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Short-term Outcomes for Medicare Beneficiaries after Low-acuity Visits to Emergency Departments and Clinics

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Abstract

Background—There is substantial interest in identifying low-acuity visits to emergency departments (EDs) that could be treated more appropriately in other settings. Systematic differences in illness severity between ED patients and comparable patients elsewhere could make such strategies unsafe, but little evidence exists to guide policy makers.

Objective—To compare illness severity between patients visiting EDs and outpatient clinics, by comparing short-term mortality and hospitalization, controlling for patient demographics, comorbidity, and visit acuity.

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Conflicts of Interest:
None of the authors report a conflict of interest. Katherine Baicker holds positions as MedPAC Commissioner and Director of Eli Lilly, but neither relationship has influenced the submitted work.

Research Design—Cross-sectional study of outcomes after medical encounters.

Subjects—Nationally-representative 20% sample of Medicare fee-for-service beneficiaries discharged home from ED or clinic visit in 2011, and enrolled continuously for one year prior to the visit.

Measures—All cause mortality and hospitalization in the 8, 15, and 30 days after discharge home from ED or clinic visits.

Results—After risk-adjusting for patient demographic, comorbidity, disability, and dual-eligibility status, as well as visit acuity as measured by a commonly used algorithm, we found that ED patients were more likely to die (risk-adjusted OR=2.75, 95% CI: 2.56–2.96) or be hospitalized (OR=1.97, 95% CI: 1.95–2.00) after discharge than clinic patients. Differences in short-term outcomes were observed even when comparing patients with the same discharge diagnoses after risk adjustment.

Conclusions—Patients presenting to EDs have worse risk-adjusted short-term outcomes than those presenting to outpatient clinics, even after controlling for acuity level of visit or discharge diagnosis. Existing measures of acuity using administrative data may not adequately capture severity of illness, making judgments of the appropriate setting for care difficult.

Keywords

emergency care; primary care; NYU algorithm; Medicare

Reducing unnecessary emergency department (ED) utilization has emerged as a key priority as healthcare organizations move towards population health management with the implementation of the Affordable Care Act.[1] Multiple studies have suggested high rates of potentially avoidable or unnecessary ED visits,[2,3,4] and there is increasing interest in identifying these patients in order to divert them to other outpatient settings where the cost of care is lower. Several states have implemented increased cost-sharing provisions for non-emergent ED visits,[5] and the state of Washington recently debated a change to reimbursement policy which would reduce or deny reimbursement to hospitals for low-acuity ED visits that could have been managed in lower-intensity clinical settings.[6]

Two assumptions underlie efforts to divert non-emergent ED patients to other outpatient settings: that low-risk ED patients can be treated more cost-effectively in other settings, and that these patients can be accurately identified on the basis of the routinely collected data available to the majority of payers and providers. Prior work on classification of ED visit acuity[7] has been validated for identification of high- and low-risk ED patients on the basis of short-term outcomes after ED visits;[8] but despite explicitly categorizing some low-risk patients as ‘primary care-treatable,’ this work did not specifically address the appropriateness of treating such patients in primary care settings. There is widespread belief that increased access to primary care would reduce the number of low-acuity ED visits,[9,10,11] but other studies find evidence that a patient’s perceived need for timely care or general preferences for the ED also play an important role for where a patient chooses to receive care.[12,13,14,15] If a patient’s decision to visit the ED rather than a clinic were correlated with illness severity, diversion to a lower-acuity care setting may be inappropriate, but there is little evidence to guide policy makers on this point.

We used Medicare claims to investigate short-term outcomes for patients presenting to an ED or a outpatient primary care clinics, controlling for claims-based measures of visit acuity and underlying comorbidity. We identified Medicare beneficiaries discharged home from both settings and compared risk-adjusted near term mortality and hospitalization rates for patients by location of care. Systematic differences in short-term outcomes and illness acuity between patients visiting EDs and clinics could indicate that not all patients are appropriately treatable in either setting.

METHODS

We examined the association between location of visit – clinic or ED – and short-term outcomes, controlling for measurable patient characteristics and acuity at the visit level.

