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Non-Operative Care for Hip Fracture in the Elderly: The Influence of Race, Income, and Comorbidities

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Abstract

Context—Hip fracture occurs in 340,000 older adults each year. Operative repair is the standard of care, maximizing the chances of functional recovery. Not receiving operative care may condemn patients to a lifetime of pain and potential immobility.

Objective—To measure the incidence of non-operative treatment for first-time hip fracture in a population-based cohort and to measure the odds of non-operative treatment of hip fracture among patients of differing race and income.

Design, Setting, and Participants—Retrospective cohort study of 165,861 Medicare beneficiaries admitted for hip fracture between March 31, 2002 and December 31, 2006 to hospitals in New York, Illinois, and Texas.

Main Outcome Measures—Odds of non-operative management of hip fracture, adjusted for fracture characteristics, comorbidities, source of admission, age, sex, race, income, and individual hospital effects.

Results—Non-operative management occurred in 6.2% of patients (N=10,283). After adjustment, black patients had a 79% increase in the odds of non-operative management as compared to whites (OR 1.79, 95% CI 1.64-1.95). Low income itself was not associated with a change in the odds of non-operative care. Among patients not receiving operative repair, blacks demonstrated lower mortality than whites at 7 days (7.96% vs. 20.17%, $p < 0.0001$) and 30 days (24.14% vs. 38.22%, $p < 0.0001$).

Conclusions—Black race predicts an increased odds of non-operative care for hip fracture. Among patients receiving non-operative care, black patients demonstrated increased survival

compared to whites. These results are consistent with differential selection of operative candidates by patient race.

Keywords

Hip fracture; geriatrics; disparities; quality-of-care

INTRODUCTION

Hip fracture is a common and disabling event among older adults.^{1, 2} Operative repair, with internal fixation or replacement of part or all of the hip joint, is the standard of care for patients with all types of hip fracture.^{2, 3} A decision to forego surgery may have profound consequences, as non-operative management of hip fracture is associated with a high risk of hip displacement,⁴⁻⁶ increased pain,^{2, 7} and loss of mobility.^{6, 8} Non-operative management is indicated only for patients who present late with a fracture that has begun to heal, are moribund, lack prospects for any functional recovery, or refuse surgery.^{2, 3, 7}

Prior research suggests that operative repair of hip fracture is not universal. A 1994 study of Medicare claims found that 92.2% of hip fracture patients underwent internal fixation or arthroplasty and 8% received “other care,”⁹ but did not define the number of patients receiving no surgical intervention. Unpublished data from a 1981-1994 cohort study of approximately 10,000 U.S. patients describe a 4% incidence of non-operative management.^{10, 11}

While recent reports suggest a declining incidence of hip fracture among persons 65 years and older,¹² the public health burden of this injury may continue to grow due to the aging of the U.S. population.^{13, 14} However, little information currently exists regarding factors that may influence the decision to repair a broken hip. Most large cohort studies of hip fracture have not reported data describing patients undergoing non-operative treatment.^{10, 15-19} As a result, there is little available data regarding the patient factors that influence the decisions of physicians to offer surgery to patients with hip fracture.

The present study had two aims. Our first aim was to determine the rate of non-operative management of first-time hip fracture in a large population of Medicare beneficiaries. Our second aim was to describe associations between patient sociodemographic factors, such as minority race and low income, and the odds of non-operative management. Minority race has been previously associated with variations in utilization of surgical services for other orthopedic²⁰ and non-orthopedic conditions.²¹ Additionally, while black patients with hip fracture have been found to experience lower 30-day mortality than whites, they experience worsened functional recovery and greater mortality at 1 year after fracture.^{22, 23}

Hip fracture offers distinct advantages as a model to examine differences in operative care between sociodemographic groups. As few clinical scenarios exist where non-operative care is medically justified, differences in care delivered are unlikely to be explained by routine variations in provider practice styles or patient choices to pursue alternative therapies. Further, Medicare data offer unique strengths for assessing patterns of care delivered to patients with hip fracture. As the majority of patients sustaining hip fractures are over age

65, Medicare claims capture a large proportion of the hip fracture care delivered in the U.S.. As hospital admission is indicated for all patients with hip fracture, Medicare claims include records for patients undergoing both operative and non-operative management. Lastly, as ICD-9-CM codes provide specific information on fracture characteristics and the procedures used for treatment, Medicare claims allow for detailed comparisons between groups of operative and non-operative patients.

