Continuity of Care and Intensive Care Unit Use at the End of Life

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Background: There is increasing concern about discontinuity of care across transitions (eg, from home to the hospital) and how it might affect appropriate medical management.

Methods: We examined changes over time in outpatient-to-inpatient continuity of care in individuals hospitalized with advanced lung cancer and its relationship to end-of-life intensive care unit (ICU) use via retrospective analysis of the linked Surveillance, Epidemiology, and End Results–Medicare database. Patients were 21 183 Medicare beneficiaries 66 years or older and diagnosed as having stage IIIB or IV lung cancer between January 1, 1992, and December 31, 2002, who died within a year of diagnosis. Outpatient-to-inpatient continuity of care was defined as an inpatient visit by the patient’s usual care provider during the last hospitalization. The primary outcome measure was ICU use during the last hospitalization.

Results: Outpatient-to-inpatient continuity decreased from 60.1% in 1992 to 51.5% in 2002 ($P < .001$). Factors associated with decreased continuity included male sex, black race, low socioeconomic status, being unmarried, treatment by a hospitalist, and treatment in a teaching hospital. Use of the ICU increased by 5.8% per year from 1993 to 2002. After adjustment for patient characteristics, patients with outpatient-to-inpatient continuity of care had a 25.1% reduced odds of entering the ICU during their terminal hospitalization.

Conclusions: Outpatient-to-inpatient continuity of care declined during the 1990s and early 2000s. Patients with terminal lung cancer who experienced outpatient-to-inpatient continuity of care were less likely to spend time in the ICU before death.

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Continuity of care is a key attribute of good medical care. Provider continuity is associated with improved patient satisfaction, increased use of preventive care services, fewer emergency department visits, lower hospitalization rates, and reduced health care costs. For patients with cancer, it is a desirable attribute of a good patient-physician relationship. Patients with cancer who experience outpatient provider continuity have reduced emergency department visits at the end of life and are more likely to die outside the hospital.

American health care has undergone major changes during the past 2 decades. Some of these changes might threaten continuity of care, whereby a patient has a long-standing relationship with a physician. Such changes include health maintenance organization (HMO) networks with shifting patient eligibility and physician membership; continued growth of specialists; and the hospitalist movement. One type of continuity of care is across transitions: home to hospital, hospital to home, hospital to nursing home, etc. Little is known about outpatient-to-inpatient continuity. Transitions between care settings jeopardize continuity of care, patient safety, and quality of care. A recent study of transitions between care settings during end of life showed that 62% of patients experience 1 or more transitions during the last 3 months of life. Most of this transition is from home to the hospital, raising issues of continuity of care.

Lack of continuity of care may affect health care decisions, in particular, end-of-life decisions, when trust and values become critical. Physicians unfamiliar with the patient may not know the patient’s wishes or values and may not be good at discussing end-of-life choices, such as hospice or palliative care.

In this study, we assessed continuity of care in patients with advanced lung cancer. We addressed the following questions: Did outpatient-to-inpatient continuity of care in patients with advanced lung cancer change over time? Was lack of outpatient-to-inpatient provider continuity associated with an increased risk of an intensive care unit (ICU) stay? Finally, did the growth of hospitalists affect...
Data Source

This is a retrospective study of patients with lung cancer identified from the linked Surveillance, Epidemiology, and End Results (SEER)–Medicare database between January 1, 1992, and December 31, 2002.35 We included the original SEER registries, encompassing 14% of the US population from 11 geographic regions: the states of Connecticut, Hawaii, Utah, New Mexico, and Iowa; the metropolitan areas of San Francisco/Oakland, Los Angeles, and San Jose/Monterey (California); and the municipalities of Detroit (Michigan), Seattle (Washington), and Atlanta (Georgia). For all incident cancers diagnosed in these areas, the SEER registries collect information on patient demographics, tumor characteristics, stage at diagnosis, date of diagnosis, therapy received within 4 months of diagnosis, and date and cause of death.

