Can Primary Care Visits Reduce Hospital Utilization Among Medicare Beneficiaries at the End of Life?

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BACKGROUND: Medical care at the end of life is often expensive and ineffective.

OBJECTIVE: To explore associations between primary care and hospital utilization at the end of life.

DESIGN: Retrospective analysis of Medicare data. We measured hospital utilization during the final 6 months of life and the number of primary care physician visits in the 12 preceding months. Multivariate cluster analysis adjusted for the effects of demographics, comorbidities, and geography in end-of-life healthcare utilization.

SUBJECTS: National random sample of 78,356 Medicare beneficiaries aged 66+ who died in 2001. Non-whites were over-sampled. All subjects with complete Medicare data for 18 months prior to death were retained, except for those in the End Stage Renal Disease program.

MEASUREMENTS: Hospital days, costs, in-hospital death, and presence of two types of preventable hospital admissions (Ambulatory Care Sensitive Conditions) during the final 6 months of life.

RESULTS: Sample characteristics: 38% had 0 primary care visits; 22%, 1–2; 19%, 3–5; 10%, 6–8; and 11%, 9+ visits. More primary care visits in the preceding year were associated with fewer hospital days at end of life (15.3 days for those with no primary care visits vs. 13.4 for those with ≥9 visits, P<0.001), lower costs ($24,400 vs. $23,400, P<0.05), less in-hospital death (44% vs. 40%, P<0.01), and fewer preventable hospitalizations for those with congestive heart failure (adjusted odds ratio, aOR=0.82, P<0.001) and chronic obstructive pulmonary disease (aOR=0.81, P=0.02).

CONCLUSIONS: Primary care visits in the preceding year are associated with less, and less costly, end-of-life hospital utilization. Increased primary care access for Medicare beneficiaries may decrease costs and improve quality at the end of life.

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BACKGROUND

Medical treatments for the 6% of Medicare beneficiaries who die each year consume almost 30% of Medicare expenditures[1,2]. In addition, the quality of end-of-life health care is often poor[3]. Problems include late referrals to hospice, undertreatment of pain, over-treatment with unwanted or ineffective procedures, poor communications regarding prognosis and treatment preferences, and more in-hospital deaths that are inconsistent with stated preferences[1,3,4].

Several strategies have been proposed to reduce end-of-life health-care costs while improving quality, including increased use of advance directives and earlier referral to hospice. However, despite some evidence regarding improved quality, neither strategy clearly reduces costs for elderly Medicare beneficiaries[4–7].

Continuity of care has been associated with patients and their families experiencing a "higher quality death"[8], with fewer emergency department visits for cancer patients[9], increased patient satisfaction, increased adherence to recommended care, and less duplicate testing[10–13]. Although some studies have shown that continuity of care with a primary care physician has been associated with reduced healthcare costs and utilization in some patients[11,14], it remains unclear whether primary care leads to more appropriate care at the end of life. More care at the end of life by a primary care physician could enhance quality and reduce costs, since the provider may have more opportunities to prevent medical complications, discuss patient preferences, and coordinate home palliative care.

To assess the impact of primary care on end-of-life healthcare utilization, we explored whether more primary care visits were associated with key outcomes during the last 6 months of life: (1) fewer hospitalized days, (2) fewer in-hospital deaths, (3) fewer preventable hospital admissions, and (4) lower costs.

METHODS

Data Source

We examined primary care physician visits provided during the preceding 12 months ("pre-period") as a predictor of hospital

use and costs in the last 6 months of life. We used a randomly sampled population of 116,318 Medicare beneficiaries aged 66 or older who died in the last 6 months of 2001. Non-Whites were over-sampled, because the study population had been constructed to focus on end-of-life health-care disparities. To ensure completeness and comparability of healthcare utilization records prior to death, we examined only those in our study sample with complete data during their final 18 months. We excluded people not continuously enrolled in the Medicare parts A and B traditional fee-for-service program, who could not be matched to the National Death Index, and who were enrolled in the End Stage Renal Disease (ESRD) program. This left a final analytical sample of 78,353.