METHODS

Study Sample

We examined claims for the period from January 1, 2002 through December 31, 2006 for all Medicare beneficiaries in New York, Texas, and Illinois. The initial population included 3,965,401 patients and 12,103,966 admissions. To identify patients with first-time hip fractures, defined as fractures of the femoral neck, intertrochanteric, or subtrochanteric portion of the femur, we selected all index admissions with one or more of the following ICD-9-CM diagnosis codes: 820.00-09, 820.21-22, and 820.8.

To prevent selecting possible readmissions, we excluded from the analysis all patients for whom we were unable to examine Medicare claims for at least 90 days prior to the fracture. We thus excluded all patients enrolled in Medicare for less than 90 days as of January 1, 2002 (age < 65.25 years). We excluded patients admitted for hip fracture between January 1, 2002 and March 31, 2002, defined either by presence of one the above ICD-9-CM diagnosis codes, or by any ICD-9-CM procedure code corresponding to surgery on the hip joint or proximal femur. As administrative data is limited for patients enrolled in Medicare HMO plans, we excluded patients enrolled in a Medicare HMO in the 90 days prior to their first recorded admission for hip fracture or within 30 days following this admission. We excluded patients whose principal residence was not in New York, Texas, or Illinois, as we would be unable to assess prior admissions for these patients. To ensure that a 90-day look-back would be sufficient to exclude re-admissions from our sample, we also performed a 180-day look-back. As the 180-day look-back resulted in a greater number of patient exclusions than the 90-day look-back, but yielded similar proportions of operative and non-operative patients, we used the 90-day look-back period to allow for analysis of a larger sample of patients.

We excluded all patients admitted with open hip fractures, concurrent pelvic fractures and patients admitted for rehabilitation. As additional fractures distant from the hip do not necessarily alter the indications for operative repair of hip fracture, we did not exclude patients whose DRG's indicated multiple trauma. Finally, we excluded patients whose records had coding errors that would prevent interpretation of their records, such as missing discharge dates.

From the initial population, following the stepwise exclusions described above, we thus developed a working dataset of 165,861 patients admitted for first-time hip fractures.

Definition of Outcome Variable

To identify patients undergoing operative repair of hip fracture we used ICD-9-CM procedure codes. To prevent misclassification of patients undergoing procedures rarely performed for hip fracture as non-operative patients, we developed a list of 104 procedural interventions on the hip joint or proximal femur. We identified all patients whose record included any one of these 104 procedure codes occurring within 30 days of the date of admission for hip fracture. Clinical evidence supports hip fracture repair within 48 hours of admission;^{16, 24} however, we chose a time window that would allow for delays in operative repair that may have been needed to stabilize concurrent medical problems or complete patient transfers between hospitals.

Of the 165,861 patients admitted for first-time hip fracture during the study period, 153,033 underwent a procedure on the hip joint or proximal femur during their index admission; an additional 2,545 underwent such a procedure during a subsequent admission within one month. We thus identified 155,578 “operative” patients and 10,283 “non-operative” patients, representing 93.8% and 6.2% of our total sample.

Definition of Independent Variables

To build a logistic regression model predicting operative or non-operative care for hip fracture, we defined independent variables relating to a range of patient characteristics. We defined a “simple” hip fracture as a closed, isolated fracture of the femoral neck (ICD-9-CM diagnosis codes: 820.00-09, 820.8), intertrochanteric (ICD-9-CM diagnosis code 820.21) or subtrochanteric (ICD-9-CM diagnosis code: 820.22) section of the femur. We defined a “complex” hip fracture as the presence of two or more of the above codes, or any of the above in combination with a trochanteric fracture (ICD-9-CM code 820.20 or 820.30). We created variables for subtypes of complex hip fracture according to the fracture indicated by the principal ICD-9-CM diagnosis code. We were not able to distinguish between bilateral fractures and multiple ipsilateral fractures.

Multiple trauma was defined by the presence of one of eleven DRG codes (DRG 280, 418, 444-5, 484-7, 506, 508, 510). Race was defined as black, white, or other, as self-reported in the Medicare Denominator file. Income was defined as the median income, by race, for each patient’s residential ZIP code as reported in the 2000 U.S. Census.

