Clinical and economic outcomes of an ambulatory urinary tract infection 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
Antibiotic treatment guidelines focusing on antibiotic selection in the treatment of urinary tract infections (UTIs) and seven other outpatient infectious diseases were examined. The guidelines also provided antibiotic drug information, such as dosing recommendations and possible adverse effects. The two products selected for initial therapy for UTIs were trimethoprim-sulfamethoxazole and nitrofurantoin. The two products selected for subsequent therapy were cephalaxin and ofloxacin. In addition, two full-time job specialists provided face-to-face educational interventions for the medical providers covered by the managed care organisation (MCO). The comparator was no antibiotic treatment guidelines.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The disease-management study was conducted in a MCO with 300,000 members.

Setting
The setting was secondary care. The economic study was carried out in Tucson, USA.

Dates to which data relate
The effectiveness and resource use data were gathered from September 1993 to August 1994 (pre-guideline introduction period) and from September 1994 to August 1995 (post-guideline introduction). The dates to which the prices related were not stated.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same sample as that used in the effectiveness study.

Study sample
All patients suffering from kidney or bladder infections (according to the presence of a UTI code from the International Classification of Diseases, 9th ed., Clinical Modification) were selected to form the study sample. In the control group
(i.e. pre-guideline introduction) there were 158 patients suffering from kidney infections and 1,946 suffering from bladder infections. In the intervention group (post-guideline introduction) there were 190 patients suffering from kidney infections and 2,065 suffering from bladder infections. Power calculations were performed retrospectively. These indicated that the sample size for kidney infections was inadequate (power = 0.22) and that 979 patients would be needed in both the study and control groups to reach statistical significance. Any patient whose medical claims could not be related to the treatment of a UTI was excluded from the study. The age and gender of the participants were not reported.

**Study design**

A pre-test post-study design was used. Data for one year before (September 1993 to August 1994) and one year after (September 1994 to August 1995) promoting the treatment guideline were compared. No loss to follow-up was reported. Existing health system’s administrative (claims) databases were used to evaluate the treatment of kidney and bladder infection patients, to identify the principal cost drivers for these infections, and to identify the types of health events occurring with these patients.

**Analysis of effectiveness**

All of the patients in the study were accounted for in the analysis. The primary health outcomes used were the adoption of the treatment guidelines, and the success of bladder and kidney infection treatment. Success or failure was described according to the event profile created for each infection episode. Infections episodes were categorised into fifteen distinct types, summarising the physician visits, antibiotic prescriptions, laboratory tests and hospitalisations. In this case, success was either event type 1 (physician visit, urgent care or emergency department, with or without antibiotic) or event type 2 (type 1 with or without laboratory test). The author described all other event types as failures. A multivariate analysis was used to control for potential confounding variables such as age, gender and the presence of co-morbidities.

**Effectiveness results**

Adoption of guidelines.

Following the promotion of the treatment guidelines, there was a statistically significant increase (from 67.8 to 71.0%) in the proportion of bladder infection patients receiving either trimethoprim-sulfamethoxazole or nitrofurantoin as the initial antibiotic, (p<0.05). There was also a decrease (from 12.6 to 9.5%) in the proportion of patients receiving fluoroquinolone as initial therapy, (p<0.01).

After the guideline was promoted to medical staff, there was an increase (from 85 to 87%) in the use of all antibiotics on the UTI treatment guideline, (p>0.05).

Changes in the prescribing patterns for kidney infections did not reach statistical significance.

Success of bladder and kidney infection treatment.

The success rate between treatment years remained essentially unchanged for the treatment of kidney infections (47% versus 48%; p=0.94).

The overall success rate was also essentially unchanged between the first and second year (73% versus 71%; p=0.3).

A chi-squared analysis indicated that there was no difference in the proportion of treatment success for both kidney and bladder infections when using agents recommended by the treatment guideline.

**Clinical conclusions**

The study demonstrated that the disease-management programme was effective in shifting prescribing patterns within the MCO. However, the data in this study suggested that treatment guidelines do not always achieve their desired goal of improving the clinical outcomes.
Measure of benefits used in the economic analysis
The measure of benefit was the success of bladder and kidney infection treatment.