Through a collaborative project between the National Cancer Institute and the Centers for Medicare and Medicaid Services, entitlement information and claims data from the Medicare program were linked to the SEER data for patients 65 years or older with cancer. Medicare eligibility was identified for 93% of SEER patients who were 65 years or older.35

Data from multiple files were used for this study: (1) the Patient Entitlement and Diagnosis File (SEER registry data and Medicare entitlement information), (2) the Medicare Provider Analysis and Review File (hospital inpatient and skilled nursing facility stays), (3) the Outpatient Standard Analytic File (hospital outpatient services), (4) the 100% Physician/Supplier File (physician and other medical services), and (5) a Hospital File created by the National Cancer Institute with information on hospital characteristics from the Centers for Medicare and Medicaid Services Provider of Service survey and the Healthcare Cost Report.

Study Cohort

Eligible patients were selected from the Patient Entitlement and Diagnosis File and included individuals who (1) were diagnosed as having stage IIB or IV lung cancer between January 1, 1992, and December 31, 2002 (n = 61,611), (2) who were 66 years or older at the time of diagnosis (n = 61,611), (3) died within 1 year of diagnosis (n = 49,617), (4) were enrolled in Medicare Parts A and B 1 year before death (n = 35,101), (5) were hospitalized in the last 6 months of life (n = 28,502), and (6) had 3 or more visits to 1 provider in the year before the admitting date of the last hospitalization (n = 21,183). We limited this analysis to the original SEER sites that provided continuous data for 1992 through 2002. Individuals enrolled in an HMO at any time from date of diagnosis through date of death were excluded because of concerns about completeness of information in the Medicare files of these patients.

Measures

Information on patients’ sociodemographic characteristics was obtained from the SEER data: age (66-74, 75-84, and ≥ 85 years), race (non-Hispanic white, black, Hispanic, and other), sex, and marital status at the time of diagnosis (married and not married). Tumor stage, vital status, cause of death, and geographic region were also derived from SEER data. Residence was dichotomized into large metropolitan area vs others. A large metropolitan area had an average population greater than 1 million based on the 1990 census. Socioeconomic status was based on whether the patient was eligible for state buy-in coverage provided by the Medicaid program for at least 1 month during the index year. Comorbidity was measured using a score developed by Klabunde et al36 using all Medicare claims from the year before diagnosis.

Establishment of Usual Care Providers

Health Care Financing Administration Current Procedural Terminology (CPT) evaluation and management codes 99201 to 99205 (new patient) and 99221 to 99225 (established patient) were used to establish outpatient visits. Individual providers were determined using the Unique Provider Identification Number. Three or more visits to the same provider within a year before the last hospitalization established the usual care providers (UCPs) for the patient. By this definition, a patient could have more than 1 UCP. The UCPs were classified as primary care physicians or others. For this study, a primary care physician was a general practitioner, family physician, internist, or geriatrician.

Definition of Outpatient-to-Inpatient Continuity of Care

An inpatient claim by the UCP during hospitalization established outpatient-to-inpatient continuity with a provider. Inpatient claims were identified using Health Care Financing Administration CPT evaluation and management codes 99221 to 99223 (initial hospital care), 99231 to 99235 (inpatient consultation), and 99231 to 99233 (subsequent hospital follow-up).

Definition of a Hospitalist

There is no provider code for a hospitalist physician in the administrative database. Therefore, we used a functional definition of hospitalist originally proposed by Saint et al37, a physician with more than 50% of his or her total Medicare claims per year originating from inpatient CPT evaluation and management codes 99221 to 99223, 99231 to 99233, and 99251 to 99255. We restricted the analyses to physicians with at least 10 inpatient claims per year and with either internal medicine or geriatrics as their specialty.

The primary outcome of ICU use during the terminal hospitalization was ascertained from inpatient hospital claims in the Medicare Provider Analysis and Review File. Patients with at least 1 ICU room charge or who had a CPT code for mechanical ventilation during hospitalization were considered to have had “ICU use” during the admission.

Hospitals were dichotomized into teaching or nonteaching. Teaching hospitals were those with a major medical school affiliation. Medical school affiliation was ascertained from the Provider of Service data in the National Cancer Institute’s Hospital File. For analyses of ICU use, patients in hospitals that did not contain ICU beds (from the Healthcare Cost Report Information System) were deleted (1303 patients). The study was approved by the institutional review board of The University of Texas Medical Branch.