Statistical Analyses

A multivariate logistic regression model was developed to isolate the effects of race and income, adjusted for case-mix differences, on the odds of non-operative management for hip fracture. Our study sample was randomly divided into two halves: a development data set and a testing data set. Using the development data set, we created a risk-adjustment model with comorbidities initially described by Elixhauser and colleagues²⁵ and from our previous work.^{26, 27} Comorbidities were listed if they could reasonably be present on admission or identified by 90-day look-back. Models also included patient sex, age, source of admission, and presence of pathological fracture. Variables were included in the model if univariate analysis showed $P < 0.15$; we included seven additional variables where univariate analysis showed $P \leq 0.15$ due to clinical relevance. We included all pair-wise interactions that were

significant beyond the $P < 0.001$ level (21 terms). A base model was created using 37 non-interacted variables, without variables for race or income; next we added in the 21 interaction variables. Using the same variables as in the development sample, we next built a logistic regression model for the second half of the study sample. Differences between models developed on the two halves were tested using a log-likelihood statistic on a dummy variable interaction model.²⁸ As log-likelihood tests demonstrated no significant difference between the logistic regression models built using the development or validation samples, we combined the two samples, using all the available data, when reporting our final results. After this model was constructed, we added independent variables for race and income level, and also ran conditional logistic models, clustering on the hospital, to account for hospital differences in their tendency to perform surgical repair.

To assist in the interpretation of the effects of race on the odds of non-operative management, we carried out analyses of mortality at 7 and 30 days after hospital admission between selected subgroups of patients. These were tested using chi-square and Mantel-Haenszel tests stratifying patients by hospital. Plots of patient survival by race and treatment were constructed using the method of Kaplan and Meier²⁹ and were compared using the log-rank test. Student's t-test was used to compare the probabilities of survival at 180 days. All analyses were carried out using SAS 9.1.3 (SAS Institute, Inc., Cary, N.C.)

RESULTS

Table 1 presents unadjusted comparisons of operative and non-operative patients. On average, non-operative patients were older than operative patients (mean age 84.5 years vs. 83.3 years, $P < 0.0001$), less likely to be female (69.2% vs. 74.9%, $P < 0.0001$), and had more comorbidities (mean 4.6 vs. 4.3, $P < 0.0001$). Prior myocardial infarction, congestive heart failure, renal failure, chronic obstructive pulmonary disease, stroke, paraplegia, and Alzheimer's disease were all more common among non-operative than operative patients. Non-operative patients were more likely than operative patients to have been admitted from a skilled nursing facility (1.9% vs 1.1%, $P < 0.0001$).

Compared to operative patients, non-operative patients experienced fewer intertrochanteric fractures (32.7% vs. 45.0%, $P < 0.0001$) and were more often admitted for major or multiple trauma (3.7% vs. 1.0%, $P < 0.0001$). Pathologic fractures were less frequent among non-operative than operative patients (1.6% vs. 2.5%, $P < 0.0001$). Non-operative patients were of slightly lower median income (\$46,293.55 vs. \$47,038.87, $P < 0.0001$) and more likely to be of black race (7.3% vs. 3.7%, $P < 0.0001$). Unadjusted mortality was greater among non-operative patients compared to operative patients at 7 days (18.8% vs. 1.6%, $P < 0.0001$) and 30 days following admission (36.7% vs. 6.8%, $P < 0.0001$).

Selected parameters from our multivariable logistic regression model predicting operative management appear in Table 2. The c-statistic for our full logistic regression model, including interaction terms, was 0.70. The odds ratios presented for race and income come from the full model. For purposes of clarity, the remaining results presented in Table 2 were developed using a model without interaction terms.

After controlling for fracture characteristics, comorbidities, sex, and source of admission, black race was associated with a 79% increase in the odds of non-operative management compared to white race (OR 1.79, 95% CI 1.64, 1.95, $P<0.0001$). This increase was unchanged after controlling for income in the full logistic model.

After controlling for fracture characteristics, comorbidities, sex, and source of admission, income below the 25th percentile for the sample was not associated with a change in the odds of non-operative management compared to patients of the highest income quartile. ($P=0.49$).

To explore possible effects of differing practice styles across hospitals on the odds of non-operative management, we developed a conditional logistic regression model, clustering based on hospital, with the same covariates as in Table 2. Controlling for individual hospital somewhat lessened the odds of non-operative treatment among black patients, although the odds of such treatment remained very elevated for black patients as compared to whites (OR=1.53, 95% CI 1.38, 1.69, $P<0.0001$).

