Effects of physician experience on costs and outcomes on an academic general medicine service: results of a trial of hospitalists

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 hospitalists (physicians who devote at least 25% of their time to the care of hospitalised patients) was compared with the use of nonhospitalists (internists) in an academic general medicine service.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients hospitalised with general medical problems.

Setting
The setting was tertiary care. The economic study was carried out at the University of Chicago, USA.

Dates to which data relate
The effectiveness and resource use data were collected from July 1997 to June 1999. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study.

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

Study sample
No sample size was determined in the planning phase of the study and no power calculations were reported. The authors studied 6,511 patients admitted to the general medicine service from 1 July 1997 to 30 June 1999. Hospital administrative data provided information on age, race, primary and secondary diagnoses, and length of stay (LOS). Of the 6,511 admitted patients, a total of 4,898 were assigned to one of the 58 nonhospitalists. These patients had a mean age of 58 years and 61% were women. The remaining 1,613 patients were assigned to one of the 2 hospitalists. These patients had a mean age of 58 years and 63% were women. Hospitalised patients were asked to consent to a 15-minute interview to collect detailed health and socioeconomic information. Contact information for a follow-up telephone interview, scheduled for 1 month after discharge, was also collected.
Of the 6,511 hospitalised patients, 4,119 (63%) were approached for interviews, 941 (14%) were not approached for interviews because the patient had an admission within the last 60 days, and 1,451 (22%) were not approached for interviews because the patient had died or was discharged. Of the 4,119 patients approached, 3,866 (94%) agreed to be interviewed, including 12% by proxy (i.e. respondents for patients unable to complete or consent to the interview). The remaining 253 (6%) declined to be interviewed.

Study design
This was a prospective cohort study that was carried out in a single academic general medicine service. All patients admitted every fourth day were assigned to one of 2 hospitalists caring for inpatients for 6 months each year, or to one of 58 nonhospitalists caring for inpatients for 1 to 2 months each year. The authors reported that the hospitalists were not given specific instructions or incentives to alter their practice patterns. However, the hospitalists were aware that resource use, patient outcomes and house staff satisfaction were being studied.

The patients were followed for up to 365 days after admission to assess mortality, which was achieved by linking to the Social Security Death Index. A telephone survey to assess re-hospitalisation, emergency department use, reported physical function and patient satisfaction, was conducted 1 month after discharge. Of the 3,866 patient interviews performed in the hospital, 2,768 patients (72%) completed the 1-month follow-up surveys.

Analysis of effectiveness
All the patients included in the study were accounted for in the analysis. The outcomes used in the analysis were:

the LOS;
re-hospitalisation;
30-, 60- and 365-day mortality after discharge;
emergency department use;
reported physical function; and
patient satisfaction.

Patient satisfaction with the hospitalisation and care provided by the attending physician were assessed using questions from the Picker-Commonwealth patient satisfaction survey. Health status was assessed using the self-rated health status and health limitation questions of the Medical Outcomes Study 12-Item Short Form (SF-12). Re-hospitalisation and emergency department use were assessed by respondent recall of all visits and hospitalisations during the month after discharge. The authors assessed the effects of hospitalists using regression models. To explore the mechanism by which hospitalists might affect patient outcomes, the authors expanded these regression analyses to include the overall and disease-specific attending experience during the study period at the time of a patient's admission. The patient groups were shown to be comparable in terms of age, gender and prognostic features. However, hospitalist physicians were found to have more overall and disease-specific experience at the time of a patient's admission than the nonhospitalists.

Effectiveness results
Over the study period, the adjusted average LOS was 4.78 days on the nonhospitalist service and 4.46 days on the hospitalist service. The difference was -0.32 days (95% confidence interval, CI: -0.61 - -0.03; p=0.03). This was reduced by only 0.29 days for hospitalists compared with nonhospitalists in the first year of the study (95% CI: -0.66 - 0.06; p=0.06), but it increased to 0.49 days by year 2 of the study (95% CI: -0.79 - -0.15; p=0.01).

The adjusted analyses showed no statistically significant effects on mortality during the 2 years of the study, although there were trends toward lower mortality for hospitalist service patients at 30 days (adjusted relative risk, RR, 0.82; p=0.11) and 60 days (adjusted RR 0.85; p=0.17) over the 2 years. These results reflected the lack of significant effects in year 1 of the study, but large and statistically significant effects at 30 days (adjusted RR 0.65; p=0.03) and 60 days
(adjusted RR 0.74; p=0.06) in year 2 of the study.

In-hospital mortality and 30-day readmission, emergency department use, self-reported health status, and patient satisfaction did not differ significantly in either year or over the 2 years combined. However, the trend over the 2 years favoured hospitalists in almost all measures.

