Leaving Against Medical Advice (AMA): Risk of 30-Day Mortality and Hospital Readmission

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BACKGROUND: With 1–2% of patients leaving the hospital against medical advice (AMA), the potential for these patients to suffer adverse health outcomes is of major concern.

OBJECTIVE: To examine 30-day hospital readmission and mortality rates for medical patients who left the hospital AMA and identify independent risk factors associated with these outcomes.

DESIGN: A 5-year retrospective cohort of all patients discharged from a Veterans Administration (VA) hospital.

SUBJECTS: The final study sample included 1,930,947 medical admissions to 129 VA hospitals from 2004 to 2008; 32,819 patients (1.70%) were discharged AMA.

MEASUREMENTS: Primary outcomes of interest were 30-day mortality and 30-day all-cause hospital readmission.

RESULTS: Compared to discharges home, AMA patients were more likely to be black, have low income, and have co-morbid alcohol abuse (for all, X^2 df=1, p<0.001). AMA patients had a higher 30-day readmission rate (17.7% vs. 11.0%, p<0.001) and higher 30-day mortality rate (0.75% vs. 0.61%, p=0.001). In Cox proportional hazard modeling controlling for demographics and co-morbidity, the largest hazard for patients having a 30-day readmission is leaving AMA (HR=1.35, 95% CI 1.32–1.39). Similar modeling for 30-day mortality reveals a nearly significant increased hazard rate for patients discharged AMA (HR=1.10, 95% CI 0.98–1.24).

CONCLUSIONS: Due to the higher risk of adverse outcomes, hospitals should target AMA patients for post-discharge interventions, such as phone follow-up, home visits, or mental health counseling to improve outcomes.

KEY WORDS: readmission; mortality; against medical advice.
J Gen Intern Med 25(9):926–9
DOI: 10.1007/s11606-010-1371-4

BACKGROUND

Leaving the hospital against medical advice (AMA) is a potentially dangerous situation. Being discharged AMA results from the complex interplay between a patient and his or her health care team. Although not well described, contributing factors include communication, medical, and psycho-social issues. Regardless of the underlying causes for this type of discharge, a number of studies have shown that patients leaving AMA suffer from increased readmission rates.

In a matched case control study of 97 general medicine AMA patients, 21% of AMA patients were readmitted within 15 days compared to only 3% of control patients.[1] In a retrospective analysis of a 5-year cohort of asthma patients, those who left AMA had a 4-fold increased risk of return to the emergency department and 2.6-fold increased risk of readmission to the hospital within 30 days.[2] The increased risk of readmission may be due to continued deterioration of the patient's condition and the likelihood that they left the hospital before achieving clinical stability. Moreover, AMA patients may also have higher mortality, particularly if they avoid or delay readmission, allowing their condition to further deteriorate. One study of acute myocardial infarction (AMI) patients who left the hospital AMA found the likelihood of readmission as more than twice as high, and mortality was 57% higher, compared to other patients.[3]

This reported increased risk of mortality after AMI and leaving AMA is not surprising given the risk of fatal arrhythmias and re-infarction in the acute AMI period. However, this observed increased mortality rate may not be generalizable to a broader medical population. To begin to understand the risks associated with leaving AMA in a general medical population, this study examines 30-day readmission and all-cause mortality rates in patients discharged AMA from any Veterans Administration (VA) hospital over a 5-year period. The study hypothesis is that discharge AMA will represent a significant hazard for 30-day mortality.

Received January 4, 2010
Revised February 25, 2010
Accepted April 8, 2010
Published online April 28, 2010

METHODS

Design

This is a retrospective cohort study of all patients discharged from any of the 129 acute care VA hospitals during fiscal years 2004–2008 (October 1, 2003 through September 30, 2008). Study data were obtained from the VA Patient Treatment File (PTF), which includes patient level data for all admissions to a

VA hospital. PTF data files include patient demographics, dates of admissions and discharge, primary and secondary diagnoses (ICD-9-CM codes), and discharge disposition. The files are error checked and released quarterly as SAS datasets. Data on patient deaths were obtained from the VA Vital Status File, which combines data from four sources including the Social Security Administration death master file and has been shown to have a sensitivity of 98.3% and a specificity of 99.8% when compared to the National Death Index.[4]

Subjects

From 2004 to 2008 there were 2,204,703 medical admissions to the 129 VA hospitals. Patients excluded from analysis included those discharged to a nursing home (6.13%), transferred to another hospital (2.33%), discharged to a non-standard setting (1.28%), and those who died in-hospital during the index admission (2.68%). The final study sample consisted of 1,930,947 medical admissions.