To obtain another indicator of severity of illness by racial group in those who did not undergo repair, we examined unadjusted mortality rates among black and white patients undergoing non-operative management. 20.17% of white patients undergoing non-operative management died within seven days of hospital admission, compared to 7.96% of non-operative black patients (OR= 2.92, 95% CI 2.23, 3.89, $P<0.0001$). This difference persisted at 30 days, as 38.22% of white non-operative patients died by one month, compared to 24.14% of black non-operative patients (OR= 1.94, 95% CI 1.63, 2.32, $P<0.0001$). To control for individual hospital effects, we carried out Mantel-Haenszel analysis of death at seven days, stratifying patients by hospital. After controlling for hospital, the odds of death at seven days remained elevated among white non-operative patients compared to black non-operative patients of (OR= 2.44, 95% CI 1.79, 3.34, $P<0.0001$).

Survival curves for the full patient sample (Figure 1, upper panel) demonstrate an initially greater probability of survival among blacks versus whites. This reversed over time, with a lower probability of survival among blacks compared to whites at 180 days (0.750 vs. 0.778, $P<0.001$). Survival curves for operative and non-operative subgroups (Figure 1, lower panel) show an initially greater probability of survival among black operative patients compared to whites. This also reversed over time, with black operative patients demonstrating a lower probability of survival at 180 days (0.779 vs. 0.799, $P<0.001$). Among non-operative patients, blacks demonstrated a greater probability of survival compared to whites at all points. At 180 days, the probability of survival among black non-operative patients exceeded the probability survival among whites (0.531 vs. 0.451, $P<0.001$).

DISCUSSION

The decision to undertake surgical repair of an acute hip fracture in an elderly patient represents the critical moment in the care of each of the 340,000 older adults who experience this potentially disabling injury each year. Failure to undergo surgery may have profoundly negative implications for a patient's future quality of life, as it is associated with increased

pain and immobility. Nonetheless, existing research provides little insight into variations that occur in the delivery of such essential services to patients with hip fracture. Our study of 165,861 Medicare beneficiaries hospitalized for this condition argues strongly that important differences exist in the type of care for hip fracture delivered to patients of differing racial groups.

We identified over 10,000 patients, or 6.2% of our sample, who did not undergo surgery for hip fracture. This figure falls within the range of prior estimates using population based data^{9, 30} and cohort studies.¹⁰ While our logistic regression models identified numerous predictors of non-operative care, we found that black patients in particular had a greatly elevated odds of non-operative management. Even after controlling for age, sex, comorbidities, and type of hip fracture, blacks experienced almost a two-fold greater odds of non-operative management (OR= 1.79, 95% CI 1.64, 1.95, $P<0.0001$). Controlling for individual hospital effects partly diminished the odds of such management among black patients, but the association remained large and statistically significant (OR= 1.53, 95% CI 1.38, 1.69, $P<0.0001$). These findings suggest that while blacks may go to hospitals that are more likely to pursue non-operative management for hip fracture, they also undergo less frequent operative management than white patients within those same hospitals.

To determine whether differences in severity of illness not captured by our risk-adjustment model could explain the association between black race and non-operative management, we examined 7- and 30-day mortality in black and white non-operative patients. Even after controlling for individual hospital effects, we found a lower odds of death at 7 and 30 days in non-operatively managed blacks than whites. This argues strongly that the elevated rate of non-operative management among black patients is not explained by increased severity of illness.

Prior investigators have found differences in outcomes among black and white patients with hip fracture. In a study using Medicare data, Polsky and colleagues observed a lower adjusted 30-day mortality rate among black hip fracture patients compared to whites; these rates were almost equivalent at 180 days and had reversed at one year.²² Using data from three large cohort studies, Penrod and colleagues observed a decreased likelihood of both survival and ambulatory function at six months among blacks versus whites admitted for hip fracture.²³

Our findings may help to explain why Polsky et al.²² find better short-term survival in black versus white patients following hip fracture, while both they and Penrod et al.²³ find worsened long-term outcomes among this group. An increased rate of non-operative hip fracture care among black patients may briefly be associated with lower hazard of death by eliminating the short-term risks of surgery and anesthesia. However, such management may be associated with profoundly lower ambulatory function and far higher mortality in the long run, as is suggested by Figure 1.

Our finding of a lower probability of survival among white non-operative patients versus blacks argues that the observed association between black race and non-operative care may relate to differences in the selection of operative patients between black and white surgical

candidates. If, in truth, the black patients had had a higher proportion of severely ill cases than the whites, the results of our logistic regression could be explained as a failure of our adjustment model to control for differences in severity of illness between groups. Since our survival analyses indicated a higher proportion of severely ill cases among white non-operative patients, our findings support the notion of differential selection.