Setting and Study Population

We used a nationally representative 20% sample of outpatient claims from Medicare beneficiaries enrolled in 2011. Patients with less than one full year of comorbidity data or not enrolled in Medicare fee-for-service were excluded. We identified only beneficiaries who were discharged home after a visit to an outpatient clinic or ED, on the basis that potentially discretionary or unnecessary visits were unlikely to be admitted. We defined an ED visit as a unique ED revenue center code (0450–0459 and 0980) occurring on a single calendar date; to avoid classifying certain outpatient services (*e.g.*, urgent dialysis) as an ED visit, we made a minor modification to the usual method of identifying ED visits[16], described in the appendix. We defined clinic visits similarly, but using Healthcare Common Procedure Coding System (HCPCS) codes for evaluation and management (99201–99215) from the Carrier (non-institutional provider) file. Clinic visits to critical access hospitals were identified using the same HCPCS codes from the outpatient file as these physicians do not appear in the Carrier file. The study was approved by the National Bureau of Economic Research Institutional Review Board.

Classifying Visit Acuity

We implemented a previously published and validated algorithm for classifying ED visits on the basis of acuity, the New York University (NYU) algorithm. We classified visits using code provided by the authors, translating the SAS code for use with Stata 13.[7] The NYU algorithm assigns to each diagnosis probabilities that the diagnosed condition falls into one of four categories: (1) ‘non-emergent,’ (2) ‘emergent – primary care treatable,’ (3) ‘emergent – preventable/avoidable,’ or (4) ‘emergent – not preventable/avoidable.’ The visit was then classified according to the most ‘emergent’ condition based on the probability that the diagnosis is ‘emergent – preventable/avoidable’ or ‘emergent – not preventable/avoidable’. We used the Ballard et al. modification of the NYU algorithm to classify ED visits as emergent or non-emergent, which has been demonstrated to predict short-term mortality and hospitalization.[8] See Appendix for more details.

Outcome Measures – Death and Hospitalization

We recorded mortality and hospitalization within 8, 15, or 30 days of the initial outpatient visit to the clinic or ED, by linking outpatient claims to Medicare inpatient and date of death data. Patients who died during the outpatient encounter or were directly transferred to another hospital were excluded.

Covariates

We controlled for patient sex, age group by sex (five-year intervals), race/ethnicity, and individual chronic conditions indicated in the Medicare chronic conditions file (see appendix documentation for more details). We also included an indicator variable for each month of the calendar year and an indicator for whether the visit occurred on a weekend or federal holiday. An indicator variable was included for dual-eligible status, which is defined as having at least one month of Medicaid eligibility in 2011. At the area level, we control for hospital referral region fixed effects and median income in the patient's zip code.

Statistical Analysis

We used logistic regression to examine risk factors for mortality and hospitalization following an outpatient visit, and used indicator variables to capture whether a visit was (1) non-emergent ED, (2) emergent clinic, or (3) emergent ED (non-emergent clinic is the omitted category). We used the 50% threshold as a baseline – visits are assigned to a category if the NYU ED algorithm assigns greater than 0.5 probability of being in that category. Visits that are not assigned any probabilities by the algorithm and those that are assigned 0.5 probability of being both a non-emergent or emergent visit are excluded from the analysis (17,788,476 of 51,794,582 total visits are excluded). We also explored sensitivity to other thresholds, $p>0.75$ and $p>0.9$ and found similar results. We controlled for observable patient characteristics including demographics and comorbidity, as above.

In an additional specification, we ran a patient fixed effect regression to control for time-invariant, unobserved heterogeneity at the patient level. By using patient-level fixed effects, we were able to control for important patient factors that remained constant throughout the year of analysis, such as proximity to local providers and access to primary care clinics that would otherwise have been difficult or impossible to directly enter into the regression analysis. The fixed effects models necessarily restricted the analysis to the subset of patients with variation in the outcome variable, e.g. patients with visits after which they were and were not hospitalized within 8 days of the index visit. Sample selection is also predicated on within-patient variation in visit location, e.g. patients who visited both the ED and the clinic. Interpretation of the fixed effects results is limited to this particular subsample of patients.

