected based on title and abstract according to four main criteria.

Data Extraction

Two authors (A.B. and S.C.) independently extracted data using a standardized extraction table. Disagreement was resolved by discussion or consensus with a third party (M.K.).

Conclusions

A significant proportion of COPD patients were willing to forgo a potentially life-saving

intervention, particularly when it was framed as an indefinite procedure. COPD patients who were willing to forgo either MV or NIV cannot be reliably predicted by known covariates (such as age, quality of life). COPD patient preferences for ventilation are not stable, but can vary depending on how the intervention is described. One study showed that COPD patients can also alter their preferences when they are asked to consider ventilation under different hypothetical health states. Finally, a systematic review of the patient preference literature offers many insights. However, the process is time-consuming due to the heterogeneity of study designs, outcomes measures, and terminology.

BACKGROUND

In the past decade, the role of patient values and preferences within health technology assessment (HTA) has received greater attention. Some observers have suggested that the standard ways of assessing technologies place too much emphasis on clinical outcomes and societal perspectives, and that patient perspectives are not adequately addressed (Boivin et al., 2009; Bridges & Jones, 2007; Facey et al., 2010; Krahn & Naglie, 2008; Penston, 2007).

Bridges and Jones (2007) pointed out that HTA has been influenced by the movement towards evidence-based medicine (EBM) and cost-effectiveness analysis (CEA), yet both of these types of analyses fail to capture the complexity of patient perspectives. In EBM, medical evidence is ranked by the quality of the study, and randomized controlled trials (RCT) are the gold standard (Bridges & Jones, 2007). However, RCTs often do not represent the broad spectrum of patients who receive treatments in many different settings. Further, RCTs may not adequately reflect the values of patients, since they are focused on outcomes which are defined by the scientific and medical community (Bridges & Jones, 2007; Serrano-Aguilar, et al., 2009). For instance, a recent study explored the intersection between patient perspectives and systematic reviews for the treatment of degenerative ataxias (Serrano-Aguilar et al., 2009). They found that many of the outcome measures suggested by patients (i.e. limitations in activities of daily living, changes in quality of life, self-esteem, acceptance of the disease) were not considered by any of the studies assessed for review (Serrano-Aguilar et al., 2009).

CEAs also fail to incorporate fully patient perspectives. CEAs emerged from a need to set priorities within a societal context of escalating drug and technology costs, and of limited

societal funds to pay for these costs (Bridges & Jones, 2007). Although CEA often does incorporate an element of patient preference in representing health outcomes as utilities and quality-adjusted life years, the primary perspective of CEA is that of society or the health care payer, rather than the individual patient.

Penston (2007) argued that the implementation of guideline-based medicine conflicts with the objective of promoting shared decision-making between doctors and patients. The notion of concordance refers to the shared decision-making between doctors and patients and is accepted as an integral part of good clinical practice (Penston, 2007). However, guideline-based medicine encourages physicians to treat patients according to the stipulated guidelines, rather than to elicit patient perspectives. In the UK context, this pressure is amplified, since for some conditions, such as cardiovascular disease, general practitioners are influenced by financial incentives to comply with treatments specified by National Service frameworks and by guidelines that emanate from the Royal Colleges or the National Institute for Clinical Excellence. Penston (2007) recommended that to enhance concordance, patients who wish to participate in treatment decision-making require more detailed information. He argued that physicians should broaden their discussions with patients beyond merely describing the treatments that are recommended by guidelines. Patients require information regarding the natural history of the disease without treatment, the benefits and adverse effects of many recommended treatments, and the limitations of large-scale RCT data.

Many of these criticisms are pertinent because clinical guidelines and HTAs tend to be constructed based on a preference-fixed approach in which there are generic treatment

recommendations based on classes of patients. By contrast, a preference-flexible (also called preference sensitive) approach would focus on accommodating variations in patients' preferences (Nease & Owens, 1994). A preference-flexible guideline could be constructed by: including systematic reviews of published evidence on patients' views and preferences; integrating patient decision aids; or, using decision analysis to integrate patients' utilities in CPG recommendations¹ or HTA guidelines (Boivin et al., 2010; Chong et al., 2007). This preference-flexible process would recognize that an optimal decision in many circumstances is determined by patients' values concerning treatments or outcomes, and would encourage patients and practitioners to make decisions on the basis of preferences (Krahn & Naglie, 2008). However, preference-flexible HTAs or CGs are very rare (Boivin et al., 2010; Chong et al., 2007).

Recent surveys indicate that only a minority of guideline developers regularly involve patients in the process (Burgers et al., 2003; Lavis et al., 2008; Schunemann et al., 2006). Furthermore, in these cases, patient involvement is limited to certain approaches: patients are included in guideline development groups, consulted with regards to draft CPGs; and/or patient versions of CPGs are developed (Boivin et al., 2010; Burgers et al., 2003; Graham et al., 2003). Although involving patients in these ways has benefits (e.g. enhanced communication), they do not produce preference-flexible guidelines. Furthermore, the perspective of the particularly vocal participants who choose to participate in CPG or HTA development will likely not be representative of the patient population. In contrast, a systematic review of the patient

¹Some exceptions were noted, for instance, "the Dutch Institute for Healthcare Improvement, has produced patient decision aids presenting options, individualized risk assessment, and the probabilities of benefits and downsides to support choices regarding 'preference sensitive decisions' (such as prostate cancer screening) which are characterized by evidence that points to a balance between harms and benefits or by scientific uncertainty" (Boivin et al., 2010, p.2-3)

preference literature can provide population estimates of patient preferences.

Patient preference data are most relevant when interventions have only marginal benefits (Penston, 2007), or when interventions involve trade-offs with significant negative and positive consequences (Nease & Owens, 1994). In these situations, patient choices can vary considerably based on individual patient preferences for outcome or process (Krahn & Naglie, 2008). Many common, chronic diseases and many stages of palliative care satisfy either or both of these two conditions. For instance, many treatments for chronic diseases have unpleasant side effects, and the benefits in terms of survival may be quite limited. In these cases, many patients may opt out of the recommended treatments. By contrast, few patients would forgo an intervention that provides a complete cure for an acute ailment.

In this paper, we sought to explore the feasibility of including preference-related data in an HTA by working through a case study. At the development stages of this project, the Ontario Health Technology Advisory Committee (OHTAC) commissioned a series of systematic reviews on the topic of COPD and a series of interventions. In addition, another research group, based in McMaster University had initiated a synthesis of the qualitative research associated with COPD patients. This provided us with an ideal opportunity to explore how a preference-related systematic review could possibly compliment the standard systematic review of an HTA. Further, our findings, based on the *quantitative* research of patient preferences, beliefs and attitudes among COPD patients, could be compared and contrasted with the findings obtained from the systematic review of the qualitative research among COPD patients.

The OHTAC review consisted of a series of systematic reviews, evaluating the effectiveness of 13 different interventions for the care of COPD. Topics were varied and included such

things as (1) community-based multidisciplinary care (2) pulmonary rehabilitation (3) hospital at home and (4) non-invasive ventilation. We selected ventilation among COPD as an ideal case study for a number of reasons: a. survival rates for COPD patients who receive mechanical ventilation (MV) are poor; b. only 30% of COPD patients who receive MV during hospitalization will survive to hospital discharge; c. about 40% will die within the following year; c. 30% will live longer than a year (Wilson et al., 2005); and d. the intervention is uncomfortable and the presence of the ventilation tube impedes the patient from either talking or eating normally. Therefore, the decision to use MV is a preference-sensitive decision. Patients will vary in terms of the value they place on prolonging life at all cost, versus the value of avoiding an unpleasant procedure which has only limited, long-term efficacy.

The general study objective was to explore and discuss the feasibility of including systematic literature reviews on patient preferences, values, and beliefs within HTA. Specific objectives included to: i. develop an appropriate search strategy with high sensitivity for finding quantitative research on patient preferences; ii. summarize the literature on patient preferences for ventilation [either MV or non-invasive ventilation (NIV)] among COPD patients; and iii. discuss the advantages and disadvantages of including patient preference data within HTAs based on the results of our case study.

