ORIGINAL INVESTIGATION

Temporal Trends in Outcomes of Older Patients With Pneumonia

Mark L. Metersky, MD; Janet P. Tate, MPH; Michael J. Fine, MD, MSc; Marcia K. Petrillo, MA; Thomas P. Meehan, MD, MPH

Background: It is unclear how outcomes of care for patients hospitalized for pneumonia have changed as patterns of health care delivery have changed during the 1990s. This study was performed to determine trends in outcomes of care for older patients hospitalized for pneumonia.

Methods: This retrospective analysis was based on Medicare claims and included most patients with pneumonia who were older than 65 years and admitted to acute care hospitals in Connecticut between October 1, 1991, and September 30, 1997 (fiscal years 1992-1997). We assessed the trends in hospital costs, discharge destination, hospital mortality rates, mortality rates within 30 days of discharge, and 30-day readmission rates for pneumonia. Multivariate logistic regression analyses were used to adjust for differences in patient characteristics.

Results: The mean (± SD) length of stay declined from 11.9 ± 11.4 days to 7.7 ± 7.2 days between 1992 and 1997. During this period, adjusted in-hospital mortality rates declined ($P = .02$), while the adjusted risk of discharge to a nursing facility increased ($P < .001$) and the adjusted risk of hospital readmission for pneumonia within 30 days of discharge increased ($P = .05$). The adjusted risk of death 30 days after discharge increased, although the difference was not statistically significant ($P = .09$).

Conclusions: Between 1992 and 1997, the adjusted risks of mortality after discharge, placement in a nursing facility, and hospital readmission for pneumonia increased among older patients hospitalized for pneumonia, in association with a decline in mean hospital length of stay. These findings raise the question of whether the declining hospital length of stay has negatively affected patient outcomes.

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From the Pulmonary Division, University of Connecticut School of Medicine, Farmington (Dr Metersky), Qualidigm, Middletown (Drs Metersky and Meehan and Mss Tate and Petrillo), and the Department of Medicine, Yale University School of Medicine, New Haven (Dr Meehan), Conn; and the Division of General Internal Medicine and the Center for Research on Health Care, University of Pittsburgh School of Medicine, Pittsburgh, Pa (Dr Fine).

PNEUMONIA IS responsible for more than 600 000 hospitalizations per year among older patients,[1] costing approximately $9 billion per year.[2] In addition to this huge economic cost, there is tremendous morbidity and mortality associated with pneumonia. Approximately 10% of patients older than 64 years admitted to the hospital for pneumonia do not survive to discharge and many more die within a month of discharge.[3] Among patients who are admitted to the hospital from home and survive, approximately 12% require placement in a long-term care or rehabilitation facility.[4]

The market forces affecting the use of health care resources have created financial incentives for medical care to be delivered in the most cost-effective manner possible. These incentives have prompted profound changes in the patterns of care for patients with acute illness. The length of stay in acute care hospitals for pneumonia and many other disorders began declining with the implementation of the diagnosis related group–based prospective payment system (PPS) more than a decade ago.[5] The effects of the declining length of stay on patient outcomes are not well understood and are likely complex. Rogers et al[5] evaluated length of stay and clinical outcomes for 5 common conditions after the institution of the PPS. They found that length of stay declined by 24% but that overall outcomes were not adversely affected. However, a higher percentage of patients were discharged while their conditions were still unstable, and, in these patients, subsequent mortality rates increased. Others[4,6] found an increased rate of discharge to a nursing facility after the institution of the PPS.

Despite the tremendous adverse impact of pneumonia on older individuals, there is little information regarding how processes and outcomes of care have changed during the 1990s, a period marked by increased penetration of managed care and increased incentives to limit the costs associated with acute care hos-