RESULTS

Study population

Of 10,016,372 Medicare beneficiaries alive and in the 2011 20% random sample, we identified 4,685,709 beneficiaries with at least one ED visit or one clinic visit in 2011. We identified 1,674,618 ED visits (0.36 visits per person) and 26.8 million clinic visits (5.72 visits per person). We restricted the sample to those visits that were discharged home. Table

1 shows that those who visit the ED are younger on average than those who visit the clinic and have fewer chronic conditions, but they are more likely to be disabled, dual-eligible, or have end stage renal disease.

Nearly 8.5% of patients visited both the ED and the clinic in just their first two visits of 2011. Regression analysis indicates that patients are more likely to visit clinics over time, but the effect is very small in magnitude (OR=1.00, 95% CI: 1.00–1.00).

Table 2 shows the most common primary ICD codes for each visit by location and acuity. Hypertension (not otherwise specified, NOS), bronchitis, back symptoms, and urinary tract infection are among the top ten most common primary discharge diagnoses classified as ‘non-emergent’ or ‘primary care treatable’ for both ED and clinic visits in the sample. Atrial fibrillation, chest pain, asthma, sciatica, and diabetes with other manifestations were among the top ten most common emergent primary diagnoses for both ED and clinic visits. Benign hypertension appeared as the primary diagnosis in both non-emergent and emergent clinic visits because the acuity classification incorporates potentially life-threatening secondary diagnoses in addition to the primary diagnosis.

Visit acuity

Table 3 shows logistic regressions results using patient and visit characteristics to predict short-term mortality and hospitalization. Results for 8-day outcomes are reported in the main text, with results for 15 and 30 reported in the appendix. In the 8 days following ED visits, patients with ‘emergent’ visits were more likely to die or be hospitalized compared to those with ‘non-emergent’ visits. For ED visits, ‘emergent’ diagnoses were associated with significantly higher 8-day mortality (OR=2.31, 95% CI: 2.14–2.49) and hospitalizations (OR=1.30, 95% CI: 1.28–1.32) compared to ‘non-emergent visits.’ This relationship also held for clinic visits (mortality rate OR= 1.80, 95% CI: 1.73–1.86, hospitalization OR=1.65, 95% CI: 1.64–1.66). The odds ratios for these comparisons can be calculated by simply dividing the odds ratio of group by another. Results using a fixed effects specification, which controlled for time-invariant unobserved patient characteristics, were similar, as were results for 15- and 30-day outcomes (see appendix).

Relative to clinic visits, ED visits are associated with significantly higher rates of death and hospitalization after medical encounters across a range of acuity levels, including ‘non-emergent’ and ‘primary care treatable’ (mortality OR=2.75, 95% CI: 2.56–2.96; hospitalization OR=1.97, 95% CI: 1.95–2.00) and ‘emergent’ conditions (mortality OR=3.55, 95% CI: 3.35–3.75; hospitalization OR=1.55, 95% CI: 1.53–1.57). Indeed, ED visits deemed ‘non-emergent’ were associated with higher mortality (OR=1.53, 95% CI: 1.42, 1.65) and hospitalization rates (OR=1.19, 95% CI: 1.18–1.21) than even clinic visits deemed ‘emergent’ by the algorithm. The results were robust to different thresholds for the NYU classification variable ($p>0.75$, $p>0.9$) as well as using the probability measures as continuous variables (not reported). Similar results were found in the patient fixed effects specification (also in Table 3) that compared ED and clinic outcomes for those patients with visits to both care locations over the study period, thereby controlling for fixed patient-level characteristics.

Individual ICD Regressions

As a further sensitivity analysis, we performed additional logistic regressions restricted to a single primary diagnosis to account for differences in the composition of ‘non-emergent’ and ‘emergent’ visits to the clinic and ED. For example, non-emergent visits to the ED may have had a relatively higher share of diagnoses associated with higher short-term mortality than non-emergent visits to the clinic. Specifically, we identified the ten most frequent primary diagnoses across ED and clinic groups, and ran separate regressions for each diagnosis. Regression specifications were similar to main specification except that we simply included an indicator for whether the patient visited the ED as there is no variation in NYU category within an ICD code. This sensitivity check ruled out the possibility that the composition of diagnoses, within a given acuity category, explains the different outcomes for ED and clinic visits. For regressions that were restricted to a single primary ICD code, we use 10-year age bins, not interacted with gender, and state-level (rather than HRR-level) fixed effects to avoid over-fitting on the small subsamples.