METHODS

Search Strategy

An expert in library and information science was consulted to aid in developing a list of appropriate databases and search strategies. We searched the MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane, American Economic Association's electronic bibliography (EconLit), EMBASE, Health Economic Evaluations (HEED), and PsycINFO databases for relevant human studies published in English from 1990 through March 4, 2011.

Our objective was to include studies that pertained to the values, beliefs, attitudes, perspectives and preferences of COPD patients regarding ventilation (either MV or NIV) and that used quantitative methods. An iterative process was used to develop search terms pertaining to patient preferences. We developed a large list of possible search terms based on our knowledge of the literature, by examining key papers in the patient preference literature and by consulting with experts in the area. In this study, we used the term 'patient preference research literature' to include research pertaining to: patient view; patient value; patient perception, patient acceptability; patient participation; patient satisfaction, decision aid, decision tool; and patient perspective (See Appendix A for complete list).

Search terms for COPD and ventilation were developed by referring to systematic reviews of these topics (e.g. Cochrane systematic reviews). Next, we searched abstracts and set aside all relevant quantitative articles. The reference lists of these articles were scrutinized to ensure that we did not omit any relevant literature. This process was repeated until we had developed a search strategy with high sensitivity. Final search terms and strategies for each database are described in Appendix A.

Inclusion & Exclusion Criteria

Studies published in English were selected if they met the following criteria: (i) at least some of the study participants met criteria for COPD and results for COPD were reported separately; (ii) at least one of the study interventions included invasive (MV and/or NIV) ventilation for the treatment of COPD; (iii) patient preferences were reported (this encompassed any of the outcome terms stated above); (iv) the study was quantitative.

Since the purpose of this study was exploratory, involving a wide range of outcomes and study designs, we did not exclude any articles on the basis of their poor methodological quality. Our initial search yielded thousands of articles that pertained to 'quality of life' indicators. Although quality of life indices overlap conceptually with issues regarding preferences, attitudes and beliefs, we decided to exclude these studies for this research paper in order to focus on the more neglected topic of preferences, attitudes and beliefs.

Selection of Studies

Identified studies were selected based on title and abstract by 2 independent authors (A.B. and S.C.). Full articles were retrieved if a decision could not be made based on the abstracts. The same authors (A.B. and S.C.) independently extracted from each study and inserted the most pertinent aspects of the study design and results into tables that were developed for this project. All disagreement was resolved by discussion or consensus with a third party (M.K.).

Analysis

We developed our analytic strategy after reviewing the studies that satisfied our inclusion criteria. The heterogeneity between

studies in terms of questions, measures and outcomes precluded the possibility of a meta-analytic strategy. However, the data suggested that an interpretive, descriptive process for summarizing the data would be most useful. Given prior research which has shown that different ways of framing questions can lead to different responses (Levin et al., 1998), we chose to display the interview questions in as much detail as possible. Table 1-1 provides summaries of the study design. Table 1-2 shows the main results of each study.

RESULTS

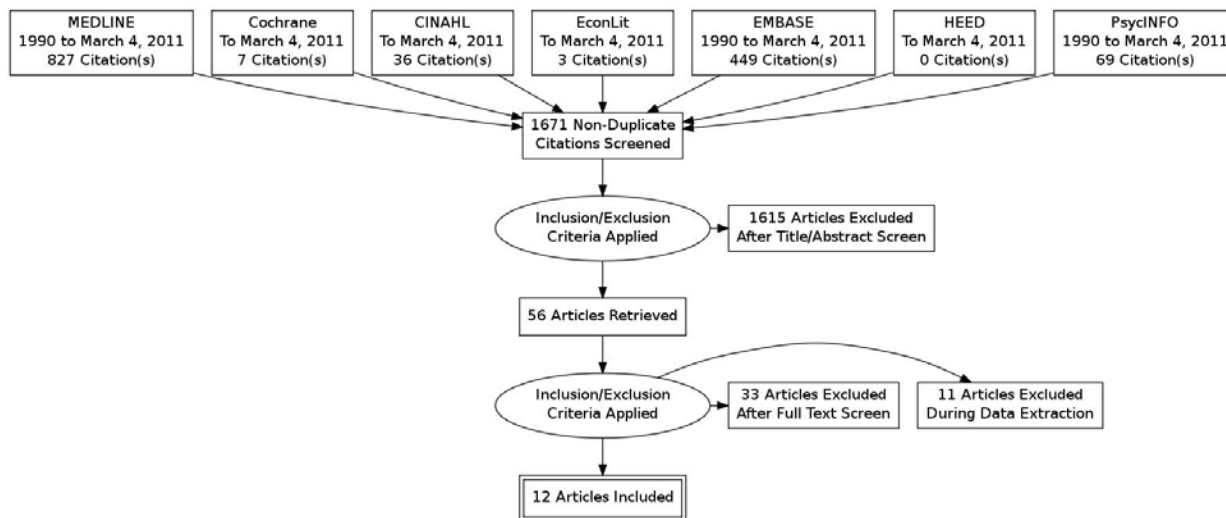
Refer to Tables 1-1 and 1-2.

Study Characteristics

Among 1833 identified citations, 12 studies were eligible for data abstraction (Figure 1). The majority of the studies were cross-sectional (n=9). A study was considered cross-sectional if the interview/survey was conducted at a single time point in the representative cohort during the trial. Three studies measured preferences more than once (Dales et al., 1999; Lynn et al.,

2000; Wilson et al., 2005) during the trial period. Six studies used very small samples (n<100). Nine of the twelve identified studies were conducted in hospital settings, while four studies were conducted in community settings. One study occurred at a rehabilitation centre (Wilson et al., 2005). A total of eleven studies measured patient preferences for MV and three studies measured preferences for both NIV and CPR.

Figure 1: Study Selection



The majority of studies (n=10) elicited patient preferences via interview, while two studies employed the use of a decision aid with a follow up interview (Dales et al., 1999; Wilson et al., 2005). These studies generally documented a stated preference for one or more types of ventilation [typically MV, but also NIV and cardiopulmonary resuscitation (CPR)].

It is critical to note the different means in which patient preferences (in the very broad sense of the concept) were elicited in these twelve studies, as well as the different synonyms used in the patient preference literature on a larger

scale. In general, patients were asked about their stated preferences (i.e. their willingness to receive MV/NIV), or presented with a hypothetical situation in which they were faced with choosing a particular treatment for their worsening COPD or exacerbation.

Nine studies measured patient's stated preferences for the MV intervention (Table 1-1). Two studies explored the perspective of patients who had received the intervention: Goldstein et al. (1995) measured *experience* with patients already using MV support; Jones et al. (1998) measured patient satisfaction with

NIV. Chakrabarti et al. (2009) and Rocker et al. (2008) measured patient *attitudes* towards receiving information about MV, whereas Gaber et al. (2004) asked participants whether sensitive issues, such as preferences for MV and CPR, should be discussed by patients. Lynn et al. (2000) measured patient decisions regarding MV retrospectively, via patient medical record review. Specifically, patients were determined to have made a decision regarding MV if it was documented in the patient's chart, or if the patient was on a ventilator during their hospital stay at any time window during the study.

None of the eligible articles were based on a health economics perspective. Some health economics articles were picked up by the search, but they did not meet our inclusion criteria since they explored COPD patients' utilities, but did not explicitly examine ventilation [e.g. see Haughney et al. (2005) for a quantification of COPD patients' perspectives using discrete choice analysis].