Age, sex, race, and zip code of residence were obtained from the Medicare denominator file, using the Medicare racial/ethnic categories of White, Black, Hispanic, and Other (for those of Asian, North American Native, and other or unknown races and ethnicities). A Medicaid indicator in the Medicare file was used as a proxy for low economic status. To adjust for nursing home status, and since we could not determine nursing home residence directly, we coded "any nursing home use" for people who used a Medicare-reimbursed skilled nursing facility (SNF) in the pre-period. A summary comorbidity measure was determined using DxCG's prospective relative risk score (DCG version 6.1 for Windows), derived from the presence of ICD-9-CM diagnosis codes from inpatient and outpatient encounters in Medicare's utilization files. These encounters include all physician visits, hospital care, and nursing home care, but not codes used for diagnostic tests. The score is calibrated to associate 1.0 with average expected expenditures in the following year among all Medicare beneficiaries observed during routine 12-month periods[15].

We used Berenson-Eggers-Type-of-Service (BETOS) codes in the Medicare Carrier file [http://www.cms.hhs.gov/HCPCSReleaseCodeSets/20_BETOS.asp] to identify outpatient visits in a nursing facility or office. We used the Medicare HCFA specialty codes to define a visit to an internist (11), geriatrician (38), or family practitioner (08), as "primary care"[16,17]. We used the number of such visits in the 12-month "pre-period" prior to the final 6 months of life to form five primary care groups: 0, 1–2, 3–5, 6–8, and ≥9.

Outcomes

We studied four outcomes during the last 6 months of life: (1) number of inpatient days [obtained from the Medicare Provider Analysis and Review (MedPAR) files], (2) in-hospital death (from the National Death Index), (3) total costs paid by Medicare (from the MedPAR, Carrier, Durable Medical Equipment, Hospice, and Outpatient files), and (4) any hospital admission for each of two chronic Ambulatory Care Sensitive Conditions (ACSC), congestive heart failure (CHF), and chronic obstructive pulmonary disease (COPD). Admissions for CHF and COPD, which are common chronic diseases in the elderly, can often be prevented by appropriate primary care[18,19].

Statistical Analysis

We used bivariate analyses (chi-square for categorical variables and analysis of variance for continuous variables) to identify differences in end-of-life utilization and costs across the primary-care groups. Due to large samples, almost all comparisons were highly statistically significant. STATA version 9.1 was used for all analyses.

To account for geographic differences, we used multivariable cluster analysis, specifically, fixed effects difference regression. This accounts for both measured and unmeasured healthcare supply and labor factors, which vary by geographic location, by only contrasting each outcome for beneficiaries residing in the same geographic area. We mapped each beneficiary's zip code of residence into the two Dartmouth Atlas-based geographic area units characterized by healthcare utilization patterns: the "hospital referral regions" (HRRs) and "hospital service areas" (HSAs). The United States is divided into approximately 300 HRRs and 3,000 HSAs. The five "primary-care visit groups" based on number of such visits during the pre-period were our key predictors, while adjusting for other factors known to affect health utilization and outcomes: age[20], sex[21], race [22], receipt of Medicaid, nursing home use, comorbidity[1,3,23,24], and place of residence[25–27] by HSA. We calculated each risk-adjusted, expected outcome for a primary-care visit group by using its coefficient and the mean values for each of the other covariates in the equation predicting the outcome.

Since sicker people visit doctors more often, the primary care visit group is highly confounded with pre-period morbidity. We additionally examined our data within comorbidity score quartiles to examine the possibly differential effect of primary-care visit frequency on sicker patients.

We examined the presence of end-of-life hospitalizations for CHF or COPD among patients with those conditions. We identified people with COPD (ICD-9-CM codes for chronic bronchitis 491.xx, emphysema 492.xx, asthma 493.xx, and COPD NOS 496.xx) or CHF (428.xx) if they had at least one clinical encounter with a diagnostic code for these conditions during the pre-period. We used logistic models to predict the likelihood of a hospitalization for each condition, adjusting for age, sex, race, Medicaid receipt, nursing home use, and total comorbidity burden (DCG score). However, with relatively rare dichotomous outcomes (only 8–17% of those with CHF or COPD were hospitalized for these conditions), it was not feasible to also account for geography using 3,000 regional fixed-effect clusters (HSAs). Recognizing the importance of geography, we verified that findings from the logistic models without geographic adjustment were consistent with a linear regression analysis of the same data, using hospital referral regions (HRRs) as the geographic cluster unit. Noting that pre-period primary visits were strongly associated with death in a nursing home (ranging from 18% for those with 0 visits to 43% for those with greater than 9 visits), we repeated the modeling including interactions between the pre-period nursing home use indicator and the primary care visit groups. We also performed several sensitivity analyses, examining separately those who did and did not use a skilled nursing facility (SNF) in the pre-period, and both controlling for hospice use, and removing hospice patients, from analyses.