Measurement and Analysis

The primary outcomes of interest were readmission to a VA hospital within 30 days of discharge and mortality within 30 days of discharge. Readmissions were defined as any subsequent admission to any VA hospital for any reason within 30 days of discharge from the index admission. Potential covariates for the models included: age, sex, race, income, and the presence of individual comorbidities as defined by the Elixhauser algorithm.[5]

Bivariate analyses were used to compare patient baseline characteristics and outcomes between those discharged AMA and those with a standard discharge to the community. Continuous variables were analyzed using a t-test and categorical variables using the chi-square test. Multivariable Cox proportional hazard models were used to model time-to-readmission and time-to-death. The "time-to-event" variable represents the number of days from discharge to the subsequent event (readmission or death). All models included discharge type, gender, and race. Stepwise model selection was then used to determine which of the remaining covariates also represented significant risk factors in each separate model. Variable entry or removal from the model was set at $p<0.05$. Wald 95% confidence intervals were calculated for all risk factors. All analyses were performed using SAS statistical software, version 9.2, SAS Institute Inc. (Cary, NC).

RESULTS

Of the final 1,930,947 patients, 32,819 or 1.70% were discharged AMA. Table 1 shows the demographics for the two discharge groups. AMA patients were younger, more likely to be male, more likely to be black, and had a lower income ($p<0.0001$ for all comparisons). The AMA patients had a higher rate of 30-day readmission (17.7% vs. 11.0%, $p<0.001$). They also experienced an increased 30-day mortality rate (0.75% vs. 0.61%, $p=0.001$). Also included in Table 1 are the number and percentage of patients in each discharge group for each of the co-morbidities that were significant predictors of readmission or mortality in Cox proportional hazard models.

In the multivariable hazard models, discharge AMA is a significant predictor of readmission within 30 days with a hazard ratio of 1.35 (95% CI, 1.32–1.39). Other significant predictors in the model included age (10-year increments), income ($10,000 increments), and 12 different co-morbidities. Table 2 lists each of the significant predictors selected into the model, the hazard ratio, and associated 95% confidence interval. The presence of an arrhythmia, dementia, fluid disorder, myocardial infarction, or psychosis was a significant risk factor for re-admission. The presence of the following seven comorbidites was protective against readmission: alcohol, congestive heart failure, chronic obstructive pulmonary disease, deficiency anemia, complicated diabetes, lymphoma, and metastatic cancer. Having a recorded race of Asian/Pacific Islander, Black, or Unknown also resulted in significant hazard estimates in comparison to being White.

Based on these results, a hazard model including just those patients discharged AMA was run to determine any covariates significantly associated with 30-day readmission. The model did not reveal any covariates that conferred increased risk of readmission. However, four covariates were identified as

Table 1. Patient Characteristics

	AMA (N=32,819)	Community (N=1,898,128)
Mean age, years (range)	54.4 (17–111)	64.4 (17–116)
Male (%)	31,769 (96.8)	1,813,875 (95.6)
Mean income, $US (SD)	17,172 (32,455)	21,311 (40,700)
Race (%)		
White	21,832 (66.5)	1,310,202 (69.0)
Black	7,275 (22.2)	348,085 (18.3)
Hispanic	1,726 (5.3)	101,538 (5.3)
Native American	196 (0.6)	8,975 (0.5)
Asian/Pacific Islander	154 (0.5)	11,035 (0.6)
Unknown	1,636 (5.0)	118,293 (6.2)
30-day Readmission (%)	5,817 (17.7)	207,793 (11.0)
30-day Mortality (%)	247 (0.75)	11,563 (0.61)
Co-morbidities (%)		
Alcohol	7,748 (23.6)	158,791 (8.37)
Liver disease	3,765 (11.5)	111,552 (5.88)
Psychosis	1,627 (4.96)	46,421 (2.45)
Fluid disorder	4,959 (15.1)	253,666 (13.4)
Neurological disease	1,922 (5.86)	92,044 (4.85)
Coagulation	1,063 (3.24)	45,028 (2.37)
Myocardial infarction	2,037 (6.21)	104,270 (5.49)
Deficiency anemia	1,343 (4.09)	69,286 (3.65)
Complicated diabetes*	1,887 (5.75)	114,045 (6.01)
Lymphoma	356 (1.08)	27,664 (1.46)
Cerebrovascular disorder	1,645 (5.01)	123,600 (6.51)
Chronic obstructive pulmonary disease	6,760 (20.6)	413,702 (21.8)
Metastatic cancer	834 (2.54)	78,980 (4.16)
Congestive heart failure	4,070 (12.4)	269,017 (14.2)
Arrhythmia	4,512 (13.8)	323,316 (17.0)
Malignancy	2,819 (8.59)	272,498 (14.4)

