

Risk Factors for Leaving Against Medical Advice in Patients Admitted for Upper Extremity Orthopedic Procedures

David Momtaz, MPH 

Umar Ghilzai, MD

Shawn Okpara, MD

Abdullah Ghali, MD 

Rishi Gonuguntla, BSA

Travis Kotzur, BS

Kai Zhu, BS

Ali Seifi, MD

Ryan Rose, MD

From the UT Health San Antonio, Department of Orthopaedics, San Antonio, TX (Mr. Momtaz, Mr. Gonuguntla, Mr. Kotzur, Mr. Zhu, Dr. Seifi, and Dr. Rose), and the Baylor College of Medicine, Department of Orthopaedics, Houston, TX (Dr. Ghilzai, Dr. Okpara, and Dr. Ghali).

Correspondence to Dr. Ghali:
ghaliabdullah@gmail.com

None of the following authors or any immediate family member has received anything of value from or has stock or stock options held in a commercial company or institution related directly or indirectly to the subject of this article: Mr. Momtaz, Dr. Ghilzai, Dr. Okpara, Dr. Ghali, Mr. Gonuguntla, Mr. Kotzur, Mr. Zhu, Dr. Seifi, and Dr. Rose.

JAAOS Glob Res Rev 2024;8: e23.00063

DOI: 10.5435/JAAOSGlobal-D-23-00063

Copyright © 2024 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of the American Academy of Orthopaedic Surgeons. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

ABSTRACT

Introduction: Patients who leave against medical advice (AMA) face increased risks of negative health outcomes, presenting a challenge for healthcare systems. This study examines demographic and hospital course factors associated with patients leaving AMA after an upper extremity (UE) orthopaedic procedure.

Methods: We analyzed 262,912 patients who underwent UE orthopaedic procedures between 2011 and 2020, using the Healthcare Cost and Utilization Project database. We then compared demographic and hospital course factors between patients who left AMA and those who did not leave AMA.

Results: Of 262,912 UE orthopaedic patients, 0.45% (1,173) left AMA. Those more likely to leave AMA were aged 30 to 49 (OR, 5.953, $P < 0.001$), Black (OR, 1.708, $P < 0.001$), had Medicaid (OR, 3.436, $P < 0.001$), and were in the 1st to 25th income percentile (OR, 1.657, $P < 0.001$). Female patients were less likely to leave AMA than male patients (OR, 0.647, $P < 0.001$). Patients leaving AMA had longer stays (3.626 versus 2.363 days, $P < 0.001$) and longer recovery times (2.733 versus 1.977, $P < 0.001$).

Conclusion: We found that male, Black, younger than 49 years old, Medicaid-insured, and lowest income quartile patients are more likely to leave AMA after UE orthopaedic treatment.

Patients self-discharging against medical advice (AMA) occurs when patients refuse continued care.¹ Roughly 1% to 2% of hospitalized patients leave AMA.^{1,2} Patients who leave AMA have a higher risk of hospital readmission, morbidity, and mortality than discharged patients.² Previous studies have identified that younger, male, and low socioeconomic status (SES) patients are more likely to leave AMA.^{2,3} Patients who leave AMA represent a public health and financial concern because they are more likely to experience adverse outcomes and to use additional healthcare resources in the future.⁴

The upper extremity (UE) function is critical in patients' quality of life.⁵ A study by de Putter et al⁶ found that patients with UE arm injuries had lower health-related quality of life (HRQoL) factors such as mobility and self-care. In addition, they also found that the HRQoL for hospitalized UE patients was far below that of the general population. In a retrospective cohort study by MacDermid et al⁷ of 266,324 patients with UE fractures in Ontario, 7.6% of the fractures were associated with hospital admission. Many UE orthopaedic injuries require hospitalization, including trauma-related UE amputations, mangled UEs, and multiple UE fractures.⁷⁻⁹ However, the factors that contribute to higher rates of UE orthopaedic patients leaving AMA have not been well categorized.