The results from the regression analyses revealed that patients in the hospitalist services had an 8% shorter LOS, and a trend towards 18% (RR 0.82) and 14% (RR 0.86) lower relative risk for 30- and 60-day mortality, respectively. Including measures of overall and disease-specific experience eliminated the independent effects of hospitalists. Only the effects of disease-specific experience on resource use were statistically significant. A doubling of previous case volume decreased the LOS by 4.4%. There was also a tendency toward decreased mortality with increasing disease-specific experience.

Clinical conclusions
Hospitalists decreased short-term mortality and resource use. Improvements increased over time in association with disease-specific experience.

Measure of benefits used in the economic analysis
No measure of benefit was derived. The study was, in effect, a cost-consequences analysis.

Direct costs
The costs of the hospital were included in the analysis, which only included the LOS in the hospital. LOS was defined as the number of days from when a patient was admitted to the general medicine service to discharge from the hospital, even when the patient was transferred to another service before discharge. The authors reported that physician fees were not included. The costs were assessed using an activity-based accounting system. Resource use and the costs were reported separately. Discounting was not relevant as the patients were hospitalised for a short time only. The study reported the average costs. The price year was not reported.

Statistical analysis of costs
Resource use and the costs were treated stochastically. Differences in the LOS and costs were tested using t-tests, with corrections for clustering of patients by attending physician. The authors also assessed the effects of hospitalists, using regression models in which the dependent variables were, amongst others, the costs and LOS.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were performed.

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

Cost results
Over the 2 years, the adjusted average costs were $8,746 with the nonhospitalist service versus $8,320 with the hospitalist service. The difference was -$426 (95% CI: -912 - 31; p=0.03).

The difference in average costs between the services in year one of the study was not statistically significant. However, the mean cost for hospitalists was reduced by $782 compared with nonhospitalists in year 2 (95% CI: 1,313 - -187; p=0.01).

The results from the regression analysis showed that a doubling of previous case volume decreased the costs by 5.1%.

**Synthesis of costs and benefits**
The costs and benefits were not combined.

**Authors' conclusions**
Hospitalist care was associated with lower costs and short-term mortality in the second but not the first year of hospitalists’ experience. The authors also concluded that disease-specific physician experience could reduce resource use and improve patient outcomes. In addition, it could be an important determinant of the effectiveness of hospitalists.

**CRD COMMENTARY - Selection of comparators**
A justification was given for using a nonhospitalist service as the comparator. It represented current practice in the authors' setting. You should decide if the comparator represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The study was based on a prospective cohort study, which was appropriate for the study question, although it is associated with some limitations in relation to confounding and bias. The study sample was large and it appears to have been representative of the study population. The patient groups were shown to be comparable at analysis in terms of age and gender. However, because hospitalists spent more time on the inpatient service over the study, their average overall and disease-specific experience was greater than that of the nonhospitalists throughout the study. The authors tested all differences between the two patient groups using appropriate statistical techniques. They also included regression analyses to estimate the effect of physician experience on the outcomes. Given the nature of the study design, the internal validity is likely to be quite low.

**Validity of estimate of measure of benefit**
The authors did not derive a measure of health benefit. In effect, a cost-consequences analysis was undertaken.

**Validity of estimate of costs**
All the categories of cost relevant to the perspective adopted were included in the analysis. However, some of the relevant individual costs were omitted from the analysis. For example, the authors reported that physician fees were not included in the analysis. This would appear to create a bias in favour of the nonhospitalist service, as patients in this group spent more time in hospital. The costs and the quantities were reported separately, which will enhance the generalisability of the authors' results. To test for statistically significant differences between the two groups, the authors performed a statistical analysis of the costs and resource use, which was appropriate. Further, the authors used regression techniques in their analysis. Discounting was unnecessary since all the costs were incurred during a short time.

**Other issues**
The authors made appropriate comparisons of their findings with those from two other studies. In one study the results were similar to those presented in this study, whilst in the other, the initial savings in the use of hospitalists contradicting the results presented here. The authors provided several reasons why this might have been the case. The
issue of generalisability to other settings was partly addressed by the authors comparing their results to those from other studies, and by providing explanations for any different results from these studies. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis.

The authors reported some further limitations to their study. First, because only 2 hospitalists were involved in the study, questions might be raised about the generalisability of their results. Second, despite a statistically significant reduction in mortality at 30 and 60 days and trends toward improvement in almost all other outcomes, the relative infrequency of adverse outcomes leaves considerable uncertainty about the authors’ estimates of effects on outcome.

**Implications of the study**
The authors reported that it was important for the results of their findings to be replicated using more clinicians and institutions, as their study was based on a small number of hospitalists at only one institution.

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