Table 4 shows results from regression analyses comparing outcomes for ED vs. clinic patients with the same primary discharge diagnosis for six of the ten diagnoses common to the clinic and the ED (see Table 2). For all diagnoses appearing in the top 10 most common diagnoses for each acuity and location group, see the online appendix tables. Odds ratios for death ranged from 1.34 for chest pain (not otherwise specified), to 3.00 for hypertension (NOS). Most of the odds ratios for death were statistically significant, implying increased risk of death or hospitalization for ED patients. For asthma visits, for example, odds of death (OR=2.57, 95% CI: 1.18–5.64) and hospitalization within 8 days (OR=1.94, 95% CI: 1.72–2.19) were both significantly higher for ED vs. clinic visits. Similarly, for hypertension (NOS) ED visits are associated with increased mortality (OR=3.00, 95% CI: 1.58–5.70) and hospitalization (OR=2.74, 95% CI: 2.47–3.04) within eight days.

DISCUSSION

This paper is the first comparison to date of short-term outcomes for similar patients who seek care at the ED vs. outpatient clinics. We find that patients who seek care at the ED are more likely to die or become hospitalized in the 8 days following the visit, a finding with two possible interpretations: either EDs provide lower quality care, perhaps because of worse continuity of care and a lack of follow-up, resulting in poorer outcomes for patients of similar acuity; or patients who visit the ED have higher underlying illness severity in ways that are unmeasured by administrative data.

We view the latter interpretation as more likely, given the results of other studies suggesting that patients who present to the ED relative to outpatient clinics are different in important ways that are unmeasured by administrative data.[17] Even controlling for time-invariant patient characteristics using patient-level fixed effects, there are still large differences in outcomes across ED and clinics for otherwise similar diagnoses. This indicates that for patients that have access to both types of providers, perceived symptom severity, which likely varies from encounter to encounter, may play an important role in dictating where the patient seeks care.

One other possible explanation is that the same diagnosis code may indicate visits for very different reasons. For example, the same diagnosis code might be sometimes be associated with a routine check-up or medication management, but other times might represent an unexpected flare up that requires timely acute care. Administrative data is not well suited to identifying these differences. The NYU algorithm itself acknowledges this uncertainty by assigning visits probabilities of being emergent or non-emergent, rarely assigning a visit to one category with 100% certainty.

While it is generally the case that ED visits are associated with higher mortality and hospitalization rates, this is not always the case. In Table 4, for example, patients who visit the ED with a diagnosis of chest pain and are subsequently discharged home, have a statistically significantly lower chance of being hospitalized within 8 days (OR=0.61, 95% CI: 0.57–0.65). Although this is only one example, it may indicate that the ED may sometime be better suited than primary care clinics for providing timely diagnostic testing to identify those with truly high-acuity conditions.

Our analysis highlights an important limitation of current approaches to measure the acuity and appropriateness of visits to EDs. While the NYU algorithm discriminates well among patients within a locus of care—for example, ‘emergent’ conditions have higher rates of death and hospitalization than ‘non-emergent’ for both ED and clinic patients—comparisons across settings are more complex: ‘non-emergent’ ED visits are associated with higher short-term mortality and hospitalization rates than ‘emergent’ clinic visits. This breakdown is troubling considering the algorithm explicitly labels some ED visits ‘non-emergent’ and ‘primary care treatable.’ The fact that outcomes for ED patients are significantly worse than those for similar patients treated in primary care settings, even after controlling for diagnosis and patient characteristics, highlights that existing measures of acuity using administrative data might not adequately capture severity of illness.

Limitations

There are a number of limitations to Medicare claims that should be noted, as they are particularly germane to our results. Our sample only contains Medicare enrollees, a group with higher rates of mortality and hospitalization than the general population, which limits generalizability. While claims data do not suffer from recall bias and are therefore more complete than survey data, unmeasured comorbidity and other patient factors (*e.g.*, behavioral, access to care, etc.) can impact results. We attempt to control for time-invariant patient characteristics, including proximity and accessibility of EDs and clinics and comorbidities that do not worsen or improve over the sample period, but time varying characteristics may still persist. In addition, the fixed effects specification restricts the sample to patients with multiple visits with both outcomes, e.g. hospitalized within 8 days and not, and visits of different types, e.g. non-emergent clinic and non-emergent ED, which eliminates a large part of the sample and reduces the generalizability of that portion of the analysis. It is worth noting that the results from the fixed effects regressions are nearly identical to those on the larger sample, so it is plausible that the restricted sample is representative.