RESULTS

Among 78,356 Medicare decedents in our sample, 56% were female; 40%, White; 36%, Black; and 11%, Hispanic. The mean age at death was 81 years (range 66–98). In the 12-month pre-period prior to the final 6 months of life, 32% received

Medicaid, 13% had Medicare-reimbursed nursing home care, and less than 2% were enrolled in hospice. Also, 38% had 0 primary care visits, 22% had 1–2, 19% had 3–5, 10% had 6–8, and 11% had 9 or more visits. The following were associated with less primary care utilization: younger age, Black race, male sex, no Medicaid, no nursing home use, fewer hospital admissions, and less comorbidity (Table 1).

In the final 6 months of life, 24% of the population used hospice. Death occurred in a hospital for 43% and a nursing home for 25%. The average number of hospital days was 15.1, average costs were $24,800, and 17% of those with CHF and 8% of those with COPD had at least ine admission for the respective ACSC (Table 1).

More primary care visits in the pre-period were associated with reduced hospital days, in-hospital deaths, cost, and preventable hospital admissions. After adjusting for age, sex, race, Medicaid, nursing home use, comorbidities, and geographic location, expected total hospital days in the last 6 months of life varied with the number of primary-care visits in the pre-period as follows (Table 2): 15.3 days for decedents with 0 primary-care visits; 15.9 days for 1–2 visits; 14.2 days for 6–8 visits; and 13.4 days for 9 or more visits (P<0.001).The association was even greater among those who used SNF care in the pre-period (Table 3).

After adjusting for age, sex, race, Medicaid, nursing home use, comorbidities, and place of residence, in-hospital deaths occurred as follows: 43.9% of decedents with 0 primary-care visits, 43.8% of those with 1–2 visits, 43.1% with 3–5 visits, 39.5% with 6–8 visits, and 39.2% of those with ≥9 visits (Table 2). While hospice use was associated with site of death, sensitivity analyses that either controlled for hospice use or removed hospice patients did not notably alter the association between primary care visits and in-hospital death (data not shown).

Adjusting for the same factors, more primary-care visits were associated with reduced total Medicare expenditures at the end of life (Table 2). Among decedents with 0 primary-care visits in the pre-period, total costs in the last 6 months were $24,449, compared to $26,026 for decedents with 1–2 primary care visits, $25,572 for decedents with 3–5, $24,005 for decedents with 6–8 primary care visits, and $23,345 for decedents with ≥9 primary care visits.

Among Medicare beneficiaries with diagnoses of congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD), those who had more primary care visits in the pre-period were less likely to be hospitalized for these conditions during the last 6 months of life (Table 3). Those with ≥9 primary care visits in the 12 months preceding the end-of-life period were significantly less likely to be hospitalized for CHF (odds ratio=0.82, 95% CI 0.74—0.92), and COPD (odds ratio= 0.81, 95% CI 0.68–0.97) compared to those with fewer visits. These significant associations between more primary care visits and the main outcome of hospital days were magnified for the sickest 25% of patients. Repeating the multivariable

Table 1. Decedent Characteristics by Numbers of Prior Primary Care Visits* †

Pre-period Characteristics†	Primary Care Visit Groups					
	Total	0	1–2	3–5	6–8	≥9
N	78,356	29,557	17,181	15,112	7,952	8,554
%	100	38	22	19	10	11
Mean age (SD)	80.9 (8.1)	80.1 (8.2)	80.8 (8.1)	81.2 (8.0)	81.6 (8.0)	82.5 (8.1)
Women, %	56	51	57	59	61	63
White, %	40	36	40	42	44	41
Black, %	36	41	36	32	30	31
Hispanic, %	11	11	11	11	10	10
Other, %	14	13	13	14	16	17
Medicaid, %	32	29	31	32	36	42
Nursing home use,%	13	6	12	16	20	27
Mean comorbidity risk score (SD)‖	2.2 (1.7)	1.7 (1.5)	2.1 (1.6)	2.4 (1.6)	2.8 (1.7)	3.3 (1.9)
Mean number of hospital admissions (SD)		0.7 (1.3)	0.9 (1.4)	1.0 (1.5)	1.1 (1.6)	1.3 (1.7)
Diagnoses:						
CHF, % §	32	23	29	36	43	48
COPD, % §	26	19	25	30	33	35
End-of-life utilization‡						
Mean total hospital days (SD)	15.1 (20.2)	14.5 (20.2)	15.5 (19.8)	15.6 (20.2)	15.0 (20.1)	15.8 (21.1)
Mean total costs in $1,000 (SD)	24.8 (30.9)	23.4 (29.8)	25.1 (30.2)	25.7 (30.3)	25.2 (31.2)	27.4 (36.3)
Hospice, %	24	22	25	25	24	22
Place of death						
In-hospital, %	43	45	44	42	39	39
Nursing home, %	25	18	22	28	36	43
Residence, %	21	24	22	19	16	10
ACSC hospitalization among those with:						
CHF, % §	17	18	18	17	16	15
COPD, %§	8	10	9	8	7	7