Many studies have been done to further understand the factors associated with patients who leave AMA in a general hospital setting. Our goal was to investigate this specific population because there are limited studies that have analyzed the demographics and risk factors of UE orthopaedic patients who leave AMA to our knowledge.⁴ It is important to understand these factors because UE orthopaedic patients who leave AMA tend to have decreased HRQoL and cause economic burden to healthcare systems. It is our hope that by understanding the factors contributing to higher rates of patients leaving AMA, we can develop solutions to improve patient adherence to medical advice. We hypothesize that hospitalized UE orthopaedic patients will have similar demographics and risk factors of those in a general hospital setting that leave AMA. We hypothesize that younger patients, male, of racial minority groups, have lower SES, and lack health insurance, are more likely to leave AMA.

Methods

We conducted a retrospective analysis of the Healthcare Cost and Utilization Project database, sourced from federal, state, and industry levels from community and academic hospitals between 2011 and 2020. We specifically reviewed UE trauma assessing CPT codes S42 (fracture of shoulder and upper arm), S52 (fracture of forearm), and S62 (fracture at wrist and hand level). This database is generated each year by randomly sampling 20% of all included patient data. Variables that include age, sex, household income by quartile, concurrent diagnoses, insurance payer type, rural or urban practice setting, length of stay, recovery time, days from admission to the procedure, and the total charge for a visit were collected.

We compared the relationship between the collected variables and rates of leaving AMA. Multiple logistic regression models that were created from the variables found to have a notable relationship. Independent sample *t*-tests were conducted for normally distributed data, and the Wilcoxon rank-sum test was used for nonnormally distributed data. Categorical variables were analyzed with the Chi-square with Kendall tau or Fischer exact test. Residuals were assessed for normal distribution where appropriate, and no multicollinearity was observed. Categorical data are reported as *n* (%), and continuous data are reported as mean (standard deviation). The standard error is reported when appropriate.

Results

We identified 262,912 patients who satisfied the inclusion criteria. 261,739 (99.55%) were discharged without leaving AMA, while 1,173 (0.45%) left AMA. 91.98% of all patients received care in an urban setting, while 8.02% received care in a rural setting.

Demographic Factors

The mean age of all patients in this study was 62.46 years. Patients who left AMA were significantly younger than patients who did not leave AMA (43.69 versus 62.55, $P < 0.001$). Men were more likely than women to leave AMA (69.05% versus 30.95%, $P < 0.001$), and Black patients were more likely to leave AMA than the general population ($P < 0.001$). Patients from the lowest income quartile were the most likely to leave AMA (OR, 1.657, $P < 0.001$), and patients from the highest income quartile were the least likely to leave AMA (OR, 0.579, $P < 0.001$). Household income levels indicated that most patients who left AMA tend to come from the lowest income quartile (0 to 25th percentile, $n = 443$, 40.27%) compared with the highest income percentiles (75th to 100th percentile, $n = 143$, 13%). Patients on Medicaid (38.61% versus 7.81%, $P < 0.001$) or who had no insurance (2.14% versus 0.34%, $P < 0.001$) were more likely to leave AMA than the rest of the population. Patients with private insurance (25.30% versus 10.96%, $P < 0.001$) or with Medicare (56.47% versus 20.72%, $P < 0.001$) were more likely to have normal discharge than the general population. This information is summarized in Table 1.

Female patients were 0.647 times as likely as male patients to leave AMA ($P < 0.001$). In addition, patients younger than 30 years were 2.324 times more likely to leave AMA ($P < 0.001$), and patients aged between 30