Conclusion

Despite limitations, we show that short-term outcomes following discharge are worse for patients with non-emergent diagnoses who presented to the ED as compared with those who presented to the clinic. This is likely due to imperfect measurement of visit severity, conditional on diagnosis, as a remaining source of variation. It appears that patients sort themselves, but it is impossible to rule out the possibility that clinics cause better outcomes.

These results have important implications for payers and policy makers. While current approaches to categorization of ED visits have been validated for use within a given care site – ED or clinic – more research is needed before these can be translated into policy and patient care. Efforts to provide incentives, or penalties, to redirect patients from EDs to clinics may be premature as we do not know what causes patients to seek care at different sites nor do we fully understand how outcomes may change if we alter current patterns of care seeking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Means Table (Patient-Visit Level)

Variable	Clinic Visits Mean	Clinic Visits 95% CI		ED Visits Mean	ED Visits 95% CI	
patient characteristics						
Age	73.21	73.21	73.22	67.67	67.65	67.70
Male	0.41	0.41	0.41	0.40	0.40	0.40
Dual Eligible	0.21	0.21	0.21	0.40	0.40	0.40
Disabled	0.15	0.15	0.15	0.34	0.34	0.34
Number of Chronic Conditions	7.74	7.74	7.74	7.62	7.61	7.62
Acute Myocardial Infarction, ever	0.052	0.05	0.05	0.06	0.06	0.06
Alzheimer's Disease	0.044	0.04	0.04	0.07	0.07	0.07
COPD	0.32	0.32	0.32	0.38	0.38	0.38
Congestive Heart Failure	0.33	0.33	0.33	0.35	0.35	0.35
Diabetes	0.44	0.44	0.44	0.42	0.42	0.42
End Stage Renal Disease	**.011**	**.011**	**.011**	**.031**	**.031**	**.031**
Ischemic Heart Disease	0.57	0.57	0.57	0.55	0.55	0.55
Depression	0.36	0.36	0.36	0.50	0.50	0.50
Asthma	0.18	0.18	0.18	0.23	0.23	0.23
visit characteristics						
Non-emergent	0.66	0.66	0.66	0.50	0.50	0.50
Emergent	0.29	0.29	0.29	0.44	0.44	0.44
Weekend or Holiday	0.030	0.03	0.03	0.32	0.32	0.32
outcomes						
Died within 8 Days	0.0005	0.00	0.00	0.003	0.00	0.00
Hospitalized within 8 Days	0.024	0.02	0.02	0.062	0.06	0.06
Total Number of Visits	26,811,634			1,674,618		

Notes: Variables reported at the person-visit level. Data come from a 20% random sample of Medicare beneficiaries in 2011. See main text for more details on sample selection. "Age" and "Number of Chronic Conditions" are reported as means. All other variables are reported as the fraction of visits where the patient exhibited the characteristics described. Abbreviations used: Chronic Obstructive Pulmonary Disease (COPD).