Proportion of COPD Patients Expressing Willingness to Use Mechanical Ventilation

The proportion of COPD study participants who reported a willingness to receive MV varies considerably across studies. Chakrabarti et al. (2009) found that 60% were willing to receive MV after they had been given a detailed verbal description of MV. This percentage dropped to 58% when respondents were given an explanation of alternative treatments and the possible consequences, such as palliation and likely death. Another study asked COPD patients to imagine a hypothetical scenario in which "they were admitted to hospital with a worsening of their condition" (p.627), failing to improve, possibly deteriorating and/or sustaining a cardiopulmonary arrest. On reaching that stage, 77%² responded that they

² Up to possibly 88% as 11 patients gave "mixed" responses but these 11 responses were not recorded in the paper.

would like to receive to MV (Gaber et al., 2004). Stapleton et al. (2005) also reported that a majority of patients (62.2%) would accept short term MV for a "few days" if they were unable to breathe on their own, and given the possibility that there would be "no guarantee that you would be able to come off the breathing machine and be able to breathe on your own" (p. 329). Showing similar results, Norris et al. (2005) found that only a minority of patients would reject MV in their current health state (39.6%).

Three studies appeared to ask COPD patients their preferences for indefinite ventilation. Travaline and Silverman (1995) reported that only 40% would use MV in situations in which the patient would require MV as indefinite life support rather than temporary modality. Lynn et al. (2000) found that a majority of patients (60-70%) would rather die than "spend all of the time" on the ventilator (p. 598). Claessens et al. (2000) reported that 78% of their respondents would be "very unwilling" or "rather die" than be attached to a ventilator "all the time" (p. 155). The statement "all the time" is ambiguous, since we cannot know with certainty whether respondents interpreted these statements as using MV indefinitely, or using MV "all the time", but for a temporary time frame.

Two studies used a decision aid to elicit patient preferences concerning MV. Wilson et al. (2005) gave COPD study participants a comprehensive decision aid to review. The decision aid provided extensive details about survival rates with and without MV, as well as the risks, benefits and process of MV. The decision aid also described the alternative choice as supportive care without MV. The decision aid comprised a portable, self-administered and self-paced audio booklet, and a personal worksheet designed to help patients clarify their own values. It was reported that a majority of patients (74%) declared that they would forego MV in the event of a serious exacerbation (Wilson et al., 2005). An earlier

version of the decision aid was administered to a smaller group (n=20) of COPD patients and this study found that 60% of respondents would forgo MV (Dales et al., 1999).

One study obtained data from patient medical records to determine patients' treatment choices concerning ventilators. Therefore, these decisions would have 'real' medical consequences, in contrast to the responses from the other studies which consisted of preferences that were merely reported to study personnel. This study was part of a larger study called SUPPORT (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment) that was based in five teaching hospitals in the USA (Lynn et al., 2000). They reported data in different time windows based on time before death. They found that in the time period 6 to 3 months before death, the choices selected by patients were the following: 33% choosing to use a ventilator (MV), 12% choosing not to use a ventilator and 54% did not have a decision documented. In the time period 3 to 1 month before death, the corresponding figures were: 46%, 15% and 40%. In the last month before death, the corresponding figures were 40%, 31% and 30%. Although this study suffers from a large number of undocumented cases, it does indicate that those who explicitly made decisions in favour of the ventilator consistently out-numbered those who explicitly chose not to use a ventilator.

Proportion of COPD Patients Expressing Willingness to Use Non-Invasive Ventilation

Two UK studies reported on COPD preferences for NIV. A study based in a community setting found that approximately 67% of their respondents were willing to receive NIV in the situation in which they were "admitted to hospital with worsening of their condition... but failed to improve, continued to deteriorate or sustained a cardiopulmonary arrest." (Gaber et al., 2004, p.627). The second study was

conducted in a hospital setting and reported that 76% to 96% of COPD patients were willing to receive NIV if offered in the acute setting (Chakrabarti et al., 2009).

COPD Patient Satisfaction with Mechanical Ventilation & Non-Invasive Ventilation

Only two studies examined the experiences of COPD patients after receiving ventilation. A Canadian study used a questionnaire to elicit positive and negative comments from patients about the use of MV. The results for the small sub-sample of 9 COPD patients are summarized below. Positive statements included: a life-sustaining treatment (11%), mobility and freedom (44%), and improved symptoms (78%). In terms of negative statements, 67% reported limited mobility and freedom. A UK study sent a postal questionnaire to COPD patients two years after treatment with NIV to evaluate their satisfaction with the procedure. Among respondents, 75% (n=11) claimed to be very satisfied with the treatment.

These studies provide an interesting contrast on patient perspectives compared to the results described previously, because in these cases, patient perspectives post-intervention were described. Unfortunately, the two studies that were obtained for this review have a number of methodological weaknesses: small sample sizes and the absence of a comparison group. Therefore, there are likely selection biases. Regarding the research by Jones et al. (1998), only those participants still alive after two years were able to participate in the study. In the Goldstein et al. (1995) study, the sampling frame consisted entirely of those participants who were in a community setting. Therefore, the results pertain to the experience of those patients with relatively successful outcomes (in community and alive), and necessarily excludes those patients with less successful outcomes (in hospital or died).

Predicting Preferences for Mechanical Ventilation & Non-Invasive Ventilation Among COPD Patients

A number of studies tested associations between patient preferences for ventilation and covariates. Based on simple bivariate analyses, two studies found preferences for MV were associated with younger age (Chakrabarti et al., 2009; Wilson et al., 2005³); but no associations were found in two other studies (Gaber et al., 2004; Travaline & Silverman, 1995). In addition, Stapleton (2005) found that preferences for MV were associated with younger age in bivariate analyses only, but age did not predict preferences in a multivariate model. In terms of functional status or quality of life, associations were found in only one study (Chakrabarti et al., 2009). However, they were not found in three other studies (Gaber et al., 2004; Stapleton et al., 2005 and Wilson et al., 2005). An association between gender and preferences for MV was found in one study with a very small sample size of nineteen participants (Dales et al., 1999), but no association with gender was found in any of the other studies that examined this covariate (Chakrabarti et al., 2009; Gaber et al., 2004; Norris et al., 2005; Stapleton et al., 2005; Travaline & Silverman, 1995; Wilson et al., 2005). All other covariates tested did not reveal any statistically significant association with MV preferences. Covariates that were tested and showed no associations included: spirometry; education; race; clinic attended; marital status; FEV₁; home oxygen; dyspnea; SF36 dimensions; depression index; use of antidepressants; number of hospital admissions over the previous 12 months; previously ventilated; mental status score; health status; presence of comorbid conditions; forced expiratory vital capacity; home oxygen use; long term oxygen

³ Note that Wilson et al. 2005 made the rather arbitrary decision to lump the undecided group (n=2) in with those who would be willing to accept MV (N=8) when they conducted these analyses.

therapy; body mass index (BMI); Medical Research Council (MRC) index; social circumstances; smoking status; and anxiety (Chakrabarti et al., 2009; Gaber et al., 2004; Stapleton et al., 2005; Travaline & Silverman, 1995; Wilson et al., 2005).

The studies that explored patient preference for NIV also did not reveal associations with any measured covariates. Chakrabarti et al. (2009) found that preferences for NIV were not associated with health status, BMI, FEV₁, Nottingham Extended Activities of Daily Living (NEADL) Index, Hospital Anxiety and Depression Scale (HADS), gender, domiciliary oxygen use, prior participation in a pulmonary rehabilitation program, social status, smoking status, MRC index, or World Health Organization (WHO) performance status. Similarly Gaber et al. (2004) did not find associations between preferences for NIV and any measured covariates such as age, sex, spirometry, the use of antidepressants, the number of hospital admissions over the previous 12 months, being on LTOT, or the BPQoL questionnaire score.

The results indicate that it is very difficult to predict those COPD patients who are willing to receive either MV or NIV and those who would forgo the intervention.