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METHODS

POPULATION AT RISK AND PATIENT SELECTION

Denominators for hospitalization rates were calculated using Connecticut Medicare beneficiary coverage files to determine the number of individuals with fee-for-service coverage for each year in the study. All-cause hospitalization rates were derived from Medicare Part A hospital claims during the period. All 35 acute care hospitals in Connecticut in operation at any time during the study period were included. Hospitalizations for pneumonia were identified from Medicare Part A claims for hospitalizations from October 1, 1991, to September 30, 1997 (fiscal years 1992-1997). Approximately 96% of the population 65 years of age or older is covered under Medicare Part A.[7] We used the *International Classification of Diseases, Ninth Revision, Clinical Modification*[8] (*ICD-9-CM*) diagnosis and procedure codes (indicated parenthetically hereinafter) to identify eligible patients. Patients older than 65 years who were discharged with a principal diagnosis of pneumonia (codes 480-483, 85-87, and 507) or a principal diagnosis of respiratory failure (code 518.81) or sepsis (codes 38.0-38.9) and a secondary diagnosis of pneumonia were potentially eligible for inclusion.[3] Although most patients are eligible for Medicare at age 65 years, patients who were younger than 66 years were excluded because we were unable to adequately assess their chronic morbidity level from prior Medicare claims data. To prevent inclusion of patients with pneumonia that was more likely to be hospital acquired and inclusion of immunosuppressed patients with pneumonia, patients were excluded if they were discharged from any acute care hospital within 10 days before the index hospitalization, were transferred to or from another acute care hospital, were infected with human immunodeficiency virus (secondary diagnosis, code 42), or were organ-transplant recipients (secondary diagnosis, codes V42-V49). We also excluded patients who were discharged on the date of hospital admission or left the hospital against medical advice. If a patient had 2 or more hospitalizations for pneumonia within the same fiscal year or had 2 hospitalizations for pneumonia within 60 days in concurrent years, only the first hospitalization was assessed.

DATA ELEMENTS

All data elements were derived from Medicare claims and enrollment data. Patients were classified by demographic characteristics (age, sex, and race) and the following clinical characteristics: the number of hospitalizations in the past year for any cause, presumed cause of pneumonia, and the Deyo comorbidity index,[9] a measure of chronic illness derived from Medicare claims data. The severity of pneumonia was classified as high risk if the principal discharge diagnosis was respiratory failure or sepsis and as moderate risk if the principal discharge diagnosis was pneumonia due to *Klebsiella pneumoniae* (code 482.0), *Pseudomonas* species (code 482.1), *Staphylococcus* species (code 482.4), anaerobes (code 482.81), *Escherichia* species (code 482.82), other Gram-negative bacteria (code 482.83), and inhalation of food or vomit (code 507).[10] All other included *ICD-9-CM* codes were considered low risk. These classifications were ultimately validated by the univariate risk of in-hospital mortality for patients in each of these categories; the odds ratios (95% confidence intervals) for moderate- and high-risk patients were 2.28 (2.12-2.45) and 4.34 (3.98-4.74), respectively, compared with low-risk patients.

Processes of care included admission to an intensive care unit, use of mechanical ventilation, and length of hospital stay. Although length of stay may alternatively be

pitalization. Therefore, we undertook an analysis of acute care hospitalizations for pneumonia in Connecticut between October 1, 1991, and September 30, 1997. We attempted to determine changes over time in patient characteristics and resource use. We previously determined that the length of hospital stay for community-acquired pneumonia has declined markedly in Connecticut (Qualidigm, unpublished data, 1992-1997). Given the potential for this decline to be associated with worsened clinical outcomes, a major aim of this study was to determine if patient outcomes changed during the corresponding period.

RESULTS

Between 1992 and 1997, the number of fee-for-service Medicare beneficiaries in Connecticut increased by 7.6%, from 333 938 to 361 454 (**Table 1**). The number of hospitalizations for pneumonia included in the study each year increased by 27.2%, from 5870 in 1992 to 7469 in 1997. Therefore, there was an increased rate of hospitalization for pneumonia, from 17.6 per 1000 in 1992 to 20.7 per 1000 in 1997; this trend was statistically significant ($P<.001$). This finding is in contrast to a declining rate of hospitalization for all causes for the same population in Connecticut during this same period, from 350.5 per 1000 in 1992 to 309.3 per 1000 in 1997 ($P<.001$).

There were some changes in the demographic characteristics of the pneumonia study population between 1992 and 1997 (**Table 2**). Although the median age remained unchanged at 80 years, the percentage of the study population older than 84 years increased from 29.1% to 30.9% ($P<.001$). There was also a gradual increase in the preadmission level of chronic illness, as reflected by a rising percentage of patients with a Deyo comorbidity index of 2 or higher (33.0% to 40.3%; $P<.001$). In contrast, the percentage of the study population that had 1 or more acute care hospitalizations during the year prior to the index hospitalization for pneumonia declined slightly from 41.6% to 40.4% ($P<.001$).