**All P<0.001*

†Pre-period, months 18–7 before death

‡End-of-life utilization, months 6–date of death, unadjusted

§CHF, congestive heart failure, COPD, chronic obstructive pulmonary disease

‖Comorbidity risk score = relative risk from DxCG's prospective risk adjustment software, which organizes ICD-9-CM diagnosis codes from the Medicare utilization files, assigns weights to them, and summarizes their expected impact on future expenditures via a relative risk score.

Table 2. Healthcare Utilization[§] and Percentage of Deaths[§] in Hospital by Level of Prior Primary Care Use [||] (N=78,356)

Number of Primary Care Visits	Total Hospital Days (95% CI)	Total Costs $1,000 (95% CI)	In-hospital Death % Population (95% CI)
0	15.3 (15.0, 15.5)	24.5 (24.1, 24.8)	43.9 (43.3, 44.5)
1–2	15.9 (15.6, 16.2) [‡]	26.0 (25.6, 26.5) *	43.8 (43.1, 44.5)
3–5	15.4 (15.1, 15.8)	25.7 (25.1, 26.0) *	43.1 (42.3, 43.9) [†]
6–8	14.2 (13.7, 14.6) [‡]	24.0 (23.3, 24.7)	39.5 (38.4, 40.1) [†]
≥9	13.4 (12.9, 13.8) [‡]	23.4 (22.7, 24.0) *	39.2 (38.1, 40.4) [†]

*$P<0.05$, reference=0 primary-care visits
[†]$P<0.01$, reference=0 primary-care visits
[‡]$P<0.001$, reference=0 primary-care visits
[§]*Outcomes measured during final 6 months of life and adjusted for age, sex, race, Medicaid, nursing home use, comorbidity, and geographic variation (hospital service area)*
[||]*Primary-care visits measured during pre-period, months 18-7 before death*

analyses using comorbidity score quartiles, we found the sickest decedents with ≥9 primary care visits had an average of two fewer hospital days compared to those with no primary care visits (Table 3).

DISCUSSION

Frequent primary care visits were associated with four key end-of-life care outcomes: fewer days hospitalized, fewer preventable hospital admissions, fewer in-hospital deaths, and lower total costs.

Few interventions have been shown to influence end-of-life care either by improving quality or reducing costs. Although hospice and advance directives can improve patient self-efficacy at the end of life, neither clearly reduces costs[4,5,7,28,29]. Thus, the association of visits to primary care physicians with substantial reductions in costs and utilization at the end of life is especially notable. Although we cannot conclude from our cross-sectional analysis that more primary care visits *cause* lower utilization, primary care may substitute outpatient visits for more costly hospitalizations of patients with complex medical conditions. Although previously shown for specific chronic diseases[30], our study is the first to find this association at the end of life. A recent systematic review found that hospitalization of nursing home residents is determined by many factors, including sociodemographics, individual preferences, provider preferences, and economics of the particular healthcare system[31]. Our study suggests that fewer prior primary care visits are yet another determinant of hospitalization for Medicare beneficiaries.

There may be a threshold effect, because only at six or more visits was end-of-life utilization lower. Higher utilization and costs incurred by those with 1–5 visits compared to those with 0 visits could be due to patients with relatively high morbidity receiving too few primary care visits. In addition, patients with 0 visits had healthier beneficiaries who likely required few healthcare services; the healthiest patients probably do not benefit from frequent primary care visits. However, among the sickest Medicare beneficiaries, frequent primary care visits were associated with a 9% reduction in hospital days.