The assessment of operative risk is a complex task in hip fracture patients, many of whom have multiple comorbidities that may place them at elevated risk for postoperative complications.¹⁹ Further, limitations in pre-fracture functional status among hip fracture patients¹⁵ may complicate preoperative risk assessments, which routinely incorporate assessments of functional ability.³¹ Our data suggest that unequal thresholds may exist for black and white patients to receive operative management, and argue that, in patients of marginal operative risk, race may have a pronounced influence on the care delivered.

Our study has important limitations. As we use administrative claims data to identify operative and non-operative patients, errors in coding may have influenced our analysis. This effect is likely mitigated by the high sensitivity and specificity of Medicare claims in identifying hip fractures and common surgeries used in their repair, which has been previously validated by comparison with chart review.³² Further, to limit the effect of coding errors on our findings, we employed a conservative definition of non-operative care, classifying patients undergoing a wide range of procedures involving the hip joint or proximal femur as operative patients. As a result, our finding of a 6.2% incidence of non-operative care may underestimate the true rate of non-surgical management.

As a retrospective analysis of administrative claims data, our findings may reflect the influence of unmeasured confounding variables. Medicare claims provide limited information regarding baseline or post-fracture functional status or the severity of comorbid illnesses. While our model controls for source of admission, which may serve as a proxy for baseline functional independence, important unobserved differences in pre-fracture functional status may still exist among patients in our study sample.

Similarly, administrative claims provide no insight into patient or family preferences for care. While patient preferences play an essential role in determining the goals of care for all elderly patients, systematic differences in care preferences between black and white patients are unlikely to fully explain the increased odds of non-operative care among blacks. While no data exist on differences in preferences between elderly blacks and whites regarding hip fracture care, patients eligible for hospice services represent a similar population to patients receiving non-operative care for hip fracture, who are at high risk for death within six months. Among hospice-eligible patients, blacks are less likely to accept recommendations for hospice care than are whites³³, and are more likely to revoke hospice benefits to pursue aggressive life-prolonging therapies.³⁴ We are thus reluctant to fully attribute the greatly elevated odds of non-operative repair among black patients to choices on the part of patients or their families to pursue less aggressive care at the end of life.

In conclusion, our analysis of a large, retrospective cohort of older adults with hip fracture illustrates a 6.2% rate of non-operative management, with a 79% increase in the odds of

non-operative management among black patients. This association persists after controlling for comorbidities, income, fracture characteristics, source of admission and hospital effects. As black non-operative patients demonstrated a lower rate of mortality compared to whites, our findings suggest inequitable processes of selection for operative repair in black and white patients. Our work calls for further research to delineate the physician, hospital, and patient factors that contribute to variation in the utilization of surgical repair for hip fracture. Further, it should provide impetus for researchers to explore differences in the assessment of preoperative risk between black and white patients undergoing surgeries other than hip fracture repair, as such differences may provide a mechanistic explanation for racial disparities in the delivery of a range of operative procedures. Such work may help providers, policy makers and patients to define opportunities to improve the quality of operative care delivered to older adults by promoting management choices rooted in the appropriate assessment of the potential risks and benefits of a given procedure for each individual patient.

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Figure 1. Kaplan-Meier Survival Curves, By Race

Upper panel: survival curves for the full patient sample. Lower panel: survival curves for patients receiving operative or non-operative care. See text for description.