Table 3 demonstrates the changes in processes of care during the study period. There was a steady decline in hospital length of stay, from a mean ± SD of 11.9 ± 11.4 days to 7.7 ± 7.2 days ($P<.001$). The percentage of patients receiving intensive care did not change during the study period, while the percentage of patients receiving mechanical ventilation increased from 9.0% to 9.9% ($P<.001$).

There were significant trends in all the outcomes during the study period (**Table 4**). The percentage of pa-

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defined as an outcome, it is frequently driven by subjective decision making as opposed to objective clinical criteria and was therefore considered a process of care. *Mechanical ventilation* was defined as use of continuous positive airway pressure (code 93.9), nonoperative intubation (codes 96.0-96.07), other continuous mechanical ventilation (codes 96.7-96.72), or tracheostomy (codes 31.1-31.2). An indicator variable in the claims data was used to identify the use of intensive care. Length of hospital stay was calculated as discharge date minus admission date.

Outcome variables included in-hospital mortality rates, mortality rates within 30 days of admission, mortality rates during the 30 days after discharge, discharge destination, and hospital readmission rates within 30 days of discharge. Patients who died in the hospital were excluded from the analysis of length of stay and each of the outcomes after discharge. In addition, those who died within 30 days of discharge were excluded from the analysis of hospital readmission rates. The 3 discharge destinations that could be assessed with claims data were home with self-care; home with home health care services; and skilled or intermediate-level nursing care facility. Hospital costs were calculated by adjusting hospital charges according to overall cost-to-charge ratios for hospitals in Connecticut, thereby arriving at an estimate of true costs.[11] Cost-to-charge ratios were not available for 1997, so the 1996 ratios were used as there was little year-to-year change in this figure. Costs were corrected for the rate of inflation of medical costs, using constant 1992 dollars from the published Bureau of Labor Statistics data for medical care in urban areas as a proxy for Connecticut.[12]

STATISTICAL ANALYSES

Changes in demographic characteristics and processes and outcomes of care during the study period were assessed using the Mantel-Haenszel χ^2 test for trend or the linear regression of means. Multivariate logistic regression analyses were used to adjust for the influence of patient characteristics on outcomes over time. We created a series of forced logistic regression models for the outcomes: in-hospital mortality rates, mortality rates within 30 days of admission and discharge, discharge to a nursing facility, and readmission rates within 30 days of discharge. Independent variables included patient characteristics, processes of care, and fiscal year. Patient characteristics were defined as race (white, nonwhite, or unknown), Deyo comorbidity index, and number of discharges for any cause during the previous 1 year (categorical variable, with 0 as the reference, 1, 2, or >2), and severity of pneumonia (low, moderate, or high risk as defined above). Processes of care included use of intensive care (yes or no), use of mechanical ventilation (yes or no), and length of stay (treated as a categorical variable using quartiles, with the lowest quartile, the middle 2 quartiles, and the highest quartile composing the 3 categories). For the outcome of discharge to a nursing facility, age was used as a continuous variable and length of stay was not included to optimize model fit. Odds ratios and 95% confidence intervals were determined for all independent variables, considering 1992 as the reference category for time in years. To test for trends in the adjusted outcomes, linear regression was performed, using the year as the independent variable and the odds ratio as the dependent variable. Statistical significance was accepted at $P=.05$.

The χ^2 goodness-of-fit statistic[13] revealed adequate fit ($P=.13$-$.84$) for all models. The area under the receiver operating characteristic curves[14] (0.69-0.78) revealed good discrimination for all models. The correlation coefficients (R^2) were between 0.01 and 0.15. All calculations were performed using SAS statistical software (version 6.12; SAS Institute Inc, Cary, NC).

Table 1. All-Cause and Pneumonia-Specific Hospitalization Rates in Acute Care Hospitals in Connecticut From 1992-1997*

	Fiscal Year						
	1992	1993	1994	1995	1996	1997	*P*
Fee-for-service Medicare population	333 938	352 736	362 123	365 236	367 062	361 454	<.001
Hospitalization rate†							
All cause	350.5	320.5	318.1	318.9	310.1	309.3	<.001
Total pneumonia (before exclusions)	21.1	20.7	21.6	23.3	22.6	25.7	<.001
Study population with pneumonia							
All	17.6	17.1	17.7	19.0	18.3	20.7	<.001
By age, y							
66-74	9.3	9.3	9.8	10.3	9.3	10.7	.28
75-84	21.0	20.4	21.1	22.5	21.7	24.0	<.001
≥85	47.3	40.1	38.7	42.2	41.1	45.0	<.001
By sex							
Male	21.9	21.2	21.3	22.2	21.8	24.6	<.001
Female	14.9	14.5	15.4	17.0	16.0	18.1	<.001