Our findings differ from those of Weinberger et al.[32], who found that increased primary care was associated with a higher hospital re-admission rate. It is possible that for the select group of severely ill veterans in this study, more primary care led to more hospital re-admissions because the patients were prematurely discharged from the hospital, and their clinical decompensation was appropriately evaluated and triaged by the primary care team. In contrast, our study population is 50-fold larger and a more representative sample of the national Medicare population. In addition, rather than focusing on re-admissions, we measured total hospital admissions and days.

By using fixed effect regression analysis with geographic clustering, we adjusted for both measurable and unmeasurable geographic factors. Previous studies have shown the importance of local characteristics of the health-care system in rates of preventable hospitalizations for Ambulatory Care

Table 3. Hospital Utilization[§] and ACSC[||] Admissions within Selected Patient Cohorts by Level of Prior Primary Care Use[¶]

Number of Primary Care Visits	Non-SNF Users Hospital Days (95% CI) N=68,170	SNF Users Hospital Days (95% CI) N=10,186	Sickest Quartile Hospital Days (95% CI) N=19,589	CHF Admission Odds Ratio (95% CI) N=24,856	COPD Admission Odds Ratio (95% CI) N=20,161
0	15.4 (15.1,15.6)	14.5 (13.5,15.4)	22.7 (21.6, 23.9)[‡]	Reference	Reference
1–2	16.2 (15.9,16.5)[†]	13.9 (13.0,14.8)	21.9 (20.8, 23.0)[‡]	1.00 (0.93,1.12)	0.96 (0.84,1.10)
3–5	15.7 (15.4,16.1)	13.8 (12.9,14.6)[†]	21.1 (19.8, 22.4)[‡]	0.98 (0.89,1.08)	0.85 (0.74,0.98)*
6–8	14.4 (13.9,14.9)[†]	12.9 (11.9,13.9)[†]	20.5 (19.3, 21.7)[‡]	0.88 (0.79,0.99)*	0.75 (0.63,0.90)*
≥9	13.8 (13.3,14.3)[†]	11.6 (10.8,12.5)[†]	19.5 (18.8, 20.3)[‡]	0.82 (0.74,0.92)*	0.81 (0.68,0.97)*

*$P<0.05$, reference=0 primary-care visits
[†]$P<0.01$, reference=0 primary-care visits, no Skilled Nursing Facility (SNF) services
[‡]$P<0.01$, reference=0 primary-care visits, lowest quartile comorbidity (least sick), after population was first stratified into four quartiles by comorbidity risk score
[§] *Utilization measured during final 6 months of life, and adjusted for age, sex, race, Medicaid, nursing home use, comorbidity, geographic variation (hospital service area)*
[||]*ACSC, ambulatory care sensitive conditions: CHF, congestive heart failure; COPD, chronic obstructive lung disease. Admissions for ACSC measured during final 6 months of life and adjusted for age, sex, race, Medicaid, nursing home use, and comorbidity*
[¶]*Primary-care visits measured during pre-period, months 18-7 before death*

Sensitive Conditions[30,33] and hospital utilization at the end of life[26,27,34]. These local characteristics are more important than patient preferences in determining whether someone dies in a hospital at the end of life[21]. After controlling for geographic variations, we found that fewer previous primary care visits are also a determinant of in-hospital death. Our findings are robust to geographic area variations in healthcare use. With more visits, primary care physicians may be better able to elicit patients' preferences, resulting in fewer hospitalizations and unwanted in-hospital deaths.

The study has several limitations. Medicare claims data contain no direct information regarding beneficiary preferences, appropriateness of clinical treatment, or quality of care. These findings may not generalize to Medicare beneficiaries in the End Stage Renal Disease program, in managed care plans, or those without the optional Medicare part B coverage. Although we did not have clinical data on disease severity, the DCG comorbidity score, constructed from detailed data encoded in diagnoses recorded during all medical encounters, has been shown to accurately predict future utilization of a population with very different levels of future mortality and costs[15,24,35,36]. Primary care visits do not account for all forms of primary care. For example, nurse visits, telephone consultations, and primary care provided by specialists were not counted. The economic status of beneficiaries was only partially captured by Medicaid receipt as noted in Medicare's records. Also, since Medicare only covers the first 3 months of a nursing home stay after hospitalization, we could not distinguish long-term care residents from short-term skilled nursing facility (SNF) users in our dataset. However, our findings suggest that primary care visits reduce hospital utilization most profoundly within nursing homes. Almost half of the beneficiaries with >9 primary-care visits died in a nursing home, and the association of more primary-care visits with reduced end-of-life utilization was most striking among previous SNF users. Given these limitations, future studies could use the additional demographic information in the Medicare Minimum Dataset (MDS) to clarify the relationship between primary care visits and hospital utilization among long-term nursing home residents.