Table 1. Demographic Factors Associated With Leaving AMA

Factor	No AMA	AMA	Total	P
Total number, N (%)	261,739 (99.55)	1,173 (0.45)	262,912	
Demographics				
Age				
Mean (SD)	62.545 (18.198)	43.687 (16.374)	62.461 (18.234)	<0.001
Age category				
<30	21,570 (8.24)	258 (21.99)	21,828 (8.30)	<0.001
30-54	26,327 (10.06)	513 (43.73)	26,840 (10.21)	
55-64	63,802 (24.38)	257 (21.91)	64,059 (24.37)	
≥65	149,983 (57.31)	145 (12.36)	150,128 (57.11)	
Sex				
Female	140,148 (53.57)	363 (30.95)	140,511 (53.47)	<0.001
Male	121,460 (46.43)	810 (69.05)	122,270 (46.53)	
Race				
Asian or pacific islander	2,853 (1.15)	12 (1.06)	2,865 (1.15)	<0.001
Black	16,856 (6.78)	199 (17.55)	17,055 (6.83)	
Hispanic	19,763 (7.95)	152 (13.40)	19,915 (7.98)	
Other	6,988 (2.81)	39 (3.44)	7,027 (2.81)	
White	202,086 (81.31)	732 (64.55)	202,818 (81.23)	
Household income by zip code				
0 to 25th percentile	64,228 (24.97)	443 (40.27)	64,671 (25.04)	<0.001
26th to 50th percentile	69,238 (26.92)	295 (26.82)	69,533 (26.92)	
51st to 75th percentile	67,592 (26.28)	219 (19.91)	67,811 (26.25)	
76th to 100th percentile	56,139 (21.83)	143 (13.00)	56,282 (21.79)	
Rural/urban				
Rural	20,938 (8.04)	37 (3.32)	20,975 (8.02)	<0.001
Urban	239,578 (91.96)	1,079 (96.68)	240,657 (91.98)	
Payer				
Medicaid	20,401 (7.81)	451 (38.61)	20,852 (7.94)	<0.001
Medicare	147,601 (56.47)	242 (20.72)	147,843 (56.32)	
No charge	886 (0.34)	25 (2.14)	911 (0.35)	
Other	15,978 (6.11)	56 (4.79)	16,034 (6.11)	
Private insurance	66,126 (25.30)	128 (10.96)	66,254 (25.24)	
Self-pay	10,366 (3.97)	266 (22.77)	10,632 (4.05)	

AMA = Against Medical Advice

and 49 years were 5.953 times more likely to leave AMA ($P < 0.001$). However, patients aged between 50 and 64 years were 0.841 times less likely to leave AMA ($P < 0.016$), and patients aged older than 65 years were 0.117 times less likely to leave AMA ($P < 0.001$). Black patients were 1.708 times more likely to leave AMA compared with patients of different racial backgrounds

($P < 0.001$), while White patients were 0.840 times less likely to leave AMA ($P < 0.001$). Although our study shows that Asian (OR, 0.580, $P < 0.062$) and Hispanic (OR, 0.896, $P < 0.221$) patients were less likely to leave AMA, the data were not statistically significant. Patients with Medicaid were 3.436 times more likely to leave AMA than patients with other type of insurance ($P <$

0.001), and patients with private health insurance were 0.191 times less likely to leave AMA ($P < 0.001$). Patients in the bottom quartile of income were 1.657 times more likely to leave AMA than other patients ($P < 0.001$), and patients in the top quartile of income were 0.579 times less likely to leave AMA compared with non-AMA patients ($P < 0.001$). These data are presented in Figure 1.

Hospital Course Variables

Patients who left AMA had longer average days from admission to procedure (0.896 versus 0.383 days, $P < 0.001$), longer lengths of stays at the hospital (3.626 versus 2.363 days, $P < 0.001$), and longer recovery times (2.733 versus 1.977 days, $P < 0.001$) than patients who did not leave AMA. In addition, patients who left AMA had a lower total charge of hospital stay compared with non-AMA patients (\$57,627.24 versus \$65,993.79, $P < 0.001$). These data are presented in Table 2.

