Measuring outcomes of a chronic obstructive pulmonary disease management program

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
A disease management programme for chronic obstructive pulmonary disease (COPD) was studied. The author reported that the programme provided patient education, self-management tools and support, case management, and follow-up to members of contracted managed care organisations (MCOs) with asthma and COPD.

Type of intervention
Other: Management of a chronic condition.

Economic study type
Cost-effectiveness analysis.

Study population
The study population for clinical outcomes comprised all patients on the programme from 1996 to the date of their most current visit as of 31 December, 2000. Only patients who were on the programme for at least 90 days were included in this study. The stratified cross-sectional cost study population consisted of an (unspecified) MCO's clients who met the following criteria:

- at least one HCU (HCU = 1 hospital day or 1 emergency room visit) with a primary diagnosis code starting with 491 or 492;
- at least one HCU with a selected respiratory primary diagnosis code (starting with 460 - 496 or 510 - 519);
- at least three different dates of service of any type of claim with a primary or secondary diagnosis code starting with 491 or 492;
- two different dates of service with a primary or secondary diagnosis code starting with 491 or 492, and at least one date of service with another respiratory primary diagnosis code for any type of claim;
- at least one date of service of any type of claim with a primary or secondary diagnosis code starting with 491 or 492.

The author stated that these criteria had to have been met in claims incurred in the 12 months prior to the measurement period. It was reported that comparable claims runout periods were used, and that members who did not have at least six eligible months in the stratification period were excluded. Outliers, defined as members within a population type with a z-score of the natural log of their per member per month (PMPM) cost greater than 2.576, (p<0.005), were also excluded. The author stated that the study population for the population cross-sectional cost comparison was made up of members meeting COPD criteria from the commercial and Medicare health maintenance organisation memberships of an MCO client. The COPD criteria were not specified.

Setting
The setting appears to have referred to care delivered in a community setting, although physicians participated in the review and approval of care plans and might also have been consulted if the patient’s condition became a cause for
concern. The economic study took place in the USA.

**Dates to which data relate**
The duration of the clinical outcome study spanned the period from 1996 (date the programme commenced) to the date of the most current visits for all patients as of 31 December, 2000. The dates to which the resource use data referred were not reported. For the stratified cross-sectional cost comparison, the baseline period was the calendar year 1998, with members stratified based on claims from 1997. The contract period was the calendar year 1999 and the programme members were stratified based on claims from 1998. It appears that, for the stratified cross-sectional study, the baseline costs were the actual costs for 1998, while for the contract period, the actual costs were those for 1999. The dates of the population cross-sectional cost comparison were unclear.

**Source of effectiveness data**
The evidence was derived from a single study.

**Link between effectiveness and cost data**
A link between the effectiveness and cost data was not reported.

**Study sample**
The study samples used in the effectiveness and cost studies may be considered appropriate, as in each case they were made up of the whole study populations. There was no report of power calculations being carried out either for the effectiveness or the cost studies.

In the effectiveness study, there were a total of 6,428 patients. The average age was 68.9 years and the average number of days on the programme was 391.2. Of these patients, 1,751 were aged 64 years or younger (average age 56.3 years; average days on the programme 367.8) and 4,677 were aged 65 years or older (average age 73.6 years; average days on the programme 400). The authors expressed reservations about the suitability of the study sample for the cost study based on a stratified cross-sectional comparison. It would appear that, at the beginning of 1999, several changes concerning patient selection to the programme and payment were implemented. Further, members already enrolled in the programme at the time of change were permitted to remain on the programme even if they did not meet the new selection criteria.

The study sample used in the stratified cross-sectional cost study comprised the whole study population. However, it was reported that the distribution of the baseline cases was adjusted to reflect the contract period stratum mix to come to an overall measure of savings. In this cost study, 3,200 Medicare patients and 1,617 commercial patients were studied in the baseline period, while 1,698 Medicare patients and 584 commercial patients were studied in the contract period. In the comparison of the two periods, population cost study data from 1,544 patients in the baseline period and 1,213 patients in the contract period were collected.

The author did not fully justify the choice of the patient sample in terms of the characteristics of the disease and/or the treatment under investigation. The choice was also not justified with respect to the generalisability of the findings.

**Study design**
All three studies can be described as cohort studies. It was not stated whether the study was single- or multi-centred. The follow-up period for the effectiveness study appears to have varied on a patient by patient basis, while that for the stratified cross-sectional cost study was the contract period (i.e. 1 year, the baseline period being the previous year). For the population cross-sectional comparison, the author reported that each measurement period was 12 months and each identification period was the corresponding measurement period plus the previous 12 months (24 months total). The issue of loss to follow-up was not relevant for any of the three studies reported in this paper, owing to the study designs.
Analysis of effectiveness
The author did not report whether or not the analysis of effectiveness was carried out on the whole study sample. The primary health outcomes measured were complaints of wheezing, complaints of chest tightness and night-time awakenings. Each of these outcomes was measured for three sub-groups, namely all patients, those aged 64 years old or younger and those aged 65 years or older. The quality of life outcomes measured were interferes with normal activities, shortness of breath when walking 20 feet and shortness of breath when grooming.