Table 2

Top Ten Visits by Category and Location

	Clinic, Non-Emergent			ED, Non-Emergent	
	ICD Code	N		ICD Code	N
1.	DM2 without complications	1,107	1.	Abdominal pain	40
2.	Hypertension (NOS)	878	2.	Urinary tract infection (NOS)	26
3.	Benign hypertension	715	3.	Other chest pain	23
4.	Joint/leg pain	520	4.	Other cellulitis/abscess	22
5.	Chronic Ischemic heart disease (NOS)	464	5.	Acute bronchitis	19
6.	Acute bronchitis	432	6.	Headache	18
7.	Other back symptoms	384	7.	Other back symptoms	17
8.	Urinary tract infection (NOS)	327	8.	Hypertension (NOS)	13
9.	Other/unspecified hyperlipidemia	303	9.	Contusion face/scalp/neck	13
10.	Malignant neoplasm of prostate	292	10.	Contusion of thigh	12
	Clinic, Emergent			**ED, Emergent**	
	ICD Code	N		ICD Code	N
1.	Atrial fibrillation	997	1.	Chest pain (NOS)	34
2.	DM2 without complications	341	2.	Syncope and collapse	18
3.	Benign hypertension	272	3.	Open wound of nose (NOS)	13
4.	Sciatica	244	4.	Extrinsic asthma (NOS)	13
5.	Extrinsic asthma (NOS)	222	5.	Calculus of kidney	12
6.	Chest pain (NOS)	18	6.	Atrial fibrillation	10
7.	Congestive heart failure (NOS)	138	7.	Open wound of scalp	10
8.	Shortness of breath	137	8.	Sciatica	10
9.	Diabetes w/other manifestations	111	9.	Bronchopneumonia	9
10.	Transient cerebral ischemia (NOS)	99	10.	Diabetes with other manifestations	8

Notes: Most common primary diagnosis codes for visits to primary care clinics or the emergency department (ED). **Visits measured in thousands.** Data come from a 20% random sample of Medicare beneficiaries in 2011. **Abbreviations used: “not otherwise specified” (NOS), “Type 2 Diabetes Mellitus” (DM2),**

Table 3

NYU Category Regression Results

	Logit				Logit (Patient Fixed Effects)			
	OR	SE	95% CI		OR	SE	95% CI	
Death within 8 days								
Non-emergent								
Clinic	1.00				1.00			
ED	2.75	0.10	2.56	2.96	1.94	0.10	1.75	2.15
Emergent								
Clinic	1.80	0.033	1.73	1.86	1.62	0.04	1.54	1.70
ED	6.37	0.19	6.00	6.75	3.73	0.16	3.44	4.05
N	28,485,776				91,342			
Hospitalized within 8 days								
Non-emergent								
Clinic	1.00				1.00			
ED	1.97	0.013	1.95	2.00	1.32	0.01	1.30	1.34
Emergent								
Clinic	1.65	0.005	1.64	1.66	1.46	0.005	1.45	1.47
ED	2.56	0.017	2.53	2.59	1.54	0.011	1.51	1.56
N	28,486,232				3,652,777			

Note: Regression analysis controls for the following: weekend day, month of the year, hospital referral region (HRR) fixed effects, median zip code income, male, age group [5-yr intervals] by gender, dual-eligible status, visit characteristics (alcohol-related, drug related, injury related, ambulatory care sensitive, and psychiatric), and a dummy variable for several chronic condition (see appendix for the full list of conditions). Fixed effects regressions include patient fixed effects.

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Table 4

Individual ICD-9 Regression Results

Non-Emergent	OR	SE	Emergent	OR	SE
	[95% CI]			[95% CI]	
Hypertension (NOS)			*Chest Pain (NOS)*		
Died 8 days			**Died 8 days**		
ED	3.00	0.98	ED	1.34	0.30
	[1.58, 5.70]			[0.86, 2.08]	
Hospitalized 8 days			**Hospitalized 8 days**		
ED	2.74	0.14	ED	0.61	0.02
	[2.47, 3.04]			[0.57, 0.65]	
N	*799,332*		*N*	*201,969*	
Acute Bronchitis			*Asthma*		
Died 8 days			**Died 8 days**		
ED	2.35	0.68	ED	2.57	1.03
	[1.34, 4.14]			[1.18, 5.64]	
Hospitalized 8 days			**Hospitalized 8 days**		
ED	1.50	0.075	ED	1.94	0.12
	[1.36, 1.65]			[1.72, 2.19]	
N	*423,683*		*N*	*180,908*	
Urinary Tract Infection			*Atrial Fibrillation*		
Died 8 days			**Died 8 days**		
ED	2.36	0.51	ED	2.97	0.73
	[1.55, 3.60]			[1.84, 4.79]	
Hospitalized 8 days			**Hospitalized 8 days**		
ED	1.84	0.064	ED	1.19	0.06
	[1.72, 1.97]			[1.07, 1.31]	
N	*337,528*		*N*	*1,000,248*	

Notes: Odds ratios are relative to clinic visits with the same principal diagnosis code. Abbreviations used: “not otherwise specified” (NOS).