Comparing Patient Preferences to Surrogate & Physician Preferences

Two studies contrasted physician preferences with patient preferences. In the study by Dales et al. (1999), the patient's physician was asked whether they would recommend "ventilation to prevent death from respiratory failure" to their patient. The physicians were kept blind to their patient's decision. The results indicate that the agreement between physician and patient was quite low at 65%. Another study explored physicians' own preferences for ventilation under situations of permanent coma or dementia scenarios. These questions were

based on the premise (and this premise has some empirical support in the literature) that physicians' estimates of patients' preferences for life-sustaining treatments are closer to physicians' own preferences than to those of their patients. (e.g. see Gramelspacher et al., 1997). They found that physicians were less likely to want ventilation for themselves, than patients with oxygen-dependent COPD under these two scenarios (i.e. permanent coma or dementia) ($p < .001$).

One study explored the preference for MV by surrogate decision makers. Family members that were most likely to make a decision on behalf of the patient, were asked which choice they would make for the patient in the event of a life-threatening exacerbation. Surprisingly, the results indicate that there was uniform disagreement between decisions made by the COPD patient and their next of kin [note that this question was posed to a small subset of the total study sample ($n=7$)]. Patients who stated that they would choose ventilation had family members who stated that they would not select it. Those patients who stated that they would forgo ventilation had family members who stated that they would choose the treatment.

Patient Preferences Regarding Mechanical Ventilation for Serious Illness Situations

In one study, COPD patients were asked about their choices regarding MV under different possible health states (Norris et al., 2005). Only a minority of COPD patients (31%) stated that they would reject intubation and MV in their current health state. But, when patients were asked their preferences in hypothetical situations in which they were seriously incapacitated, than a majority of patients stated that they would reject intubation and MV. More specifically, when asked about intubation and MV in situations of permanent coma, dementia or bed-bound, the percentage of participants rejecting the intervention was: 94%, 85% and

84% respectively. These results indicate how individual stated preferences are not fixed, but may be contingent on circumstances such as their hypothetical health state.

The Issue of "Framing" and Patient Preferences

Chakrabarti et al. (2009) demonstrates that expressed preferences among COPD patients can vary based on how the intervention is presented and described to the patient. For their multi-stage interview, they found that following a verbal description, 96% of study participants stated a willingness to receive NIV if offered in the acute setting. However, when shown a photograph, the percentage dropped to 76% and after receiving a demonstration it increased to 84%. In terms of MV, 60% were willing to receive the intervention following a verbal description. This decreased to 58% when patients were given an explanation of alternative treatments to MV. These findings reveal that patients can express different preferences depending on the content of the information that is conveyed to them and how it is conveyed to them (i.e. how the information is framed).

Do COPD Patients Want to Discuss Their Prognosis and Possible Interventions?

A few studies explored whether COPD patients want to discuss sensitive issues, such as preferences for MV, or advanced directives of care (ADC). A Canadian study found that only 32% believed it was important to know about ICUs and only 29% thought that it was extremely important to know about MV⁴ (Rocker et al., 2008). Regarding broader informational needs, another study found that only 30% of respondents wanted to know about their prognosis and disease progression (Rocker et al., 2008). In contrast, a UK study found that

⁴ No data were provided for other response categories.

98% of respondents (65 patients completed the satisfaction questionnaire) thought that the “sensitive” issue of preferences for NIV, invasive ventilation and CPR should be discussed with patients (Gaber et al., 2004). It is worth noting that only Gaber et al. (2004) had patient preferences elicited by a respiratory nurse who was responsible for coordinating the patients’ care needs. In contrast, for the other two studies, patients were queried about their preferences by individuals with whom the patients had no prior relationship [a respiratory physician in Chakrabarti et al. (2009) and a research coordinator in Rocker et al. (2008)]. It is possible that patients respond more favourably to discussions concerning their preferences in the context of a professional relationship, rather than in the context of a research study with relatively unknown research personnel. In addition, these studies are all based on a selected group of COPD patients who are willing to discuss their preferences in the context of a research study (Chandramouli et al., 2011). COPD patients who are not willing to participate in a research study may be less inclined to know about their condition and discuss their treatment preferences.

Decision Aids: Stressful for COPD Patients?

One study provided greater detail about the decision-making process by asking participants whether working through a decision aid was stressful. Wilson et al. (2005) reported that 55% of respondents found that “working through the decision aid” was “not at all upsetting”. However, some patients found it “a little” (18%), “quite” (9%) or “very upsetting” (18%). In addition, five individuals (15%) completed the first interview but declined to take part in the follow-up, and of these, three “specifically indicated that they had been upset by the content of the decision aid” (Wilson et al., 2005, p.94). The decision aid provides far more detailed information about the disease and the

intervention than the information that was provided to the patients in the other studies. In addition, the decision aid is an instrument that is reviewed at home. So in this case, information is acquired in isolation, rather than with a professional in the context of a caring relationship. It is possible that this isolating context contributed to the patient distress reported above.

DISCUSSION

The results of this study provide us with a number of insights regarding the attitudes, beliefs and preferences for ventilation among COPD patients. In addition, the *process* of conducting this systematic review brought to light the challenges in locating and synthesizing the literature. Initially, particular results of this case study will be discussed. Secondly, broader set of issues pertaining to systematic reviews of patient preferences and HTAs will be presented.

Understanding Preferences for Ventilation Among COPD Patients

The studies extracted for this review were highly varied in terms of research question and study design. Nonetheless, the results obtained from this systematic review provided us with some important new understandings regarding ventilation preferences and attitudes among COPD patients.

The studies selected for this review provided quite different estimates of the proportion of COPD patients that would choose MV as a treatment modality. These studies differed significantly in terms of key features of the study, such as the questions that were asked, the background information that was presented to participants, and the type of personnel that was asking the question. Nonetheless, it seems that when COPD patients were provided with a simple explanation of MV, a majority of participants reported that they would *try* the intervention (Chakrabarti et al., 2009; Gaber et al., 2004; Stapleton et al., 2005). However, when the question was framed in terms of *indefinite* use, only a minority of respondents stated that they would accept the intervention (Claessens et al., 2000; Lynn, et al., 2000; Travaline & Silverman, 1995). Studies in which participants were provided with more detailed information about the intervention, via decision

aids, found that a majority of their respondents were willing to forgo the intervention (Dales et al., 1999; Wilson et al., 2005).

A second important finding was the striking unpredictability of patient responses regarding their preferences for ventilation. Covariates such as age, gender, or quality of life indices did not show a consistent association with patients' preferences across studies. Patient preferences were also poorly correlated with the preferences stipulated by their next of kin or by their attending physicians. Therefore, this study affirms the importance of communicating with COPD patients regarding their ventilation preferences prior to them entering critical health states, as preferences made by others on their behalf are unlikely to coincide with patients' preferences. Further, it would seem advisable to ask patients about their preferences regarding ventilation for both their current health state, as well as under situations of serious illness, as it seems that there is evidence (Norris et al., 2005) that these preferences can differ.

Incorporating Systematic Reviews of Patient Preferences into HTA: Challenges & Future Directions

This case study has shown that it is indeed possible to conduct a systematic review of the research literature that deals with the preferences, attitudes, and beliefs of patients. Further, it was shown that such a literature search provides a number of insights beyond what is obtained from the standard systematic review. In addition, the process of conducting this preference-related case study revealed a number of challenges.

The execution of this systematic review was particularly time-consuming. The majority of studies explored patient preference as a mere sideline to a broader set of research questions. Therefore, patient preference results were difficult to locate within the paper, as they were at times displayed in graphical, rather than numerical form. The process was also laborious due to the heterogeneity in both taxonomy and instrumentation.