*p-values: all p<0.001, except *p=0.05*

Table 2. Thirty-day Readmission and Mortality Hazard Ratios

	Hazard ratio (95% confidence limit)[a]	
	30-day Readmission	30-day Mortality
Discharge AMA	**1.35 (1.32–1.39)**	**1.10 (0.98–1.24)**
Metastatic cancer	0.72 (0.64–0.81)	1.14 (1.10–1.18)
Myocardial infarction	1.03 (1.01–1.05)	1.09 (1.02–1.16)
Fluid disorder	1.03 (1.02–1.04)	1.06 (1.02–1.10)
Age (10-year)	1.01 (1.00–1.01)	1.03 (1.02–1.05)
Asian/Pacific Islander	1.07 (1.01–1.14)	N/A
Dementia	1.05 (1.01–1.08)	N/A
Psychosis	1.04 (1.02–1.07)	N/A
Unreported race	1.03 (1.00–1.06)	N/A
Arrhythmia	1.02 (1.00–1.03)	N/A
Income ($10,000)	1.00 (1.00–1.00)	N/A
Black	0.98 (0.97–0.99)	N/A
Complicated diabetes	0.97 (0.96–0.99)	N/A
Alcohol	0.96 (0.95–0.98)	N/A
Chronic obstructive pulmonary disease	0.96 (0.95–0.97)	N/A
Deficiency anemia	0.96 (0.95–0.99)	N/A
Congestive heart failure	0.95 (0.94–0.96)	N/A
Lymphoma	0.81 (0.70–0.94)	N/A
Neurologic disorder	N/A	1.16 (1.08–1.24)
Coagulation	N/A	1.11 (1.04–1.18)
Cerebrovascular disorder	N/A	1.10 (1.03–1.17)
Liver disease	N/A	1.07 (1.01–1.12)

[a]*Cells with N/A represent variables that did not meet selection criteria during model building for that model*

protective against readmission, age (HR=0.97, 95% CI 0.94–0.99), alcohol (HR=0.87, 95% CI 0.82–0.93), congestive heart failure (HR=0.88, 95% CI 0.82–0.94), and neurological disease (HR=0.88, 95% CI 0.79–0.98).

In hazard modeling for risk of mortality in all patients, there was a modest, although not statistically significant, increase in mortality within 30 days of leaving AMA (HR=1.10; 95% CI, 0.98–1.24). Modeling of 60-day mortality provided a larger sample and more statistical power, and detected a similar hazard rate point estimate for discharge AMA with a tighter confidence interval that was statistically significant (HR=1.11; 95% CI, 1.02–1.21). Other predictors in the 30-day mortality model included age (10-year increments) and seven co-morbidities. The hazard ratios and 95% confidence intervals for these are also listed in Table 2.

DISCUSSION

This study is the first to demonstrate that general medical patients discharged AMA suffer worse health outcomes than those discharged to home. There were higher rates of 30-day readmission and of 30-day mortality. With more than one in six AMA patients returning to the hospital within 30 days, there is significant need to consider ways to improve care and management of these patients.

