A pneumonia practice guideline and a hospitalist-based reorganization lead to equivalent efficiency gains


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
The use of clinical practice guidelines and the creation of a managed care service (MCS) to contain costs without compromising quality of care.

The clinical practice guideline for community-acquired pneumonia (CAP) was written by a multidisciplinary team on the basis of the American Thoracic Society guidelines. The guideline encouraged early empiric antibiotic use, while discouraging the routine use of sputum Gram stain and culture because of poor accuracy. In general, low-risk patients were switched to oral antibiotics on day 3 after index admission and were discharged on day 3 or 4.

On the MCS conducted at the hospital level, attending physicians and house staff were more involved in initial treatment decisions than physicians on a traditional service (TS), and they also served for more months during the year.

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients admitted to the general medicine service (including regular floor and intensive care unit). The analysis focused, in particular, on the sub-group of patients with a diagnosis of CAP. Patients with a secondary diagnosis of cystic fibrosis, bronchiectasis, interstitial lung disease, aspiration pneumonia, human immunodeficiency virus infection or other immunodeficiency, or a current diagnosis of malignancy were excluded.

Setting
The setting was a hospital. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were gathered from July 1994 to June 1995 (fiscal year 1995, FY95) and from July 1995 to June 1996 (fiscal year 1996, FY96). The costs were standardised to 1995-1996 values.

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

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the clinical study.

**Study sample**

Power calculations were not reported. Eligible patients were identified from hospital records after excluding patients transferred from another acute care or skilled nurse facility. A total of 1,707 patients were included in the control group (FY95) and 1,624 in the guideline group (FY96). The mean age of the patients was 54.5 (+/- 20.4) years in the FY95 group and 55.2 (+/- 20.6) years in the FY96 group. The proportion of women was 42.5% in each group. The FY96 group comprised 807 patients on the MCS (mean age 55.5 +/- 20.7 years; 41.6% women) and 817 patients on the TS (mean age 54.8 +/- 20.5 years; 43.3% women). The sample of patients with CAP comprised 132 patients in the FY95 group and 157 patients in the FY96 group (76 patients in the MCS group and 81 patients in the TS group).

**Study design**

This was a retrospective cohort study that was carried out at a single centre, the Moffitt-Long Hospital of the University of California San Francisco. Several comparisons were made: FY95 versus FY96, FY95 versus MCS, FY95 versus TS, and MCS versus TS. The length of follow-up appears to have been 10 days after hospital discharge. No patient was lost to follow-up.

**Analysis of effectiveness**

All of the patients included in the initial study sample were accounted in the effectiveness analysis. The clinical outcomes considered were the mortality rates and 10-day readmission rates. The baseline comparability of the study groups was not discussed, but demographic characteristics were comparable across the groups. A multiple logistic regression analysis was run to examine differences in clinical variables.

**Effectiveness results**

Among all patients, there were no statistically significant differences in terms of mortality rates between the FY95 and FY96 groups.

Among patients with CAP, the 10-day readmission rate was 4.8% in the FY95 group and 0.7% in the FY96 group, (p=0.05). However, the difference in the 10-day readmission rate did not reach statistical significance among patients with other diagnoses (6.2% in the FY95 group and 7.1% in the FY96 group; p=0.33).

**Clinical conclusions**

The effectiveness analysis showed that the implementation of both the MCS and the guidelines did not change mortality rates. There was a borderline reduction in readmission rates among CAP patients.

**Measure of benefits used in the economic analysis**

The health outcomes were left disaggregated and no summary benefit measure was used in the economic evaluation. In effect, a cost-consequences analysis was performed.

**Direct costs**

Discounting was not relevant since the costs per patient were incurred during a short timeframe. The unit costs were not presented separately from the quantities of resources used. The economic evaluation considered all relevant hospital services, including length of stay (LOS) and all diagnostic tests (haematology, chemistry, microbiology, pharmacy, radiology, chest X ray, and respiratory therapy). The cost/resource boundary of the hospital appears to have been used. Both the costs and resource use were estimated using data derived from the hospital's Transitions Systems International computer database. The costs were standardised to 1995-1996 values.
Statistical analysis of costs
A multiple linear regression analysis was performed to examine the differences in resource use and cost data. The analyses were initially run with only the year of admission, the admission service, and the diagnosis group as independent variables. Subsequent analyses also considered patient age, gender, payer, and both the highest-frequency diagnosis related group (DRG) and the highest-cost DRGs. Both LOS and cost outliers (more than 3 standard deviations above the mean) were truncated by reclassifying their data back to 3 standard deviations above the mean.