As concerns about the quality and costs of end-of-life care increase, our study suggests that providing more primary care to Medicare beneficiaries may improve the quality of end-of-life care while reducing time spent in the hospital and overall costs. In 2001, nine primary-care visits cost Medicare approximately $3,000, 9 days in the hospital cost Medicare approximately $11,000, and 533,000 fee-for-service Medicare beneficiaries died in the hospital[37]. Decreasing just 1 hospital day for each of these beneficiaries at the end of life could have saved millions of dollars. Future studies that incorporate Medicare's DRG reimbursement system, hospice, home services, and pharmaceutical costs are needed to validate the cost-effectiveness of enhanced primary care at the end of life.

To achieve greater primary care utilization by a growing population of elderly, the workforce of primary care providers must grow. However, the primary care workforce is diminishing due to many primary care physicians leaving practice and few young physicians entering primary care[38]. Thus, providing more primary care may require increased training opportunities for nurses and physicians, or altered incentives that make primary care provision a more attractive enterprise[33,38].

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REFERENCES

1. **Hogan C, Lunney J, Gabel J, Lynn J.** Medicare beneficiaries' costs of care in the last year of life. Health Aff. 2001;204188–95.
2. **Edwards C, DeHaven T.** War betweeen the generations: federal spending on the elderly set to explode. In: C. Institute, eds. Policy Analysis. Washington D.C.; 2003: 1–22.
3. Approaching Death: Improving Care at the End of Life. Washington D.C.: National Academy Press; 1997.
4. **Ezekiel EJ.** Cost savings at the end of life: What do the data show? JAMA. 1996;275241907–14.
5. **Campbell D, Lynn J, Louis T, Shugarman L.** Medicare program expenditures associated with hospice use. Ann Intern Med. 2004; 140:269–77.
6. **Degenholtz HB, Rhee Y, Arnold RM.** Brief communication: the relationship between having a living will and dying in place. Ann Intern Med. 2004;1412113–7.
7. SUPPORT Principal Investigators. A controlled trial to improve care for seriously ill hospitalized patients: the study to understand prognoses and preferences for outcomes and risks of treatments. JAMA. 1995;274:1591–8.
8. **Patrick D, Curtis R, Engelberg R, Nielsen E, McCown E.** Measuring and improving the quality of dying and death. Ann Intern Med. 2003;1392410–5.
9. **Burge F, Lawson B, Johnston G.** Family physician continuity of care and emergency department use in end-of-life cancer care. Med Care. 2003;418992–1001.
10. **Burge F, Lawson B, Johnston G, Cummings I.** Primary care continuity and location of death for those with cancer. J Palliat Med. 2003;66911–8.
11. **De Maeseneer JM, De Prins L, Gosset C, Heyerick J.** Provider continuity in family medicine: does it make a difference for total health care costs? Ann Fam Med. 2003;13144–8.
12. **Gill JM, Mainous AG 3rd.** The role of provider continuity in preventing hospitalizations. Arch Fam Med. 1998;74352–7.
13. **Saultz JW, Albedaiwi W.** Interpersonal continuity of care and patient satisfaction: a critical review. Ann Fam Med. 2004;25445–51.
14. **Cabana MD, Jee SH.** Does continuity of care improve patient outcomes? J Fam Pract. 2004;5312974–80.
15. **Ash AS, Ellis RP, Pope GC, et al.** Using diagnoses to describe populations and predict costs. Health Care Financ Rev. 2000;2137–28.
16. **Burns RB, McCarthy EP, Freund KM, et al.** Black women receive less mammography even with similar use of primary care. Ann Intern Med. 1996;125:173–82.
17. **Keating NL, Landrum MB, Ayanian JZ, et al.** The association of ambulatory care with breast cancer stage at diagnosis among Medicare beneficiaries. J Gen Intern Med. 2005;20:38–44.