**We examined data from October 1, 1991, to September 30, 1997 (fiscal years 1992-1997). P values were determined using the Mantel-Haenszel test of trend.*
†Rate per 1000.

tients discharged to nursing facilities increased steadily between 1992 and 1997, from 30.3% to 43.1% ($P<.001$). While the crude in-hospital mortality rate dropped from 14.1% to 12.0%, the mortality within 30 days of admission increased from 15.7% to 17.8% and the mortality during the 30 days after discharge increased from 6.9% to 9.3% ($P<.001$ for all outcomes). The increase in mortality rates after discharge was accounted for in part by

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Table 2. Characteristics of Patients With Pneumonia in Acute Care Hospitals in Connecticut From 1992-1997*

Characteristic	Fiscal Year 1992	1993	1994	1995	1996	1997	*P*
No. of patients	5870	6020	6403	6946	6703	7469	<.001
Male	47.5	47.7	46.7	45.4	46.4	46.4	.05
White	95.6	96.0	96.1	95.2	94.5	94.5	<.001
Age, y							<.001
66-74	28.3	27.9	27.8	27.1	24.8	24.7	
75-84	42.5	43.6	44.0	43.7	44.5	44.4	
≥85	29.1	28.5	28.2	29.3	30.7	30.9	
Comorbidity index[9]							<.001
0	30.9	26.7	24.7	24.4	23.3	25.3	
1	36.1	36.8	36.6	36.1	34.8	34.4	
2	15.9	17.2	18.2	18.3	18.5	18.4	
>2	17.1	19.3	21.5	21.2	23.4	21.9	
Hospitalizations in previous year							<.001
0	58.4	58.4	58.6	59.7	61.5	59.4	
1	23.0	23.7	23.2	24.1	21.8	23.1	
2	10.6	10.8	10.6	9.3	9.6	10.2	
>2	8.0	7.1	7.6	6.9	7.0	7.3	

**We examined data from October 1, 1991, to September 30, 1997 (fiscal years 1992-1997).* P *values were determined using the Mantel-Haenszel test of trend. Data are presented as percentage of patients unless indicated otherwise.*

Table 3. Processes of Care for Pneumonia in Acute Care Hospitals in Connecticut From 1992-1997*

Process of Care	Fiscal Year 1992	1993	1994	1995	1996	1997	*P*
Length of stay, d, mean ± SD	11.9 ± 11.4	11.1 ± 10.0	10.0 ± 8.9	9.0 ± 7.8	8.4 ± 7.6	7.7 ± 7.2	<.001
Admitted to intensive care unit, %	15.0	14.8	15.8	15.7	15.6	15.1	.47
Received mechanical ventilation, %	9.0	8.5	8.5	8.9	9.9	9.9	<.001

**We examined data from October 1, 1991, to September 30, 1997 (fiscal years 1992-1997).* P *values were determined using linear regression of means or Mantel-Haenszel test of trend.*

Table 4. Outcomes of Patients With Pneumonia in Acute Care Hospitals in Connecticut From 1992-1997*

Outcome	Fiscal Year 1992	1993	1994	1995	1996	1997	*P*
Discharge destination							
Home without services	51.1	48.5	45.2	42.0	37.5	34.6	<.001
Home with services	18.6	19.3	20.6	21.0	21.8	22.3	<.001
Nursing facility	30.3	32.1	34.2	37.0	40.7	43.1	<.001
Mortality rate							
In hospital	14.1	13.8	12.9	11.1	12.2	12.0	<.001
Within 30 days of admission	15.7	15.9	17.0	15.3	17.3	17.8	<.001
Within 30 days of discharge							
All patients	6.9	7.0	8.7	7.9	9.0	9.3	<.001
Discharged to home	3.5	3.7	4.3	3.6	3.6	3.9	.76
Discharged to nursing facility	14.9	14.0	17.2	15.1	16.9	16.5	<.001
Readmission rate for pneumonia within 30 days	3.0	3.3	3.1	3.5	3.8	3.7	<.01
Adjusted cost, 1992 $	9228	8481	7899	7370	7466	6897	<.001