Effectiveness results
The results detailed the proportions, by age group, of members reporting the two responses representing the lowest frequencies (frequency options varied with the particular health outcome that was measured) to the questions in the baseline and most current surveys.

The symptom frequency outcomes are reported below.
In the all-patients group, the change in proportions of patients reporting the responses representing the two lowest frequency levels was 76.2 to 87.4% for complaints of wheezing, 83.3 to 92.1% for complaints of chest tightness, and 74.8 to 85.4 for night-time awakenings.
In the age 64 years or younger group, the change in proportions of patients reporting the responses representing the two lowest frequency levels was 66.7 to 81.1% for complaints of wheezing, 75.6 to 88.5% for complaints of chest tightness, and 64.5 to 77.9 for night-time awakenings.
In the age 65 years and older group, the change in proportions of patients reporting the responses representing the two lowest frequency levels was 79.8 to 89.8% for complaints of wheezing, 86.1 to 93.4% for complaints of chest tightness, and 78.6 to 88.1 for night-time awakenings.

The author reported that all differences between baseline and current measurements for the symptom frequency outcomes were statistically significant at an alpha level of 0.01.

The quality of life outcomes are reported below.
In the all-patients group the change in proportions of patients reporting the two lowest disability levels was 37.2 to 51.6% (significant at alpha = 0.01) for interferes with normal activities, 61.0 to 64.1% (significant at alpha = 0.01) for interferes with social activities, 81.4 to 87.2% (significant at alpha = 0.05) for shortness of breath when walking 20 feet, and 67.3 to 71.8% (significant at alpha = 0.01) for shortness of breath when grooming.
In the age 64 years or younger group, the change in proportions of patients reporting the two lowest disability levels was 35.1 to 51.2% (significant at alpha = 0.01) for interferes with normal activities, 57.6 to 63.9% (significant at alpha = 0.01) for interferes with social activities, 83.1 to 83.9 for shortness of breath when walking 20 feet, and 69.1 to 73.1% (significant at alpha = 0.01) for shortness of breath when grooming.
In the age 65 years and older group, the change in proportions of patients reporting the two lowest disability levels was 37.9 to 51.8% (significant at alpha = 0.01) for interferes with normal activities, 62.3 to 64.2% for interferes with social activities, 80.7 to 82.3% (significant at alpha = 0.05) for shortness of breath when walking 20 feet, and 66.7 to 71.3% (significant at alpha = 0.01) for shortness of breath when grooming.

Clinical conclusions
In all cases, the proportion of patients reporting symptom frequency at the two lowest frequency options increased between the baseline and current measurement points.

Measure of benefits used in the economic analysis
The author did not derive a summary measure of benefits. In effect, a cost-consequences analysis was performed. The author reported that the questionnaires used to measure effectiveness were developed internally and were derived from
the Health Status Questionnaire (HSQ 2.0) and the COPD TyPE Specification (see 'Other Publications of Related Interest' below for bibliographic details).

**Direct costs**
The resource quantities and the costs were not reported separately. The direct costs of the payer were included in the analysis. The direct costs used in the analyses were COPD HCUs, respiratory HCUs, 3 COPD claims, COPD and respiratory claims, and any COPD claims. It appears that the direct cost data have included all medical and pharmacy claims. No models were employed. Discounting was not relevant. Both of the cost studies reported the average costs. The price data for the stratified cross-sectional cost study appear to have been taken from 1998 and 1999, while the dates of the price data for the population cross-sectional comparison were unclear.

**Statistical analysis of costs**
No statistical analysis of the costs was reported.

**Indirect Costs**
The indirect costs were not reported.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was reported.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The results for the stratified cross-sectional comparison were as follows.

For the baseline period strata, the Medicare patient adjusted PMPM costs were $1,737.93 for COPD HCUs, $2,210.78 for respiratory HCUs, $995.28 for 3 COPD claims, $1,040.95 for COPD and respiratory claims, and $1,306.77 for COPD claims.

For the baseline period strata, the commercial patient adjusted PMPM costs were $1,076.94 for COPD HCUs, $1,990.80 for respiratory HCUs, $882.58 for 3 COPD claims, $667.09 for COPD respiratory claims, and $926.96 for COPD claims.

Note, the author reported that these baseline costs were adjusted for overall cost trend by line of business and that trend factors were provided by the client.

For the contract period strata, the Medicare patient PMPM costs were $1,386.83 for COPD HCUs, $1,718.37 for respiratory HCUs, $789.13 for 3 COPD claims, $616.89 for COPD and respiratory claims, and $855.60 for COPD claims.