Discussion

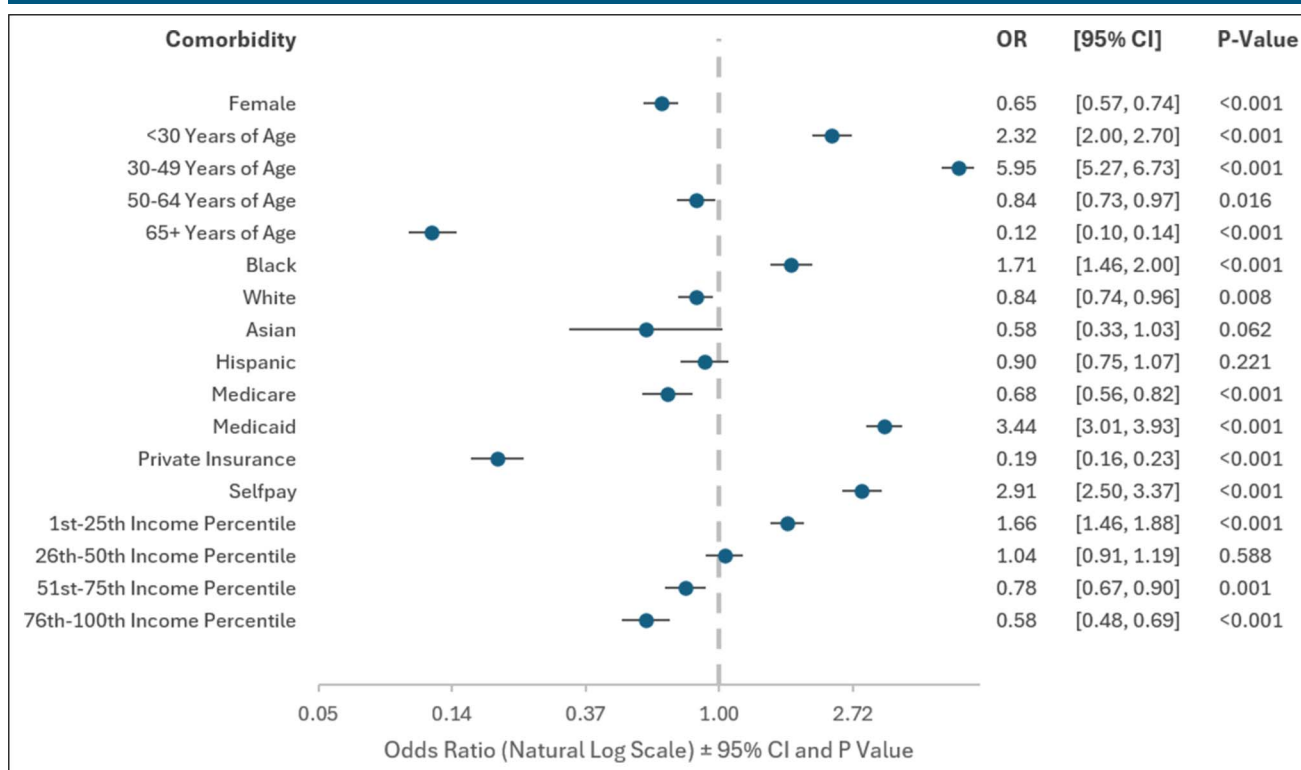
Our retrospective analysis of 262,912 patients found that in UE adult orthopaedic patients, 0.45% left AMA. Pa-

tients more likely to leave AMA were male, younger than 50 years, Black, on Medicaid, and came from zip codes with a median income in the bottom quartile.

It has been established in the literature that Black and male patients leave AMA more frequently across many fields of medicine. Moy et al¹⁰ retrospectively reviewed 241,911 patients in a general hospital setting and found that African American patients were 1.78 times more likely than White patients to leave AMA, a finding replicated in our study. They also found that men and patients with either state or no insurance were more likely to leave AMA.¹⁰ Some of this effect may be explained by SES factors.¹¹ African Americans are less likely to have health insurance than the general population, and one in four surveys reported problems paying medical bills.¹² However, our study found that when controlling for sex, age, insurance status, and income, Black patients were still more likely to leave AMA than patients from other racial backgrounds after UE orthopaedic injuries. Although these SES factors may explain some of these differences, other variables are likely mediating this effect.

Another potential reason Black patients may leave AMA more frequently than the rest of the population is a lower level of trust in healthcare providers, leading to

Figure 1



Graph showing odds ratios of each demographic factor and patients leaving AMA.

Table 2. Hospital Course Factors Associated With Leaving AMA

Hospital Course Variables		No AMA	AMA	Total	P
Days from admission to procedure (d)	Mean (SD)	0.382 (1.343)	0.896 (1.556)	0.384 (1.345)	<0.001
Length of stay (d)	Mean (SD)	2.363 (2.573)	3.626 (4.447)	2.369 (2.586)	<0.001
Time recovery (d)	Mean (SD)	1.977 (2.162)	2.733 (3.780)	1.980 (2.172)	<0.001
Total charge (\$)	Mean (SD)	65,993.791 (48,122.789)	57,627.242 (54,622.040)	65,956.363 (48,156.934)	<0.001
Discharge disposition	Adverse discharge	34,984 (13.37)	1,173 (100.00)	36,157 (13.75)	<0.001
	Home discharge with care	42,145 (16.10)		42,145 (16.03)	
	Routine discharge	184,610 (70.53)		184,610 (70.22)	