**We examined data from October 1, 1991, to September 30, 1997 (fiscal years 1992-1997).* P *values were determined using the Mantel-Haenszel test of trend. Data are presented as percentages unless indicated otherwise.*

an increasing mortality rate in patients who went to nursing facilities in comparison to those who went home, combined with the marked increase in the percentage of patients who went to nursing facilities. Readmissions to the hospital for pneumonia within 30 days of discharge also increased during the study period, from 3.0% to 3.7% ($P<.01$). Finally, the mean adjusted costs associated with hospitalization for pneumonia declined steadily during

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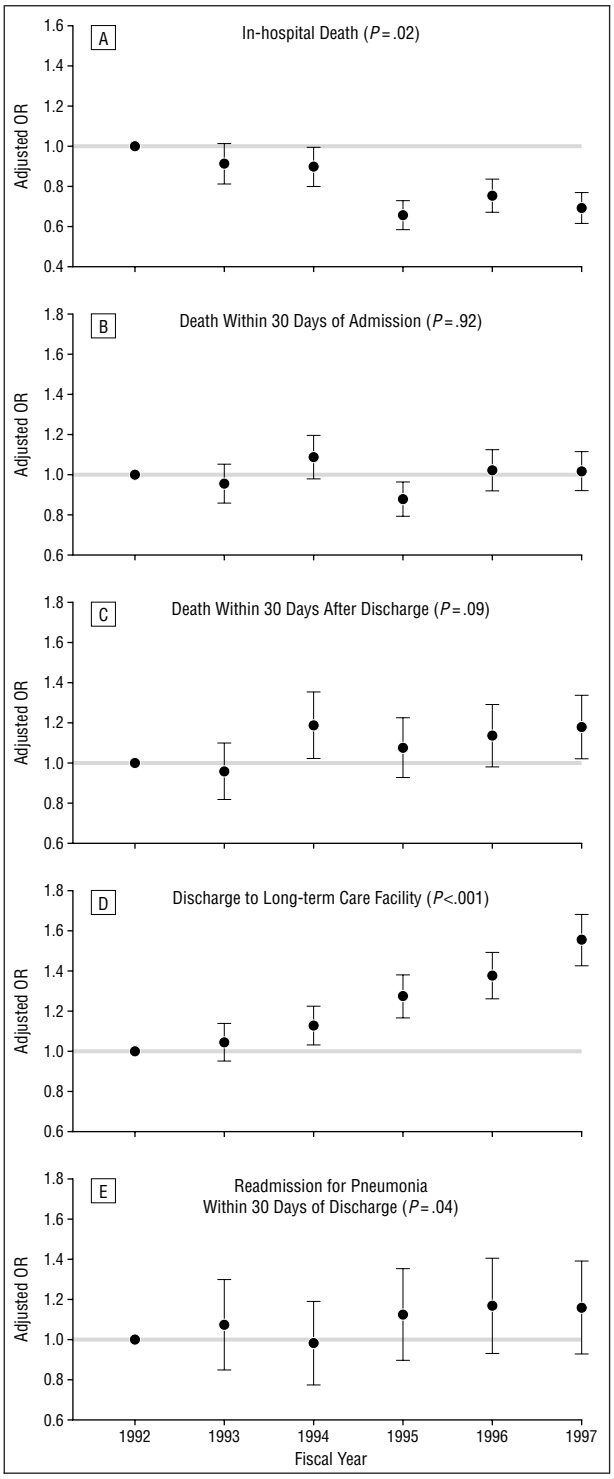
the study period, when expressed as constant 1992 dollars, from $9228 to $6897 ($P<.001$).

The **Figure** illustrates the trends over time of selected outcomes after adjustment for patient characteristics, severity of pneumonia, and processes of care. Risk-adjusted in-hospital mortality rates declined between 1992 and 1997 ($P=.02$), while risk-adjusted mortality rates within 30 days of admission remained unchanged ($P=.92$). Risk-adjusted mortality rates during the 30 days after discharge also increased, although the difference was not statistically significant ($P=.09$). Although the overall trend for this outcome was not statistically significant, in 1997 there was a statistically significant increase in the adjusted mortality rate after discharge when compared with 1992 (odds ratio, 1.18; 95% confidence interval, 1.03-1.36). The risk-adjusted rates of discharge to a nursing facility and hospital readmission for pneumonia within 30 days of discharge increased steadily between 1992 and 1997 ($P<.001$ and $P=.05$, respectively).