Indirect Costs
The indirect costs were not considered.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were not performed.

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

Cost results
Among patients with CAP, the LOS was 4.98 days in the FY95 group, 4.17 days in the FY96 group, 4.19 years in the MCS group, and 4.16 days in the TS group. Only the difference between the FY95 and FY96 groups reached statistical significance, (p=0.04).

Among patients with CAP, the estimated cost per patient was $8,164 in the FY95 group, $6,282 in the FY96 group, $6,310 in the MCS group, and $6,256 in the TS group. In this case, only the difference between the MCS and TS groups did not reach statistical significance, while the remaining comparisons were all statistically significant.

Among patients with other diagnoses, the LOS was 5 days in the FY95 group, 4.64 days in the FY96 group, 4.34 years in the MCS group, and 4.93 days in the TS group. Only the difference between the FY95 and TS groups did not reach statistical significance.

Among patients with CAP, the estimated cost per patient was $8,076 in the FY95 group, $7,511 in the FY96 group, $7,089 in the MCS group, and $7,914 in the TS group. Only the difference between the FY95 and TS groups did not reach statistical significance.

The analysis showed that the number of sputum cultures per patient decreased significantly between FY95 and FY96, which was in keeping with the guidelines, and the overall microbiology costs decreased. Similarly, the number of blood cultures decreased in the TS group compared with historical controls, although the guideline did not discouraged these tests.

Synthesis of costs and benefits
A synthesis of the costs and benefits was not relevant since a cost-consequences analysis was carried out.

Authors' conclusions
The implementation of a practice guideline for patients with community-acquired pneumonia (CAP) led to a reduction in costs without affecting quality of care. For patients with other diagnoses, greater efficiency was achieved with a reorganisation of the medical service.
CRD COMMENTARY - Selection of comparators
The selection of the comparators was appropriate as it reflected usual care delivered at the study hospital before the implementation of the guideline and MCS. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence came from a cohort study. The study had a retrospective nature, which represents a drawback of the analysis. Patients were allocated to the FY95 and FY96 groups depending on the year of entry. However, the method used to allocate the patients to either TS or MCS was unclear. Since no randomisation was used, the impact of selection bias and confounding could not be excluded. The study groups were quite comparable at baseline, although no statistical tests were conducted to confirm this comparability. Moreover, there was no evidence about the appropriateness of the sample size. The evidence came from a single institution, which might not be fully representative of the patient population. The information on the clinical outcomes used in the analysis was limited. These issues tend to limit the internal validity of the study.

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted. Please refer to the comments reported in the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The study appears to have been carried out from the perspective of the hospital. All the relevant categories of costs were included in the analysis and only the cost results were reported. Information on the unit costs and quantities of resources used was not provided, which reduces the possibility of replicating the study. The source of the data was given. The costs were specific to the study setting and no sensitivity analyses were performed. Statistical analyses of the costs were undertaken, not only to test the statistical significance of differences in the estimated costs but also to control for baseline differences. Further, the impact of outliers was controlled. The price year was provided, which aids reflation exercises in other settings.

Other issues
The authors compared their findings with those from other studies, noting some differences between the studies, although the reason for such differences was unclear. They also noted that hospitalists might favour the introduction of practice guidelines rather than a reorganisation of medical services for many reasons. However, some attractive aspects of reorganisation were highlighted. The issue of the generalisability of the study results to other settings was not addressed and sensitivity analyses were not performed. This reduces the external validity of the analysis.

Implications of the study
The study results supported the implementation of practice guidelines and the reorganisation of medical services in order to improve the efficiency of care, without compromising quality. The authors suggested that future studies should determine whether the guideline or reorganisation improvements are sustainable, and whether the results achieved in the current study could be generalisable to other non-teaching hospitals.

Source of funding
None stated.

Bibliographic details
Other publications of related interest


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Subject indexing assigned by NLM

MeSH
Adult; Aged; Cohort Studies; Community-Acquired Infections /economics /therapy; Efficiency, Organizational; Female; Hospital Bed Capacity, 500 and over; Hospital Restructuring; Hospitalists /organization & administration; Hospitals, Teaching /organization & administration /standards /utilization; Humans; Length of Stay /statistics & numerical data; Male; Middle Aged; Pneumonia /economics /therapy; Practice Guidelines as Topic; San Francisco

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