In this study, we found that taxonomy was not consistent across studies. For example, it was found that some researchers used the word 'preferences', while others used the term 'attitudes towards...' when referring to the same construct. Further, occasionally the term 'preferences' was used to describe preferences expressed by patients to research study personnel when asked about hypothetical situations, while other times it was used to describe the stated preferences documented by medical personnel in patients' medical records. These inconsistencies in taxonomy meant that creating a search strategy to 'locate' the literature was a challenging undertaking

The heterogeneity between studies also extends to key features of the study design. Consider, for instance, the studies in this review that explored a stated hypothetical preference for MV. Across studies, patients were presented with different types of information about the intervention (e.g. varying detail concerning survival rates, long term outcomes); information was presented in different ways (e.g. decision aids, demonstrations, photographs); and the preference-related questions posed different types of hypothetical scenarios (e.g. some studies asked patients about MV as a temporary modality, whereas other studies asked patients about indefinite MV). Therefore, this research literature is more diverse than typical systematic reviews; as such reviews typically feature studies with comparable interventions and outcomes (outcomes are often measured by means of a series of standardized questionnaires, for

instance). The heterogeneity for this preference-related research means that meta-analytic pooling of results is definitely not advisable and that synthesizing the research literature is a time-consuming, descriptive and *interpretive* process.

The results of this systematic review provide some evidence that ventilation preferences will vary when COPD patients are provided with different forms and types of information regarding ventilation (Chakrabarti et al., 2009). This is certainly not an unexpected finding, given the extensive research literature on "framing effects" that show that individuals will even respond differently when presented with different, but objectively equivalent descriptions of the same problem [e.g. presenting risk in a positive or negative light (see review by Levin et al., 1998)]. However, this issue poses additional challenges. If one were to construct preference-sensitive guidelines, population preferences for an intervention should then typically have to be presented as a range of values, rather than based on a point estimate, as estimates would vary based on the exact questions that are asked. Another issue to consider: should guidelines provide guidance on how questions should be addressed to patients? Or, on how communication with patients regarding preferences should proceed? If guidance is not provided, then no doubt, physicians will continue to do what they do now, which is to frame information about interventions in order to influence patient decisions (McNeely et al. 1997).

Finally, the methodological quality of this research literature was inconsistent. Many studies were hampered by very small sample size, particularly for those studies that had only a sub-sample of COPD patients. In addition, some of the preference related questions were not clearly stated, thus they may have been interpreted differently by different respondents. Although many studies explored the predictability of patient responses by

testing associations with covariates, only a few studies tested these associations in multivariate models. For those studies which used only bivariate analyses, one cannot rule out the possibility that these associations were spurious and caused by a third, (untested) covariate. Only two studies tested the stability of patient preferences, so we do not know how patient preferences may vary for the same person over time (Dales et al., 1999; Wilson et al., 2005). The two studies that explored satisfaction/experience with the ventilation had particularly weak study designs, as they lacked a control group and were therefore subject to selection biases (Goldstein et al. 1995; Jones et al., 1998).

CONCLUSIONS

In light of the considerations presented above, a number of future directions should be explored. First, the area of patient preferences, attitudes, and beliefs would benefit greatly from a taxonomy which could highlight the conceptual distinctions and commonalities of the terms used in this area. Further, conceptual work could help identify the disciplinary origins of each term and aid in the identification and search strategy utilized for relevant research articles. In this systematic review, for instance, we unwittingly excluded research concerned with discrete choice modeling. This was not intentional, but arose because of our focus on an intervention (ventilation) as well as on a condition (COPD). Discrete choice modeling explores the values accorded to outcomes and therefore is not restricted to one particular intervention. The development of a conceptual map would mitigate these unintentional exclusions.

Finally, given the inconsistent quality of the research that is found in this area, further methodological work would be beneficial. For instance, a quality checklist could be developed to ensure that all studies included in the systematic review have attained at least a minimal quality standard.

Table 1-1

Article	Frequency of Measurement	Setting	N	Preference-Related Outcome Measures	Preference Elicitation Methods	Sample Questions
1. Chakrabarti et al. (2009)	1	UK; hospital	50	Patient attitudes towards receiving MV and NIV.	Five-stage structured interview.	Willingness to receive NIV in an acute setting after being provided with a: verbal description (stage 1); photograph (stage 2); demonstration (stage 3); willingness to receive MV after detailed explanation (stage 4); after explanation of alternatives (stage 5).
2. Claessens et al. (2000)	1	USA; multi-center study in 5 teaching hospitals	445 = patient only; 730 = surrogate substitution	Preference for having MV indefinitely was assessed by interview.	Interviews.	"Would you be very willing, somewhat willing, somewhat unwilling, very unwilling, or rather die than put up with (or continue to put up with) being attached to a ventilator or respirator all the time?" Response categories (Likert scale): very willing; somewhat willing; somewhat unwilling; very unwilling; would rather die.
3. Dales et al. (1999)	1	Canada; hospital	19	Preference for intubation and MV.	Scenario-based decision aid. Patients were interviewed on two occasions, with a second interview taking place a year later.	<i>I. To be intubated and receive MV:</i> "Medication will be used to reduce breathlessness and discomfort, and there will be a 50% chance of coming off of the machine and living for one 1 year in a state of health that is no better or worse than before the attack which brought them to hospital" <i>II. Not to be intubated:</i> "Medication will be used to reduce breathlessness and discomfort, and there will be a 100% chance of natural death."
4. Gaber et al. (2004)	1	UK; community	100	Stated preference for MV, NIV or CPR.	Patients were given written information explaining MV, NIV and CPR.	Patients were asked to imagine a hypothetical scenario in which "they were admitted to hospital with worsening of their condition, but in spite of full standard treatment, they failed to improve, continued to deteriorate or sustained a cardio-pulmonary arrest. They were asked 'On reaching that stage, would you wish to have NIV, IV or CPR?' and were invited to reply to

						each of the three options with 'yes' or 'no' answers."
5. Goldstein et al. (1995)	1	Canada; community	9	Patient experience with use of MV.	Standardized format questionnaire conducted by a research assistant.	1. How has MV affected your lifestyle? Responses were classified as either positive or negative and grouped into thematic categories. 2. Do you feel that you made an informed choice when you first started MV or when it became permanent? Response categories were "yes", "no", "don't know".
6. Jones et al. (1998)	1	UK; hospital	11	Patient satisfaction with NIV.	Postal questionnaire completed after 2 years of treatment.	No details provided.
7. Lynn et al. (2000)	3	See Claessens et al. (2000)	416 *	Preference for MV.	Medical records and interviews with patients and their identified surrogates. Patients were interviewed at three instances in time: after study entry; during week 2 (or discharge), and then follow up conducted at 2 and 6 months after enrolment.	The following was assessed by interview: "preferences to die rather than spend all of the time on a ventilator". The following was assessed by medical records: "decision to use ventilator", "not to use ventilator", or "no decision documented".
8. Norris et al. (2005)	1	See Stapleton et al. (2005)	111	Stated preference for MV and CPR.	Interviewer administered questionnaire.	"Participants were asked whether they would want intubation and MV and whether they would want CPR in four health states: (1) current health, (2) permanent coma, (3) dementia unable to recognize their family or friends, or (4) bed-bound and dependent on others for all care. The response choices for the questions were: 'definitely no,' 'probably no,' 'probably yes,' and 'definitely yes'."
9. Rocker et al. (2008)	1	Canada; multi-center study in 5 teaching hospitals	118	Patients' attitudes towards receiving information about MV.	A research coordinator at each site administered a 28-item questionnaire in person.	Patients had to rate whether it was extremely important that they receive information about MV. Response categories were: (1) not at all important, (2) somewhat important (3) important (4) very important (5) extremely important.
10. Stapleton et al. (2005)	1	USA; community and hospital	101	Patient preferences for MV or CPR given their current health status.	Patients were interviewed in person by a trained study interviewer. Patients were asked about their treatment preferences	"The first treatment is short-term mechanical ventilation. You would be in an ICU, and a tube would be placed through your mouth or nose into your lungs. This tube would be attached to