Direct costs
The resource quantities and the costs were not reported separately. The direct costs included in the analysis were those of the MCO. The costs in the study were those identified in the medical and pharmacy claims as being paid by the MCO. These included physician visits, antibiotic prescriptions, laboratory tests and hospitalisations. Discounting was not relevant, as the costs for each group were incurred during one year, and was thus not performed. The study reported the average costs. The dates to which the price data referred ranged from September 1993 to August 1994 in the control group, and from September 1994 to August 1995 in the study group. The costs for the study group were not adjusted for inflation.

Statistical analysis of costs
The costs were treated deterministically. A chi-squared analysis was performed on comparisons of proportions, while a Mann-Whitney U analysis was used to compare continuous variables that were not normally distributed. An alpha-level of 0.05 was used to determine statistical significance. An econometric model was created to help understand the factors responsible for the variation in health event costs. The dependent variable in the models was the natural log of total costs for a health event. For kidney infections, the study had insufficient power to detect any differences.

Indirect Costs
The indirect costs were not included in the study.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

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

Cost results
For kidney infections, the average cost per health event was $425 (+/- 1,287) in the first year and $289 (+/- 470) after the treatment guideline was introduced. This represented a 36% decrease in the average health event costs, but it did not reach statistical significance.

For bladder infections, the average cost per health event was $125 (+/- 611) in the first year and $116 (+/- 400) after the treatment guideline was introduced. This decrease of 7% reached statistical significance, (p<0.05).

The kidney infection econometric model explained 21.1% of the variation in total health event cost. When holding the other remaining variables constant (i.e. age, gender, antibiotic therapy and co-morbidities), the year dummy variable was not statistically significant.

The bladder infection model explained 20.7% of the variation in total health event cost. When holding the remaining variables constant, the year dummy variable was statistically significant with a positive sign for the parameter coefficient. This indicated that the bladder infection health events were associated with a higher cost after controlling for age, gender, antibiotic treatments and co-morbidities.
Synthesis of costs and benefits
The costs and benefits were not combined since a cost-minimisation analysis was performed.

Authors’ conclusions
The data in the present study suggested that medical and pharmacy directors do not always achieve their desired goals in improving clinical outcomes, and/or lowering the costs, when carefully implementing disease-management programmes.

CRD COMMENTARY - Selection of comparators
Although no explicit justification was given for the comparator used, it would appear to represent current practice in the author's setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis used a study with a pre-test post-test design. This was appropriate because the success of bladder and kidney infection treatments before and after promoting the treatment guideline were compared. The study sample was representative of the study population since all of the patients in the sample were part of the MCO. It was unclear whether the patient groups were comparable at analysis, but appropriate statistical analyses were undertaken to take any confounding factors into account. The internal validity of this study has been reduced in an attempt to gain greater external validity.

Validity of estimate of measure of benefit
The estimation of benefits was obtained directly from the effectiveness analysis. The adoption of guidelines and the success of bladder and kidney infection treatment programmes were chosen to establish whether disease-management programmes could shift antibiotic prescribing patterns, and to determine whether disease-management programmes were effective in the treatment of bladder and kidney infections.

Validity of estimate of costs
All the categories of cost relevant to the perspective adopted were included in the analysis, as were all the relevant costs for each category. However, the costs of introducing the disease-management programme do not seem to have been considered. The costs and the quantities were not reported separately, which means that the generalisability of the results to other settings will be hampered. Even though costs for the study group were incurred one year later than those for the control group, these costs were not adjusted for inflation. Appropriate analyses of the costs, including econometric models, were conducted. The dates to which the prices related were not reported.

Other issues
The author compared the study findings appropriately with those from other studies and found similar results. The issue of generalisability to other settings was addressed, as this study measured effectiveness (“real life”). The project was designed to determine how the patients were currently being treated, and to examine their clinical outcomes and cost structures. However, the generalisability of the study's findings may be hampered because the author did not report the age and gender of the participants in the study. The author did not present the results selectively. The study enrolled MCO patients with kidney or bladder infections and this was reflected in the author's conclusions.

The author reported a number of limitations to the study. First, other factors not controlled for in the study (e.g. overall emphasis to reduce hospitalisations) could have played a more important role in reducing the costs than treatment guidelines. Second, it is likely that there were additional cases of kidney and bladder infections that were recorded in the medical claims as other diagnoses. Third, antibiotic samples could have been received from the physician without an antibiotic claim being made. Finally, the methodological assumption that treatment success was defined as a health event with no subsequent antibiotic therapy.
Implications of the study
The results of this study suggested that consideration should be given to expanding the number of well-established antibiotics in the treatment guideline.

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Other publications of related interest


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