Adjusted odds ratios (ORs) (error bars indicate 95% confidence intervals) for selected outcomes associated with hospitalizations for pneumonia in acute care hospitals in Connecticut between October 1, 1991, and September 30, 1997 (fiscal years 1992-1997). Statistical significance of the trends in the ORs was tested using linear regression.

COMMENT

This study, encompassing all Medicare fee-for-service hospitalizations for pneumonia in acute care hospitals in Connecticut during a 6-year period, reveals that crude mortality rates within 30 days after discharge increased by 34.0% while inpatient mortality rates decreased by 14.9%. The percentage of patients discharged to nursing facilities increased by 42.2% and the 30-day readmission rate for pneumonia increased by 26.4%. After adjusting for patient characteristics, a worsening trend for all these outcomes after discharge remained, although the trend in mortality rates after discharge were not statistically significant ($P=.09$).

Although the underlying reasons for these trends cannot be definitively determined from this study, several possibilities exist. First, if the study population was more severely ill in 1997 than in 1992, then worsened outcomes could result. As assessed by the Deyo comorbidity index, the study population in 1997 had more chronic illness than the study population in 1992, but the worsening outcomes persisted after adjustment for this difference in the multivariate analysis. The unchanged frequency of the use of intensive care and small absolute increase in the use of mechanical ventilation, as well as the decrease in inpatient mortality during the study period suggest that there may not have been a clinically significant increase in the severity of illness of patients admitted to the hospital with pneumonia.

A second potential explanation for the worsening outcomes after discharge is the declining hospital length of stay. It is possible that earlier discharge could result in increased mortality rates, increased hospital readmissions, or unnecessary placement in a nursing facility. This issue was explored extensively after the institution of the diagnosis related group–based PPS in 1983. Many studies[4,15-17] noted a significant decline in hospital length of stay for several conditions, including pneumonia, but no increased incidence of adverse outcomes, such as readmission or mortality. However, Rogers et al[5] noted an increased risk of discharge while the patients' conditions were still unstable and an increased risk of subsequent mortality in those patients.

Several groups have explored the relationship between hospital length of stay and discharge to a nursing facility. Kahn et al[4] found an increased rate of discharge to a nursing facility for several diagnoses, including pneu-

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monia, after the institution of the PPS, although they did not adjust for differences in patient characteristics over time. Leibson et al[6] reported similar findings but attributed the increase to changes in the patient population as opposed to declining quality of care. Morrisey et al[18] observed an increase in discharges to nursing facilities after hospital treatment for pneumonia, from 16% in 1980 to 25% in 1985. In the present study, we show that this trend has continued through the 1990s and may be unrelated to patient characteristics.

Why have we noted worsened outcomes in association with a declining length of stay when many others have not?[5,6,19,20] One reason may be publication bias: institutions studying the impact of quality improvement interventions or clinical practice guidelines may be less likely to report worsened outcomes. In addition, many of the studies of this issue occurred during the late 1980s after the institution of the PPS, when declines in length of stay were much less dramatic than the ones we note. Kahn et al[4] observed that the length of stay for pneumonia was 10.4 days, a decrease of 1.7 days between 1981-1982 and 1985-1986. By 1997, we observed a mean length of stay of 7.7 days. We may now be reaching the point at which further reductions are more likely to negatively impact outcomes.

Nonetheless, our study does not provide direct evidence that the declining length of stay is the cause of the worsened outcomes that we observed. Indeed, recent studies[19,20] showed that in the setting of well-planned interventions, length of stay can be reduced without any overall worsening of outcomes. The danger is that poorly planned efforts to shorten the length of stay may result in premature discharges with resulting worsened outcomes. For example, Weingarten et al[20] found that patients discharged more quickly than recommended by a hip surgery clinical practice guideline had a higher rate of discharge to a nursing home and increased subsequent physician visits. Diamond et al[21] noted that there was an increase in the 14-day readmission rate among patients treated by private physicians at a large teaching hospital during a period in which length of stay was declining.