Statistical Analysis

The likelihood ratio χ² statistic was used to compare rates of outpatient-to-inpatient continuity of care by participant characteristics. Changes in outpatient-to-inpatient continuity over time (year of diagnosis) were initially evaluated using the Cochran-Armitage trend test. Multivariate logistic regression analysis was used to assess whether changes in ICU use varied by patient, out-
patient-to-inpatient continuity of care, and hospital characteristics. A $P < .05$ was considered significant. All statistical analyses were performed using a software program (SAS version 9.1; SAS Institute Inc, Cary, North Carolina).

**RESULTS**

Of the 28,502 patients diagnosed as having advanced lung cancer who were hospitalized in the last 6 months of life, 21,183 (74.3%) had 3 or more visits to the same provider in the year before their last hospitalization. We defined any provider who saw the patient on 3 or more different occasions in an outpatient setting as a UCP.

Table 1 provides the baseline characteristics of the study cohort. Of the patients with a UCP ($n = 21,183$), 11,570 (54.6%) had outpatient-to-inpatient continuity, that is, they were seen during hospitalization by their UCP.

The Figure shows the percentage of patients receiving care from their UCP during their final hospitalization. Outpatient-to-inpatient continuity decreased from 60.1% in 1992 to 51.3% in 2002 ($P < .001$). During this same period, the number of patients who received care from a hospitalist increased from 8.0% to 16.1% ($P < .001$).

Table 2 presents the results of a multivariate analysis of factors associated with outpatient-to-inpatient continuity. Continuity declined over time. Patient characteristics associated with lower odds of continuity were male sex, black race, being unmarried, and having a low socioeconomic status. Treatment in an academic hospital and inpatient care provided by a hospitalist were also independently associated with a decreased odds of continuity of care.

Of patients with outpatient-to-inpatient provider continuity, 18.7% had an ICU stay during their last hospitalization compared with 33.2% who received care from a hospitalist, 18.7% had an ICU stay during their last hospitalization compared with 22.5% of patients without provider continuity ($P < .001$). During this same period, the number of patients who received care from a hospitalist increased from 8.0% to 16.1% ($P < .001$).

Table 3 presents the results of a multivariate analysis of factors associated with ICU use in the final hospitalization among patients with advanced lung cancer. After controlling for other relevant factors, patients with outpatient-to-inpatient continuity had a 25.1% reduced odds of spending time in an ICU. Those seen by a hospitalist during the last hospitalization had 56.7% higher odds of ICU use. Odds of an ICU admission increased approximately 5.8% per year from 1993 to 2002. Higher odds of ICU use were also associated with being married, younger age, low socioeconomic status, higher comorbidity, and ethnicity reported as Hispanic or other; and living in large metropolitan areas.

**COMMENT**

For patients with advanced lung cancer, outpatient-to-inpatient continuity of care declined during the 1990s. Continuity of care (being seen by a UCP during hospitalization) was associated with a lower chance of an ICU stay. Other factors independently associated with lower odds of outpatient-to-inpatient continuity of care include male sex, black race, lower socioeconomic status, being unmarried, care in a teaching hospital, and participation of a hospitalist in the care. The lower outpatient-to-inpatient continuity in teaching hospitals is consistent with the academic model of clinical practice, in which...
rotating attending physicians are responsible for the care of hospitalized patients. The finding of the relationship of hospitalists with reduced continuity of care supports the concern expressed by others that the growth of the hospitalist movement may threaten continuity of care across transitions. The other factors associated with low hospitalist movement may threaten continuity of care 

The decline in continuity of care may reflect the general trend in the US primary care physician workforce. The number of internal medicine residents who choose primary care has declined from 54% in 1998 to 20% in 2006. The increasing pressure to improve productivity and efficiency further limits the role of primary care physicians to either "officist" or "hospitalist," jeopardizing continuity of care.