18. **Ricketts TC, Randolph R, Howard HA, Pathman D, Carey T.** Hospitalization rates as indicators of access to primary care. Health & Place. 2001;7127–38.
19. Agency for Healthcare Research and Quality. Refinement of the HCUP Quality Indicators. 2001 Summary, Technical Review Number 4. Available at: http://www.qualityindicators.ahrq.gov/downloads/technical/qi_technical_summary.pdf. Accessed March 12, 2008.
20. **Norman Levinsky M, Wei Yu P, Arlene Ash P, et al.** Influence of age on medicare expenditures and medical care in the last year of life. JAMA. 2001;286111349–55.
21. **Valentin A, Jordan B, Lang T, Hiesmayr M, Metnitz PGH.** Gender-related differences in intensive care: A multiple-center cohort study of therapeutic interventions and outcome in critically ill patients. Crit Care Med. 2003;3171901–7.
22. **Degenholtz HB, Thomas SB, Miller MJ.** Race and the intensive care unit: disparities and preferences for end-of-life care. Crit Care Med. 2003;315 SupplS373–8.
23. **Wolff JL, Starfield B, Anderson G.** Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Arch Intern Med. 2002;162202269–76.
24. **Ash AS, Posner MA, Speckman J, Franco S, Yacht AC, Bramwell L.** Using claims data to examine mortality trends following hospitalization for heart attack in Medicare. Health Serv Res. 2003;3851253–62.
25. **Pritchard RS, Fisher ES, Teno JM, et al.** Influence of patient preferences and local health system characteristics on the place of death. SUPPORT investigators. Study to understand prognoses and preferences for risks and outcomes of treatment. J Am Geriatr Soc. 1998;46101242–50.
26. **Baicker K, Chandra A, Skinner JS, Wennberg JE.** Who you are and where you live: how race and geography affect the treatment of medicare beneficiaries. Health Aff. 2004;(Suppl Web Exclusive):VAR33–44.
27. **Wennberg JE, Fisher ES, Stukel TA, Skinner JS, Sharp SM, Bronner KK.** Use of hospitals, physician visits, and hospice care during last six months of life among cohorts loyal to highly respected hospitals in the United States. BMJ. 2004;3287440607.
28. **Emanuel E, Emanuel L.** The economics of dying–the illusion of cost savings at the end of life. N Engl J Med. 1994;3308540–4.
29. **Shugarman LR, Campbell DE, Bird CE, Gabel J, Louis TA, Lynn J.** Differences in medicare expenditures during the last 3 years of life. J Gen Intern Med. 2004;192127–35.
30. **Bodenheimer T, Wagner EH, Grumbach K.** Improving primary care for patients with chronic illness: the chronic care model, Part 2. JAMA. 2002;288151909–14.
31. **Grabowski DC, Stewart KA, Broderick SM, et al.** Predictors of nursing home hospitalization: a review of the literature. Med Care Res Rev. 2008;6513–39.
32. **Weinberger M, Oddone EZ, Henderson WG.** Does increased access to primary care reduce hospital readmissions? Veterans affairs cooperative study group on primary care and hospital readmission. N Engl J Med. 1996;334221441–7.
33. **Bodenheimer T.** Primary care–will it survive? N Engl J Med. 2006;3559861–4.
34. **Fisher ES, Wennberg JE, Stukel TA, et al.** Associations among hospital capacity, utilization, and mortality of US Medicare beneficiaries, controlling for sociodemographic factors. Health Serv Res. 34(6):1351–62.
35. **Zhao Y, Ash AS, Ellis RP, Slaughter JP.** Disease burden profiles: an emerging tool for managing managed care. Health Care Manage Sci. 2002;53211–9.
36. **Kronman A, Hanchate A, Ash AS.** Improving risk adjustment for illness burden. J Gen Intern Med. 2007;22(s1). Abstract.
37. Health Care Financing Review: Medicare and Medicaid Statistical Supplement. US Dept. of Health and Human Services, Centers for Medicare and Medicaid Services, Office of Research, Development and Information, 2003.
38. Statement for the Record for Senate HELP Committee Hearing on Addressing Healthcare Workforce Issues for the Future (12-Feb-08): A Report from the American College of Physicians; 2008. Available at: http://www.acponline.org/advocacy/where_we_stand/workforce/pc_workforce.pdf Accessed March 12, 2008.