Although we discovered an association between length of stay in an acute care hospital for the treatment of pneumonia and several outcomes after discharge, other factors could potentially be playing a role. There has been a marked increase in the frequency of pneumonia due to antibiotic-resistant *Streptococcus pneumoniae* during the 1990s; however, most studies[22-24] found either no effect or a minimal effect on outcomes from this factor. The increasingly used practice of "early switch" to oral antibiotics could conceivably be driving worsened outcomes, although this practice has not been linked to an increased complication rate.[25] Since this practice is intimately linked to earlier discharge, it would be very difficult to study the specific impact of these 2 factors.

Although annual hospitalization rates increased significantly during the study period, there was a concomitant decrease in all-cause hospitalizations. Therefore, the relative frequency of hospitalizations for pneumonia increased from 6.0% to 8.3% of all hospitalizations during the study period. While others[16] found increasing rates of hospitalization for pneumonia during the 1980s and 1990s, we are not aware of any studies that provide insight as to whether this is due to an increase in total incidence rates of pneumonia or to an increasing tendency to treat older patients with pneumonia in the inpatient setting. In either case, longer survival of patients with underlying conditions that make them vulnerable to developing pneumonia could be contributory.

We noted significant decreases over time in the mean cost associated with acute care hospital admission for pneumonia, concurrent with a marked decline in mean hospital length of stay. However, the mean cost per day of hospital stay increased from $776 to $892 (in constant 1992 dollars), so that while the length of stay decreased by 35.3%, the mean hospital cost decreased by only 25.3%. This finding is probably due to the fact that earlier discharge does little to affect the costs associated with the initial part of the hospital stay when more intensive diagnostic and therapeutic efforts are undertaken.

Our results also suggest that there may be hidden costs associated with the declining hospital length of stay. The 42.2% increase in the proportion of patients discharged to nursing facilities and the 19.8% increase in the proportion of patients requiring home health care services represent a huge expenditure of health care funds. Efforts to decrease length of stay in acute care hospitals may be resulting in cost shifting and not cost savings.

It is appropriate to discuss limitations of our study. First, the diagnosis of pneumonia was based on claims data and not confirmed with clinical criteria. However, Whittle et al[26] found that the use of a similar *ICD-9-CM*–based diagnosis resulted in a positive predictive value of 93% for community-acquired pneumonia when confirmed by chart review. A second limitation of our study concerns the lack of a variable to assess preadmission residence status of the patients. While the rate of discharge to a nursing facility increased markedly during the study period, we cannot directly determine from the Medicare database if there was an increase in the number of patients with pneumonia admitted to the hospital from nursing facilities. However, prior quality improvement studies of Medicare patients hospitalized for pneumonia in Connecticut have revealed no increase in the percentage of patients admitted from a nursing facility during this period (Qualidigm, unpublished data, 1993, 1997).

We also do not know how long patients discharged to nursing facilities remained in these facilities. The increasing rate of discharge to nursing facilities may represent an increasing number of short stays at these facilities, followed by discharge to home, a situation which may be an appropriate use of resources with no negative consequences. However, it is possible that some patients who may have been able to go home after a few additional days in the hospital are instead discharged to a nursing facility for what ultimately turns into a prolonged or permanent stay. This concern has previously been raised by Fitzgerald et al,[27] who found a higher percentage of patients with hip fracture who underwent prolonged nursing facility stays after institution of the PPS.

In summary, between 1992 and 1997 in Connecticut, admission to an acute care hospital for pneumonia was associated with dramatic decreases in length of stay and inpatient mortality. Concomitant with these changes,

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there was an increasing likelihood that survivors would require discharge to a nursing facility or readmission to a hospital for pneumonia or die within 30 days of discharge. Further investigation is required to determine to what extent the declining hospital length of stay may be influencing the outcomes of older patients hospitalized for pneumonia and other acute medical conditions. It will also be important to ascertain the magnitude of increases in health care costs due to more frequent placement in a nursing facility after discharge. This factor may be significantly reducing the cost savings associated with the declining length of stay in acute care hospitals.

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We assume full responsibility for the accuracy and completeness of the ideas presented herein. This article is a direct result of the Health Care Quality Improvement Program initiated by the Health Care Financing Administration, which has encouraged identification of quality improvement projects derived from analysis of patterns of care and therefore required no special funding on the part of this contractor. We welcome ideas and contributions concerning experience in engaging with issues presented herein.

Corresponding author: Mark L. Metersky, MD, Pulmonary Division, University of Connecticut Health Center, 263 Farmington Ave, Farmington, CT 06030-1225 (e-mail: Metersky@nso.uchc.edu).

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