In addition to a substantial increase in end-of-life ICU care over time, odds of ICU care were independently associated with no outpatient-to-inpatient continuity, care by a hospitalist, younger age, ethnicity reported as Hispanic or other, low socioeconomic status, higher comorbidity, and living in a large metropolitan area. Patients who received care from a hospitalist physician had higher odds of an ICU stay during their last hospitalization. These find-
ings should be interpreted in the context of the operational definition of a hospitalist physician. Moreover, we could not ascertain the timing of care provided by the hospitalist during the hospitalization in relation to the ICU stay. It is possible that the hospitalist provided care to these patients while in the ICU or after an ICU stay.

Previous studies of hospitalists have shown reduced length of stay and reduced overall hospital costs and no difference or improvements in outcomes such as mortality and readmission rates. A meta-analysis by Wachter and Goldman of 19 studies showed a 13.4% reduction in cost and a 16.6% reduction in length of stay after initiating hospitalist programs. Despite these improvements in efficiency, the expansion of the hospitalist movement is not without controversy. A major threat of the hospitalist model is the increasing discontinuity of care, from outpatient to inpatient and inpatient to outpatient settings.

Studies examining the effects of continuity of care have shown improved patient satisfaction, improved health outcomes, and reduced health care costs. There has been less work on the effect of continuity of care in end-of-life settings. Recent studies by Burge et al showed that patients with cancer who experienced higher outpatient continuity with their primary care provider had fewer emergency department visits and were less likely to die in the hospital.

Individual patient preferences are often difficult to establish. Physicians, nurses, and family members differ significantly in their knowledge and understanding of a patient’s preferences for end-of-life care. This situation is further complicated by misconceptions of the spiritual, religious, and cultural needs of the patient and family members. Honoring patient preferences is critical in providing end-of-life care for terminally ill patients. Thus, familiarity with the patient should improve end-of-life choices.

In this study, the effect of outpatient-to-inpatient continuity of care on ICU use was similar whether the continuity of care was with a primary care physician or a specialist. This may reflect the patient population with advanced lung cancer, who may be closely followed by a specialist such as an oncologist or a pulmonologist. The other factors that were associated with ICU use in this study, such as ethnicity, age, socioeconomic status, and comorbidity, are consistent with numerous previous studies.

Annually, 540,000 Americans die using ICU services. As the nation ages, the doubling of individuals older than 65 years by 2030 will require increasing demand on ICU services. Currently, only 37% of patients in the ICU receive care from a critical care–trained physician. The current supply and projected number of trainees are not sufficient to meet the growing national need, unless better rationing and appropriate ICU use is promoted.

This study has several limitations. First, although we found associations between lack of continuity of care and end-of-life ICU use, such associations found in observational data are not necessarily causal. Some unmeasured factors may be responsible for discontinuity of care and ICU use. This study is limited to ICU use during final hospitalization for patients with advanced lung cancer. This study used administrative data that did not contain information on patient, family, or treating physician attitudes and preferences regarding end-of-life care. It is difficult for physicians to predict the life span of an individual with advanced lung cancer, although the median survival of such patients changed little during the study period. Patients with cancer often choose treatments based on prognosis, which may be overestimated. Only services billed by the physicians were included, and nonbillable “social visits” by the UCP during the last hospitalization are not captured in the administrative data sets. However, this deficiency would likely decrease the estimate of association between continuity and ICU use.

We did not examine local health system characteristics that may have played a role in ICU use. It might be that the very factors associated with less continuity are also associated with less advance care planning or preferences for more aggressive care at the end of life. Patients with continuity may be more likely to have advance care planning. Future studies to examine the effect of continuity of care on advance care planning are needed.

These results reflect the Medicare population 66 years or older with advanced lung cancer and may not be generalizable to other settings or populations. Individuals with HMO coverage were excluded from the study. A change in HMO enrollments during the study might have affected analysis of the time trend of outpatient-to-inpatient continuity of care.

In summary, outpatient-to-inpatient continuity of care declined during the 1990s and early 2000s, whereas care by hospitalists increased. Patients with terminal lung cancer who experienced outpatient-to-hospital continuity of care were less likely to spend time in the ICU before death. Efforts to improve outpatient-to-inpatient continuity of care in hospitalized patients may reduce end-of-life ICU use in terminally ill patients.

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