The respective fees* (see below) were $80.25 for COPD HCUs, $71.17 for respiratory HCUs, $69.69 for 3 COPD claims, $71.80 for COPD and respiratory claims, and $68.01 for COPD claims. These gave totals of $1,467.08 for COPD HCUs, $1,789.54 for respiratory HCUs, $858.82 for COPD claims, $868.69 for COPD and respiratory claims, and $923.61 for COPD claims.
For the contract period strata, the commercial patient PMPM costs were $1,144.05 for COPD HCUs, $1,528.60 for respiratory HCUs, $1,086.60 for 3 COPD claims, $613.72 for COPD and respiratory claims, and $847.57 for COPD claims.

For the same strata, the respective fees* (see below) were $65.98 for COPD HCUs, $60.28 for respiratory HCUs, $48.98 for 3 COPD claims, $56.73 for COPD and respiratory claims, and $60.97 for COPD claims. These gave totals of $1,210.03 for COPD HCUs, $1,588.88 for respiratory HCUs, $1,135.58 for 3 COPD claims, $670.45 for COPD and respiratory, and $908.54 for COPD claims.

*The author reported that the fees were for the evaluation population. He stated that variations in PMPM rates resulted from differences between months in the programme and the total eligible months in the contract period in each group.

The results from the population cross-sectional comparison were as follows.

In the baseline period, for the commercial patients, the costs were $6,580,728 for claims, $470.66 for PMPM claims, $7,833,386 for adjusted costs and $560.25 for adjusted PMPM. For the Medicare patients, the costs were claims $3,330,419, PMPM claims $738.45, adjusted costs $3,775,518 and adjusted PMPM $827.14.

In the contract period, for the commercial patients, the claims costs were $6,776,575 and the PMPM costs were $518.32. For the Medicare patients, the claims costs were $2,771,497 and the PMPM costs were $681.46.

**Synthesis of costs and benefits**

Not applicable.

**Authors' conclusions**

The chronic obstructive pulmonary disease (COPD) management programme improved patient outcomes and quality of life. Further, both cost calculation methodologies demonstrated net savings for the managed care organisation (MCO).

**CRD COMMENTARY - Selection of comparators**

No explicit justification was given for the comparator, although the author did explain that randomised trials are not generally practical when providing disease management interventions in a managed care environment. You should decide if the methodologies described in this paper are relevant to your own setting.

**Validity of estimate of measure of effectiveness**

The analyses, which were based on cohort designs, were appropriate. Although different study populations were used for each of the three different sub-studies, because the studies followed defined cohorts of patients at baseline (or during a baseline period) and then at a later date (or during a later time period) the study samples can be considered to be representative of the study populations. Similarly, the patient groups can be considered to have been comparable at analyses. The analysis of clinical outcomes appears to have been handled credibly. However, the derivation of the results presented for the stratified cross-sectional cost study was not explained clearly.

**Validity of estimate of measure of benefit**

The estimation of benefits was obtained directly from the effectiveness analysis. The choice of estimate was not justified.

**Validity of estimate of costs**

It appears that all the relevant categories of cost were included in the analysis, but details of the costs included in each category were not reported. The costs were not reported separately from the quantities. Resource use was not reported, whereas the costs appear to have been taken from patient records. A sensitivity analysis of the prices was not
conducted. Charges were used to proxy prices. The date to which the prices related was reported only for the stratified cross-sectional cost comparison.

Other issues
The author did not compare the findings with those from other studies. In addition, the issue of generalisability to other settings was not addressed. The author does not appear to have presented the results selectively. The conclusions related to the patients studied and hence reflected the scope of the analyses. The costs and benefits were not combined to provide cost-effectiveness results.

The author reported limitations around the methodologies used for the cost analyses. For example, the total cost approach may falsely attribute cost-savings to the programme, as opposed to some other cause, and that the results might be affected by non-disease events such as accidents and cancer. The author also highlighted how, when using cross-sectional population comparisons, changes that occur at the population level may result not only from effective clinical interventions, but also from the targeting of appropriate members and the ability to locate and enrol members for the programme. Further, other factors might have impacted on the differences measured between time periods (e.g. changes in contracting terms, population demographics). The author reported that many participants were excluded from the stratified comparison analysis because of limitations of the dataset and also because some members met the criteria for entry into the programme but were not included in the analysis. Further, savings observed in the measurement group may not translate to savings in the COPD population as a whole if the average cost for the non-measured group increases.

Implications of the study
The author did not report any implications for practice or research.

Source of funding
None stated.

Bibliographic details

Other publications of related interest
Bethel RA. COPD Form 15.1 TyPE specification COPD 10/06/92, Health Outcomes Institute, 1992.

Indexing Status
Subject indexing assigned by CRD

MeSH
Asthma /prevention & control /therapy; Bronchitis, Chronic /prevention & control /therapy; Cost Control; Dyspnea; Follow-Up Studies; Health Care Costs; Insurance, Health; Managed Care Programs; Medicare; Outcome Assessment (Health Care); Patient Education as Topic; Program Evaluation; Pulmonary Disease, Chronic Obstructive /prevention & control /therapy; Pulmonary Emphysema /prevention & control /therapy; Respiratory Sounds; Self Care

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