AMA = Against Medical Advice

lower patient satisfaction.¹³ Patient trust has been associated with higher patient satisfaction and treatment adherence.^{13,14} Strong interpersonal communication between patients and clinicians is essential to bring high-quality care.^{13,15} African Americans and other minority patients have been found to receive poorer interpersonal communication, which can lead to greater physician verbal dominance, shorter visits, and less patient-centeredness compared with White patients.¹³ Effective communication and empathy are linked to increased patient satisfaction, better adherence to treatment, and improved health outcomes.¹⁵ Addressing these issues may be done through perspective-taking, a technique that improves a patient's ability to communicate their perspective to a doctor through directed questions. This intervention has been demonstrated to improve short-term communication and trust with patients. It can potentially improve treatment adherence and patient satisfaction and reduce the rate of Black patients leaving AMA.¹⁶ However, additional studies must be done to understand better what interventions can be instated to improve trust in medical professionals and to determine what other factors may contribute to Black patients leaving AMA more frequently than their counterparts.

Several studies have investigated the factors contributing to patients leaving AMA after trauma. Haines et al¹⁷ found that after trauma, African American and uninsured patients were more likely to leave AMA than other patients in their retrospective study of 1,770,570 patients from the National Trauma Bank, which collects data from the

United States, Puerto Rico, and Canada. Kraut et al¹⁸ conducted a retrospective review of 1,916,104 Canadian patients from the Manitoba Centre for Health Policy and found that patients who left AMA were more likely to be male, of low SES, have a history of drug abuse, and have a history of HIV/AIDS. One potential reason for patients leaving AMA is the cost of health care. Our study found that patients in the lowest household income quartile were more likely to leave AMA after an UE orthopaedic injury. In addition, our study found that patients without health insurance are more likely to leave AMA than patients with health insurance. Although safety nets such as universal health care may seem to address this issue, evidence suggests that this is not an ideal solution. Kraut et al¹⁸ followed a trauma population with universal health care provided by the government. Their population had a higher rate of patients leaving AMA than the population in our study (1.4% versus 0.45%). Haines et al¹⁷ also followed a cohort that included Canadian patients, and they also found that patients left more frequently than we did in our study (1.11% versus 0.45%). Despite these differences in rates of patients leaving AMA, our study specifically examines UE orthopaedic patients. By contrast, Kraut et al. and Haines et al. examined general trauma patients at acute care facilities.^{17,18} Additional studies must be conducted to determine why lacking health insurance leads to higher rates of patients leaving AMA.

Our study additionally found that patients who left AMA had a markedly longer time between procedure

and admission. Although intuitive that patients who are in the hospital for longer before their procedure are more likely to leave AMA, this has not been previously investigated in the literature. From our experience, this relationship may be partially explained by patients feeling like their care is not progressing, but this has not been investigated in the literature. Additional studies must be conducted to determine what potential causes of this relationship may be. A potential explanation of lower rates of patients leaving AMA in our study compared with other trauma patients could be that UE patients tend to have lower lengths of stay (mean of 4.6 days for men and 6.6 days for women) compared with other trauma patients (mean of 9.4 days).

This is one of the first studies done to assess the demographics and risk factors that contribute to higher rates of adult hospitalized UE orthopaedic patients leaving AMA. We wanted to study UE orthopaedic patients because of the importance in the functionality of the UE's in maintaining one's quality of life. We hope that future healthcare policies can be developed that contribute to decreasing rates of leaving AMA in UE orthopaedic patients. In addition, we also believe that improving AMA rates can lead to cost savings to healthcare systems.

This study is limited by its retrospective design. Limitations to our study include confounding variables, incomplete data, recall bias, no randomization, no blinding, and potential restrictions to important patient information. However, the retrospective nature of this study enabled us to analyze a large number of patients to find relationships between variables that might not otherwise have been identified. In addition, this study is only conducted in patients within the United States who underwent treatment for UE orthopaedic injuries. Therefore, the factors that may influence these patients to leave may differ from other patient groups. However, for orthopaedic surgeons who frequently see UE injuries, it is critical to identify and address any factors that may lead to patients leaving AMA and increasing the likelihood that they have adverse outcomes. Furthermore, this study did not analyze patient substance use or provide detailed information about the clinical course. However, given the identified relationship between substance use and patient outcomes, this may explain some of our identified relationships.