					for MV or CPR given their current health status.	a breathing machine for a few days. During that time, you would have to be continuously on the breathing machine and would be unable to talk. If you were in your current health and were unable to breathe on your own, would you want to be on a breathing machine for a few days? There would be no guarantee that you would be able to come off the breathing machine and be able to breathe on your own."
11. Travaline and Silverman (1995)	1	USA; hospital	37	Patient preferences for indefinite MV.	Patients were interviewed in person following their appointment with their physician via a questionnaire.	It was explained to each patient that, "the MV is a 'breathing machine' used for patients with severe difficulty in breathing function in order to keep them alive either temporarily or indefinitely. The patient was then presented with the hypothetical situation of requiring MV as 'indefinite life-support' rather than temporary modality. The patient was then asked: "Were you aware of the possibility that you may require such a breathing machine in the future if your breathing problem becomes very severe?" "Have any of the doctors discussed this issue of breathing machines with you?" "If your breathing should become so severe that you would need the breathing machine to stay alive indefinitely, would you want it?" Possible responses were "yes", "no", "unsure" Key information from the decision aid includes: (1) the average duration of MV is 7–10 days; (2) about 70% of patients will come off the ventilator and survive to hospital discharge; (3) about 20% of patients will die without ever coming off MV, and; (4) about 10% will be weaned from MV but die during the period of hospitalization. Also, among the 70% of patients who survive to hospital discharge, about 40% will die within the following year, and 30% will live longer than 1 year.
12. Wilson et al. (2005)	2	Canada; rehabilitation centre	33	Preference for MV in the event of a life-threatening exacerbation.	In the first session, baseline preferences for MV were measured. The patient is provided with a decision aid (DA) to review at home. The DA comprised of a portable, self-administered and self-paced audio booklet describing the prognosis of COPD. The decision aid describes the alternative choice as supportive care (the patient is left as comfortable as possible and results in death for more than 95%). After reviewing the DA at home, a second session was conducted to	

ask participants about their preferences for MV.

Table 1-2

Article	Main Results	Associations with Covariates
1. Chakrabarti et al. (2009)	<ul style="list-style-type: none"> ▪ Stage 1 – 96% (48/50) stated a willingness to receive NIV if offered in the acute setting. ▪ Stage 2 – 76% (38/50) stating that they would be willing to receive NIV. ▪ Stage 3 – 84% (42/50) of the cohort stated that they would be willing to receive NIV. ▪ Stage 4 – 60% (30/50) stated that they would be willing to receive MV during an acute exacerbation. ▪ Stage 5 – 58% (29/50) stated that they would be willing to receive MV. ▪ 86% found demonstration of NIV helpful in decision making compared to 24% with the photographic aid (p<00.001). 	<ul style="list-style-type: none"> ▪ Patients willing to receive MV were younger (67 versus 76 years p=0.016) and had a better functional status (NEADL index 20 versus 15 units p=0.03). ▪ Willingness to receive NIV was not significantly associated with any covariates measured such as gender, health status, depression.
2. Claessens et al. (2000)	<ul style="list-style-type: none"> ▪ 78% of COPD patients would be "very unwilling" or "would rather die" than be attached to a ventilator "all the time" (n=445). ▪ Among COPD patients, 77% responded 'yes' when it was the surrogate response b/c patient was unable to communicate (n=730). ▪ 37% of COPD patients had a preference for a do not resuscitate order. 	
3. Dales et al. (1999)	<ul style="list-style-type: none"> ▪ Two males (20%) and all ten women declined MV. Three undecided patients did make a decision as a result of the DA (15%). An additional 3 patients changed their decision after reviewing DA (15%). ▪ At 1 year, only 2 patients (11%) had changed their decision. ▪ The agreement between physicians and patients was 65%. ▪ There was no agreement between patients and next-of-kin (0%). 	
4. Gaber et al. (2004)	<ul style="list-style-type: none"> ▪ 77% of patients said yes to MV and 67% said yes to NIV. ▪ Forty-eight patients (~48%) wanted all additional treatments (MV, NIV, CPR) if needed and 12 wanted none (~12%). ▪ 19 patients said 'no' for CPR but 'yes' to NIV and MV (~19%). ▪ 10 patients said 'no' to CPR and MV but 'yes' to NIV (~10%). ▪ 11 patients gave mixed answers (11%). ▪ 64 out of 65 patients agreed that this sensitive issue should be discussed. 	<ul style="list-style-type: none"> ▪ There were no statistical differences between the groups answering 'yes' and 'no' with respect to age, sex, spirometry, the use of antidepressants, the number of hospital admissions over the previous 12 months, being on LTOT or the BPQoL questionnaire score.
5. Goldstein et al. (1995)	<ul style="list-style-type: none"> ▪ In terms of positive statements, 11% (n=1) reported it was a life-sustaining treatment, 44% (n=4) reported mobility and freedom, 78% (n=7) reported improved symptoms. ▪ In terms of negative statements, 67% (n=6) reported limited mobility and freedom, 0% reported equipment concerns or social implications. ▪ 33% (n=3) felt that they had made an informed decision when they first started MV. 	
6. Jones et al. (1998)	<ul style="list-style-type: none"> ▪ 75% claimed to be "very satisfied" with the treatment, and dissatisfaction in the remainder was related to skin ulceration on the bridge of the nose 	

	caused by the mask (a problem which the authors claimed to be resolved in most cases by careful adjustment of the head harness).	
7. Lynn et al. (2000)	<ul style="list-style-type: none"> ▪ Preferences to die rather than living on a ventilator were between 60%-70% of those interviewed. These preferences were stable over the three time windows (6mo-3mo before death; 3mo-1mo before death; 1mo-death). ▪ In terms of decisions to use the ventilator as documented by medical records: At six to three months before death, 33% (n=38) of patients made a decision to use MV, while 12% (n=14) chose not to have MV. At three to one month prior to death, 46% (n=76) chose MV, while 15% (n=24) chose not to use MV. At one month before death, 40% (n=103) chose to use MV, while 31% (n=81) chose not to use MV. 	
8. Norris et al. (2005)	<ul style="list-style-type: none"> ▪ Preferences for not wanting intubation+MV in four health states: (1) 39.6%; (2) 93.6%; (3) 84.5%; (4) 83.6%. ▪ For COPD patients, preferences for not receiving CPR in the four health states were: (1) 38.4%; (2) 91%; (3) 81.7%; (4) 82.1%. ▪ In terms of their personal preferences, physicians were less likely to want CPR or MV in permanent coma and dementia scenarios than patients with oxygen-dependent COPD (p<0.001). 	<ul style="list-style-type: none"> ▪ There were no significant differences between men and women in terms of these treatment preferences.
9. Rocker et al. (2008)	<ul style="list-style-type: none"> ▪ 29% of COPD patients thought that it was extremely important to have information about MV. ▪ No data provided for the four other response categories. 	
10. Stapleton et al. (2005)	<ul style="list-style-type: none"> ▪ A majority of the patients surveyed reported they would want MV (62.2%) and CPR (63.6%). 	<ul style="list-style-type: none"> ▪ Age, number of co-morbid illnesses, FEV₁, gender, evidence of depression, HRQoL, were not associated with preferences for MV in a multivariate model. ▪ The absence of depression was significantly associated with a preference for CPR in a multivariate model ▪ Age, sex, race, clinic or co-morbid conditions did not predict preference for MV.
11. Travaline and Silverman (1995)	<ul style="list-style-type: none"> ▪ 40% (n=15) responded they would use MV as indefinite support, 22% (n=8) would not use MV, and 38% (n=14) were unsure. ▪ Patients who had discussions with their physicians were more likely to specify a choice concerning MV when compared with those patients who had no prior discussions. ▪ Discussions concerning life-sustaining treatment with MV occurred infrequently between patients with COPD and their physicians (among only 14% of study participants). 	
12. Wilson et al. (2005)	<ul style="list-style-type: none"> ▪ Only two participants (6%) reported that they had already made an advanced decision about MV at baseline. ▪ After reviewing the decision aid, 94% (31) reported they made a choice. ▪ Of those who made a decision, 74% (23) decided to forego MV in the event of a serious exacerbation. ▪ Evidence that 24% of the participants did not completely understand the 	<ul style="list-style-type: none"> ▪ Those who would accept MV were significantly younger. However, the two groups did not vary by gender, pulmonary function, dyspnea, HRQoL, depressive symptoms. ▪ Of the 23 patients who would forego MV, 5 (22%) cited a low likelihood of survival as being the most important reason for their decision. ▪ Physical discomfort (17%), the expectation of a generally diminished

decision aid.