While elevated rates of readmission after discharge are disconcerting, the elevated mortality rates in patients discharged AMA are particularly worrisome. Being discharged AMA had an increased hazard for 30-day mortality (HR=1.10), suggesting that being discharged AMA is a high mortality risk group. In multivariable models, the risk associated with discharge AMA was even greater than that associated with several other co-morbid conditions such as liver disease or myocardial infarction. Paradoxically, despite almost 1 in 4 AMA patients having a history of alcohol abuse compared to only 1 in 12 for regularly discharged patients, alcohol abuse was not a significant predictor of mortality and was associated with lower risk of readmission. This finding may simply reflect that these patients avoid medical care until it is absolutely necessary and thus manage to stay out of the hospital for 30 days after discharge even though they are known to be frequent users of the health care system.

The hazard rates for comorbidities in the models show that 30-day readmission is a complex interaction of factors and deserves further studies to understand which sub-populations of patients are at the greatest risk. For example, the hazard models suggest that congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) are protective against readmission. Considering that these two populations typically have high rates of readmission, this finding seems counter-intuitive. However, further reflection highlights that patients with CHF and COPD that are readmitted are often those with multiple comorbid conditions. So what these models suggest is that CHF and COPD are not themselves significant risks for readmission, but in combination with several other conditions creates an unstable health environment that frequently leads to readmission.

The higher risks of adverse outcomes observed in this study strongly suggest that hospitals should target AMA patients for discharge transition interventions. Potential interventions include phone follow-up, home visits, or mental health counseling. Alternatively, identifying and ameliorating the factors that cause patients to leave AMA may help to reduce the number of patients who leave before achieving clinical stability. This may include factors related to the health care team such as provider communication style, access to social services support, or involvement of family in care decisions. Whether targeting patients before or after discharge, clear communication is likely to play a significant role in improving outcomes.

In a study interviewing physicians after a patient left AMA, the authors found that poor communication likely contributed in many cases where a patient left AMA.[6] Perhaps improved patient-centered communication, especially early in the admission, can help avoid patients leaving AMA. Review of the readmission hazard modeling does provide some support for this idea. The patients at highest risk for readmission were likely to have suffered an acute event (arrhythmia, MI) from which they may feel comparatively better and not realize the risk associated with their condition, or had a mental co-morbidity (dementia, psychosis) that may limit their ability to comprehend the severity of their medical situation. If the patient does not understand early on why they are in the hospital and how long they likely will need to be there, it is quite easy for them to get frustrated with the process and leave before it is medically appropriate. Regardless, being discharged AMA had the highest independent hazard of readmission (HR = 1.36), and thus, AMA patients deserve attention as a high-risk group.

These analyses have limitations; most notably the VA population may not be generalizable to other health care settings. While VA patients are not representative of the general medical population in the US, patients in VA who leave

AMA are similar, suggesting these findings are meaningful for the general medical population of the US. The AMA patients in this study were younger, more likely to be male, black, have low income, and abuse alcohol than other patients in the cohort, which mimics the characteristics of AMA patients in prior studies.[1–3,7,8] Furthermore, the observed AMA discharge rate of 1.7% falls into the 1–2% range observed in other studies.

One other consideration about studying patients in VA is the potential for dual care. It is estimated that approximately 79% of VA patients have another form of health care coverage and thus may obtain care from both VA and the private sector.[9] While this study cannot account for any readmissions to the private sector, this may be of less concern when focusing on patients discharged AMA. Prior studies suggest that AMA patients are less likely to have insurance, meaning in the VA system AMA patients may be more likely to have only VA provided care.

Another potential limitation of this study is its use of administrative data. Administrative data cannot capture all clinical and social factors, such as the relationship between providers and patient, which may contribute to the measured outcomes. It also lacks measures of severity of illness, and there is the potential for unmeasured co-morbidity. However, VA administrative data are highly reliable in recording mortality, making it an excellent first step in understanding the relationship between discharge AMA and risk of death.

Acknowledgements: *The research reported here was supported by the Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development (HSR&D) Service, Center for Research in the Implementation of Innovative Strategies in Practice (CRIISP) (HFP 04-149). Mr. Glasgow is supported by the University of Iowa Clinical and Translational Science Program (5TL1RR024981-02).*

The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs. This research was presented at the annual meeting of the Society of Hospital Medicine, April 2010, Washington DC.

Conflict of Interest: *None disclosed.*

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