Conclusion

In our retrospective analysis of the Healthcare Cost and Utilization Project database, we found that patients who are male, Black, younger than 49 years, have

Medicaid, or are in the lowest income quartile are more likely to leave AMA after treatment for an UE orthopaedic injury than their counterparts. Therefore, surgeons must be aware of these risk factors to mitigate rates of leaving AMA. Some interventions that can increase patient adherence to medical advice include improving communication with patients and improving access to insurance. However, additional studies must be conducted to understand best practices and policies to increase patient adherence to medical advice. Additional studies must be conducted to understand why these factors are associated with higher rates of patients leaving AMA.

References

1. Spooner KK, Salemi JL, Salihu HM, Zoorob RJ: Discharge against medical advice in the United States, 2002-2011. *Mayo Clin Proc* 2017;92:525-535.
2. Holmes EG, Cooley BS, Fleisch SB, Rosenstein DL: Against medical advice discharge: A narrative review and recommendations for a systematic approach. *Am J Med* 2021;134:721-726.
3. Southern WN, Nahvi S, Arnsten JH: Increased risk of mortality and readmission among patients discharged against medical advice. *Am J Med* 2012;125:594-602.
4. Menendez ME, van Dijk CN, Ring D: Who leaves the hospital against medical advice in the orthopaedic setting? *Clin Orthop* 2015;473:1140-1149.
5. Van Lieshout ECC, van de Port IG, Dijkhuizen RM, Visser-Meily JMA: Does upper limb strength play a prominent role in health-related quality of life in stroke patients discharged from inpatient rehabilitation? *Top Stroke Rehabil* 2020;27:525-533.
6. de Putter CE, Selles RW, Haagsma JA, et al: Health-related quality of life after upper extremity injuries and predictors for suboptimal outcome. *Injury* 2014;45:1752-1758.
7. MacDermid JC, McClure JA, Richard L, Faber KJ, Jaglal S: Fracture profiles of a 4-year cohort of 266,324 first incident upper extremity fractures from population health data in Ontario. *BMC Musculoskelet Disord* 2021;22:996.
8. Inkellis E, Low EE, Langhammer C, Morshed S: Incidence and characterization of major upper-extremity amputations in the national trauma data bank. *JB JS Open Access* 2018;3:e0038.
9. Bumbasirevic M, Stevanovic M, Lesic A, Atkinson HDE: Current management of the mangled upper extremity. *Int Orthop* 2012;36:2189-2195.
10. Moy E, Bartman BA: Race and hospital discharge against medical advice. *J Natl Med Assoc* 1996;88:658-660.
11. Franks P, Meldrum S, Fiscella K: Discharges against medical advice: Are race/ethnicity predictors? *J Gen Intern Med* 2006;21:955-960.
12. Becker G, Newsom E: Socioeconomic status and dissatisfaction with health care among chronically ill African Americans. *Am J Public Health* 2003;93:742.
13. Martin KD, Roter DL, Beach MC, Carson KA, Cooper LA: Physician communication behaviors and trust among black and white patients with hypertension. *Med Care* 2013;51:151-157.
14. Goldman LE, Vittinghoff E, Dudley RA: Quality of care in hospitals with a high percent of Medicaid patients. *Med Care* 2007;45:579-583.

15. Blatt B, LeLacheur SF, Galinsky AD, Simmens SJ, Greenberg L: Does perspective-taking increase patient satisfaction in medical encounters? *Acad Med* 2010;85:1445-1452.
16. Kong L, Chen Y, Wang L, Wang K, Liu C, Gan Y: Effect of perspective-taking on trust between doctors and patients: A randomized controlled trial. *J Clin Psychol Med Settings* 2023;30:708-715.
17. Haines K, Freeman J, Vastaas C, et al: "I'm leaving": Factors that impact against medical advice disposition post-trauma. *J Emerg Med* 2020;58:691-697.
18. Kraut A, Fransoo R, Olafson K, Ramsey CD, Yogendran M, Garland A: A population-based analysis of leaving the hospital against medical advice: Incidence and associated variables. *BMC Health Serv Res* 2013;13:415.