- 27% found the experience of the DA to be "a little" or "quite upsetting" and a further 18% found it to be "very upsetting". 12% found that the decision was "quite," "very," or "extremely" difficult to make.
- A total of 22 participants (67%) reported that they had discussed their ventilation decision with another person. This was usually the spouse or other family member (21/22 = 96%), although in some cases it also included the family physician (3/22 = 14%).

quality of life (17%), and loss of independence (9%), were also cited by some participants.

- For those who were inclined to accept MV (or who were uncertain), the most common reason was that these individuals had a strong personal will to prolong life (40%) or important external social reasons for staying alive (20%).

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APPENDIX A

#	Query	Results
	CINAHL March 4, 2011	
S67	s64 and s66	36
S66	s23 and s65	610
S65	s35 or s47	37306
S64	s48 or s49 or s50 or s51 or s52 or s53 or s54 or s55 or s56 or s57 or s58 or s59 or s60 or s61 or s62	17541
S63	noninvasive ventilation	348
S62	non invasive ventilation	126
S61	positivepressure ventilation	2
S60	positive pressure ventilation	1464
S59	intubation, intratracheal	3696
S58	tracheostomy	1970
S57	tracheotomy	301
S56	respiratory failure	3185
S55	artificial respiration	21
S54	assisted ventilation	200
S53	artificial ventilation	69
S52	mechanical ventilation	3933
S51	pulmonary ventilation	56
S50	(MH "Ventilators, Mechanical")	988
S49	ventilation	10665
S48	(MH "Ventilation+")	732
S47	s36 or s37 or s38 or s39 or s40 or s41 or s42 or s43 or s44 or s45 or s46	12472
S46	"willingness to pay"	285
S45	"cost utilit**"	328
S44	"life year**"	1414
S43	"qaly"	550
S42	"quality adjusted life years"	676
S41	"quality-adjusted life years"	676
S40	(MH "Quality-Adjusted Life Years")	276
S39	"cost effect**"	11448
S38	"cost-effect**"	11448
S37	"value of life"	312
S36	(MH "Economic Value of Life")	251
S35	s24 or s25 or s26 or s27 or s28 or s29 or s30 or s31 or s32 or s33 or s34	25522
S34	"decision tool**"	60
S33	"decision aid**"	368
S32	(MH "Decision Support Techniques+")	1009
S31	"patient* satisfaction"	19998
S30	"patient* involve**"	732
S29	"patient* participation"	560
S28	"patient* acceptibilit**"	0
S27	"patient* perception**"	1977
S26	"patient* value**"	297
S25	"patient* view**"	723
S24	"patient* preference**"	1372
S23	s1 or s2 or s3 or s4 or s5 or s6 or s7 or s8 or s9 or s10 or s11 or s12 or s13 or s14 or s15 or s16 or s17	30112
S22	"lung function**"	1978
S21	"respiratory function**"	4406
S20	"asthma"	17428
S19	"pulmonary* inflammat**"	138
S18	"airway* inflammat**"	585
S17	"lung* inflammat**"	182
S16	"obstructive pulmonary disease"	3707
S15	"obstructive lung disease"	292
S14	"obstructive airway disease"	54
S13	"airflow obstruction"	355
S12	(MH "Emphysema+")	1000
S11	(MH "bronchitis, chronic+")	156
S10	(MH "bronchiolitis+")	524
S9	(MH "bronchitis+")	1266
S8	(MH "Asthma+")	15228
S7	"chronic obstructive pulmonary disease**"	3692
S6	"chronic obstructive lung disease**"	173
S5	"chronic obstructive airway* disease**"	47
S4	(MH "Lung Diseases, Obstructive+")	23173
S3	"coad"	17
S2	"copd"	4222
S1	(MH "Pulmonary Disease, Chronic Obstructive+")	4602

ECONLIT March 4, 2011	
((copd or coad or (pulmonary disease)) or ((obstructive lung disease) or (chronic obstructive airw	3 Results

EMBASE 1980 to 2011 Week 08		
#	Searches	Results
1	[COPD BMC Pulmonary Medicine 2009, 9:32 doi:10.1186/1471-2466-9-32]	0
2	exp Pulmonary Disease, Chronic Obstructive/	50012
3	copd.mp.	22438
4	coad.mp.	211
5	OBSTRUCTIVE LUNG DISEASE.mp. or Lung Diseases, Obstructive/	51133
6	(chronic obstructive adj3 airway* disease*).mp.	893
7	(chronic obstructive adj3 lung* disease*).mp.	50784
8	(chronic obstructive adj3 pulmonary* disease*).mp.	23485
9	lung diseases, obstructive/ or asthma/ or bronchitis/ or bronchiolitis/ or bronchitis, chronic/	207009
10	airflow obstruction*.mp.	3174
11	(obstructive adj3 airway* disease*).mp.	2894
12	(obstructive adj3 lung* disease*).mp.	51357
13	(obstructive adj3 pulmonary* disease*).mp.	24026
14	(lung* adj3 inflammat*).mp.	21879
15	(airway* adj3 inflammat*).mp.	13842
16	(pulmonary adj3 inflammat*).mp.	4855
17	asthma*.mp.	161621
18	respiratory function*.mp.	15835
19	lung function*.mp.	69996
20	exp emphysema/	26096
21	((chronic adj2 bronchitis) or emphysema).ti,ab.	25851
22	or/2-21	326479
23	exp Patient Preference/	0
24	(patient* adj3 preferenc*).mp.	7964
25	(patient* adj3 view*).mp.	7706
26	(patient* adj3 value*).mp.	25302
27	(patient* adj3 perception*).mp.	12549
28	(patient* adj3 acceptabilit*).mp.	1476
29	(patient* adj3 participation).mp.	14655
30	(patient* adj3 satisfaction).mp.	71820
31	(patient* adj3 perspectiv*).mp.	6274
32	exp Decision Support Techniques/	8451
33	decision aid*.mp.	1113
34	decision tool*.mp.	287
35	exp "Value of life"/	129820
36	(value adj life).mp.	20
37	(cost-effect* or "cost effect*").mp.	106036
38	exp Quality-Adjusted Life Years/	7093
39	"quality-adjusted life years".mp.	2584
40	"quality adjusted life years".mp.	2584
41	qaly.mp.	3460
42	(life adj years).mp.	4383
43	cost utili*.mp.	4328
44	(cost adj2 utili*).mp.	7353
45	(cost adj2 effect*).mp.	107964
46	(cost adj2 utilit*).mp.	4518
47	(willingness adj2 pay).mp.	1821
48	"discrete choice experiment".mp.	206
49	exp Ventilation/	8969
50	ventilation.mp.	132473
51	exp Pulmonary Ventilation/	21983
52	pulmonary ventilation.mp.	2311
53	mechanical ventilation.mp.	25212
54	artificial ventilation.mp.	63041
55	assisted ventilation.mp.	8433
56	artificial respiration.mp.	1491
57	respiratory failure.mp.	44305
58	intubation, intratracheal.mp.	3
59	tracheotomy.mp.	9971
60	tracheostomy.mp.	12544
61	positive pressure ventilation.mp.	5611
62	positivepressure ventilation.mp.	3
63	non invasive ventilation.mp.	1116
64	noninvasive ventilation.mp.	1235
65	or/23-34	146511
66	or/35-48	243737
67	or/49-64	181919
68	22 and (65 or 66)	8867
69	67 and 68	602
70	limit 69 to (human and english language and yr="1990 -Current")	449