Table 1

Selected Patient Variables: Operative and Non-Operative Groups

	Operative	Non-operative	P
Count	155,578	10,283	
Age category (%)			<0.0001
65-74	14.7	13.6	
75-84	41.8	36.7	
85 and over	43.6	49.7	
Female (%)	74.9	69.2	<0.0001
Mean Number of Comorbidities	4.3	4.6	<0.0001
Comorbidities (%)			
Prior Myocardial Infarction	9.2	13.0	<0.0001
Congestive Heart Failure	29	39.6	<0.0001
Renal Failure	10.2	18.2	<0.0001
Chronic Obstructive Pulmonary Disease	26.0	29.0	<0.0001
Alzheimer's Disease	32.80	38.2	<0.0001
Paraplegia	3.5	5.3	<0.0001
Prior stroke	14.7	17.7	<0.0001
Source of admission (%)			<0.0001
Emergency department	83.58	78.97	
Other care	12.03	14.03	
Hospital transfer	2.67	4.29	
Skilled nursing facility	1.1	1.9	
Other transfer	0.61	0.79	
Hip Fracture Type (ICD-9-CM Code) (%)			<0.0001
Intertrochanteric fracture (820.21)	45.0	32.7	
Transcervical fracture, other (820.09)	24.2	25.9	
Unspecified part of neck of femur (820.8)	20.4	33.7	
Transcervical fracture, base of neck (820.03)	2.4	2.1	
Subtrochanteric fracture (820.22)	3.6	2.7	
Other fracture location or multiple fractures	4.4	2.9	
Other Fracture Characteristics (%)			
Pathologic Fracture	2.5	1.6	<0.0001
Multiple Trauma	1.0	3.7	<0.0001
Race (%)			<0.0001
White	92.0	88.3	
Black	3.7	7.3	
Other	4.3	4.4	
Median Income (US\$)	47,038	46,294	<0.0001
Unadjusted Mortality (%)			

	Operative	Non-operative	P
7 days	1.6	18.8	<0.0001
30 days	6.8	36.7	<0.0001

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Table 2**Predictors of Non-Operative Management**

Parameter	Odds Ratio	95% CI	P
Age category			
65-74 (Reference)	1.000		
75-84	1.034	0.968, 1.104	0.3169
85 and over	1.363	1.276, 1.457	<0.0001
Male Sex	1.093	1.043, 1.146	0.0002
Comorbidities			
Congestive heart failure	1.462	1.396, 1.532	<0.0001
Prior myocardial infarction	1.323	1.242, 1.410	<0.0001
Chronic obstructive pulmonary disease	1.127	1.075, 1.181	<0.0001
Renal failure	1.660	1.564, 1.762	<0.0001
Prior stroke	1.107	1.042, 1.176	0.0010
Paraplegia	1.480	1.336, 1.641	<0.0001
Alzheimer's Disease	1.165	1.116, 1.217	<0.0001
Source of admission			
Emergency department (reference)	1.000		
Hospital transfer	1.653	1.490, 1.834	<0.0001
Skilled nursing facility	1.641	1.408, 1.913	<0.0001
Fracture Characteristics			
Pathologic fracture	0.633	0.539, 0.742	<0.0001
Multiple trauma	3.406	3.022, 3.838	<0.0001
Race			
Black (versus White)	1.785	1.637, 1.945	<0.0001
Income			
Above 75 th percentile (reference)	1.000		
25 th -75 th percentile	0.976	0.928, 1.028	0.3632
Below 25 th percentile	1.021	0.962, 1.083	0.4916

Variables included in the full model: Age, race (white(reference), black, other), income category (>75th percentile (reference), 25th-75th percentile, <25th percentile), source of admission (emergency room (reference), hospital transfer, SNF transfer, other transfer, other care), sex (female(reference), male), fracture type (82021 (simple) (reference), 82003(simple), 82009 (simple), 82022 (simple), 8208 (simple), 82003 (complex), 82009 (complex), 82020 or 82030 (complex), 82021 (complex), 82022 (complex), 8208 (complex), multiple secondary fracture diagnoses without a primary fracture diagnosis, 82001 (simple or complex), 82002 (simple or complex), 82000(simple or complex), CHF, stroke, seizure, alcohol use, electrolyte abnormality, myocardial infarction, arrhythmia, unstable angina, chronic angina, hypertension, valvular disease, COPD, asthma, liver disease, renal parenchymal disease, renal failure, diabetes mellitus, paraplegia, collagen vascular disease, coagulopathy, thrombocytopenia, tobacco use, Graves' disease, cancer, abdominal cancer, hypothyroidism, peptic ulcer disease, AIDS, weight loss, osteoporosis, pathological fracture of the femur, Alzheimer's disease, multiple trauma, hypertension*Alzheimer's disease, hypertension*renal failure, hospital transfer*8208 (simple), age*male sex, CHF*Alzheimer's disease, age*COPD, weight loss*multiple trauma, hypertension*osteoporosis, arrhythmia*weight loss, emergency room admission*hypertension, age*osteoporosis, hypertension*electrolyte abnormality, stroke*paraplegia, age*diabetes, male sex*Alzheimer's disease, CHF*weight loss, renal failure*diabetes, age*renal failure, emergency room admission*8208 (simple), alcohol use*cancer, age*age