Ovid MEDLINE(R) 1948 to February week 4 2011		
#	Searches	Results
1	[COPD BMC Pulmonary Medicine 2009, 9:32 doi:10.1186/1471-2466-9-32]	0
2	exp Pulmonary Disease, Chronic Obstructive/	15046
3	copd.mp.	16571
4	coad.mp.	177
5	OBSTRUCTIVE LUNG DISEASE.mp. or Lung Diseases, Obstructive/	19563
6	(chronic obstructive adj3 airway* disease*).mp.	714
7	(chronic obstructive adj3 lung* disease*).mp.	2881
8	(chronic obstructive adj3 pulmonary* disease*).mp.	24479
9	lung diseases, obstructive/ or asthma/ or bronchitis/ or bronchiolitis/ or bronchitis, chronic/	144969
10	airflow obstruction*.mp.	2652
11	(obstructive adj3 airway* disease*).mp.	1692
12	(obstructive adj3 lung* disease*).mp.	19896
13	(obstructive adj3 pulmonary* disease*).mp.	24873
14	(lung* adj3 inflammat*).mp.	6512
15	(airway* adj3 inflammat*).mp.	9871
16	(pulmonary adj3 inflammat*).mp.	4032
17	asthma*.mp.	115604
18	respiratory function*.mp.	40633
19	lung function*.mp.	17789
20	exp emphysema/	9571
21	((chronic adj2 bronchitis) or emphysema).ti,ab.	22734
22	or/2-21	228429
23	[Patient Preferences]	0
24	exp Patient Preference/	574
25	(patient* adj3 preferenc*).mp.	6711
26	(patient* adj3 view*).mp.	6153
27	(patient* adj3 value*).mp.	20464
28	(patient* adj3 perception*).mp.	7362
29	(patient* adj3 acceptabilit*).mp.	1135
30	(patient* adj3 participation).mp.	16218
31	(patient* adj3 satisfaction).mp.	54890
32	(patient* adj3 perspectiv*).mp.	4825
33	exp Decision Support Techniques/	46572
34	decision aid*.mp.	833
35	decision tool*.mp.	209
36	or/25-35	153707
37	[COPD Economics - MEDLINE]	0
38	exp "Value of life"/	5118
39	(value adj life).mp.	12
40	(cost-effect* or "cost effect*").mp.	53377
41	exp Quality-Adjusted Life Years/	4795
42	"quality-adjusted life years".mp.	5600
43	"quality adjusted life years".mp.	5600
44	qaly.mp.	2500
45	(life adj years).mp.	6642
46	cost utili*.mp.	1643
47	(cost adj2 utili*).mp.	2989
48	(cost adj2 effect*).mp.	55134
49	(cost adj2 utilit*).mp.	1827
50	(willingness adj2 pay).mp.	1386
51	"discrete choice experiment".mp.	148
52	or/38-51	65084
53	[Ventilation]	0
54	exp Ventilation/	4160
55	ventilation.mp.	83304
56	exp Pulmonary Ventilation/	31348
57	pulmonary ventilation.mp.	11233
58	mechanical ventilation.mp.	19177
59	artificial ventilation.mp.	2550
60	assisted ventilation.mp.	1842
61	artificial respiration.mp.	1450
62	respiratory failure.mp.	16513
63	intubation, intratracheal.mp.	25988
64	tracheotomy.mp.	8945
65	tracheostomy.mp.	8960
66	positive pressure ventilation.mp.	4752
67	positivepressure ventilation.mp.	1
68	non invasive ventilation.mp.	684
69	noninvasive ventilation.mp.	842
70	or/54-69	149054
71	22 and (36 or 52)	4065
72	70 and 71	796
73	limit 72 to (human and english language and yr="1990 - Current")	608

PsyclINFO 1806 to March Week 1 2011		
#	Searches	Results
1	[COPD BMC Pulmonary Medicine 2009, 9:32 doi:10.1186/1471-2466-9-32]	0
2	exp Pulmonary Disease, Chronic Obstructive/	0
3	copd.mp.	618
4	coad.mp.	10
5	OBSTRUCTIVE LUNG DISEASE.mp. or Lung Diseases, Obstructive/	62
6	(chronic obstructive adj3 airway* disease*).mp.	22
7	(chronic obstructive adj3 lung* disease*).mp.	55
8	(chronic obstructive adj3 pulmonary* disease*).mp.	950
9	lung diseases, obstructive/ or asthma/ or bronchitis/ or bronchiolitis/ or bronchitis, chronic/	3096
10	airflow obstruction*.mp.	26
11	(obstructive adj3 airway* disease*).mp.	30
12	(obstructive adj3 lung* disease*).mp.	75
13	(obstructive adj3 pulmonary* disease*).mp.	958
14	(lung* adj3 inflammat*).mp.	39
15	(airway* adj3 inflammat*).mp.	54
16	(pulmonary adj3 inflammat*).mp.	28
17	asthma*.mp.	4827
18	respiratory function*.mp.	250
19	lung function*.mp.	266
20	exp emphysema/	66
21	((chronic adj2 bronchitis) or emphysema).ti,ab.	214
22	or/2-21	6242
23	exp Patient Preference/	0
24	(patient* adj3 preferenc*).mp.	1539
25	(patient* adj3 view*).mp.	2403
26	(patient* adj3 value*).mp.	1502
27	(patient* adj3 perception*).mp.	3536
28	(patient* adj3 acceptabilit*).mp.	158
29	(patient* adj3 participation).mp.	1034
30	(patient* adj3 satisfactio).mp.	3406
31	(patient* adj3 perspectiv*).mp.	2110
32	exp Decision Support Techniques/	0
33	decision aid*.mp.	611
34	decision tool*.mp.	60
35	exp "Value of life"/	0
36	(value adj life).mp.	18
37	(cost-effect* or "cost effect*").mp.	7443
38	exp Quality-Adjusted Life Years/	0
39	"quality-adjusted life years".mp.	283
40	"quality adjusted life years".mp.	283
41	qaly.mp.	322
42	(life adj years).mp.	499
43	cost utili*.mp.	272
44	(cost adj2 utili*).mp.	584
45	(cost adj2 effect*).mp.	7880
46	(cost adj2 utilit*).mp.	319
47	(willingness adj2 pay).mp.	654
48	"discrete choice experiment".mp.	68
49	exp Ventilation/	0
50	ventilation.mp.	1429
51	exp Pulmonary Ventilation/	0
52	pulmonary ventilation.mp.	59
53	mechanical ventilation.mp.	338
54	artificial ventilation.mp.	47
55	assisted ventilation.mp.	25
56	artificial respiration.mp.	213
57	respiratory failure.mp.	236
58	intubation, intratracheal.mp.	0
59	tracheotomy.mp.	42
60	tracheostomy.mp.	110
61	positive pressure ventilation.mp.	32
62	positivepressure ventilation.mp.	0
63	non invasive ventilation.mp.	20
64	noninvasive ventilation.mp.	30
65	or/23-34	14898
66	or/35-48	9221
67	or/49-64	1876
68	22 and (65 or 66)	258
69	67 and 68	10
70	limit 69 to (human and english language and yr="1990 -Current")	9

		Web of Science March 4, 2011
Search History		
Set	Results	Save search history and/or create an alert Open a saved search history
# 7	622	#6 AND #5 Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011 ts=(ventilation) or ts=(pulmonary ventilation) or ts=(mechanical ventilation) or ts=(artificial ventilation) or ts=(assisted ventilation) or ts=(respiratory failure) or Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 6	88,120	#4 AND #1 Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 5	8,833	#3 OR #2 Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 4	>100,000	ts=(value of life) OR ts=(cost-effect*) OR ts=(cost effect*) OR ts=(quality-adjusted life Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 3	>100,000	ts=(patient preference*) OR ts=(patient view*) OR ts=(patient value*) OR ts=(patient Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 2	>100,000	TS=(copd) OR TS=(coad) OR TS=(chronic obstructive pulmonary disease) OR TS=(asthma) Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH Timespan=1990-2011
# 1	>100,000	

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