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## **Factors Associated with Discharge Against Medical Advice in Alcohol Withdrawal Patients**

Rachel Coleman<sup>1\*</sup>, Simon Coulton<sup>2</sup> and Thomas Phillips<sup>1, 3\*</sup>

1. Faculty of Health Sciences, Institute for Clinical and Applied Health Research (ICAHR), University of Hull, Cottingham Road, UK

2. Centre for Health Services Research, University of Kent, Canterbury, UK

3. Alcohol Care Team, Department of Gastroenterology, Hull University Teaching Hospitals NHS Trust, Hull, UK

\* Correspondence to: Rachel Coleman, SSA PhD Fellow, Faculty of Health Sciences, Institute for Clinical and Applied Health Research (ICAHR), University of Hull. [r.coleman-2020@hull.ac.uk](mailto:r.coleman-2020@hull.ac.uk)

Running Title:

DAMA in Alcohol Withdrawal Patients

Short Summary:

We used Hospital Episode Statistics Data to explore associations between clinical and demographic factors and DAMA. Significant factors were admission via emergency, weekend discharge, living with no fixed abode, being male, being younger and having a shorter length of stay. This information will support development of Alcohol Care Teams in hospitals.

## Abstract

### Aims

To examine characteristics associated with discharge against medical advice from hospital in alcohol withdrawal patients, to support the work of hospital staff and Alcohol Care Teams and identify characteristics which may help to target patients most likely to discharge against medical advice.

### Methods

We used Hospital Episode Statistics (HES) Data to identify demographic and clinical variables, and compare these in alcohol withdrawal patients who discharged against medical advice from hospital, compared with those who were discharged by the clinical team.

### Results

Factors significantly associated with alcohol withdrawal patients discharging against medical advice from hospital were: being admitted as an emergency; discharged on a weekend; living with no fixed abode; being male; being younger and having a shorter length of stay.

### Conclusions

This study identifies characteristics which can be used to support acute hospitals and Alcohol Care Teams, in particular allocation of resources to reduce discharge against medical advice and subsequent readmissions to hospital. Particular consideration should be given to clinical provision in hospitals in emergency departments and on weekends, and also those patients who are admitted and are of no fixed abode.

Key Words (Up to 6): alcohol withdrawal, discharge against medical advice, DAMA

## **Introduction**

Those with alcohol use disorders exert a disproportionate burden on the NHS, usually accessing care via emergency departments (Phillips et al., 2019). Recent reports identify that the majority of patients experiencing alcohol dependence, including alcohol withdrawal (AW) receive treatment in acute hospitals – outside of specialist services where these skills and competencies are concentrated (Roberts et al., 2020). This raises challenges with regards to identifying AW in unplanned admissions and reducing readmissions, as identified in the NHS England Long Term Plan (NHS, 2019).

Kumar (2019) used the Nationwide Readmissions Database in the USA to explore the relationship between Discharge Against Medical Advice (DAMA) and 30 day readmissions, and found that DAMA was associated with twice the odds of unplanned 30 day readmission compared with routine discharge. Similarly, Yedlapati and Stewart (2018) found that 30 day readmission and multiple admissions followed by an alcohol withdrawal (AW) admission were predicted by DAMA. Patients who DAMA have a higher readmission rate, longer subsequent hospital stay and higher risk of mortality, and should be prioritised to reduce this burden from a clinical and societal perspective (Berger, 2008; Yong et al., 2013).

Care for AW patients has been identified as a key priority in the NHS England Long Term Plan (NHS, 2019), and therefore further exploration of factors associated with DAMA will provide useful information for Alcohol Care Teams being developed to support clinicians and patients experiencing AW in the acute hospital setting.

This study used existing data collected by the NHS in England to examine the factors and characteristics associated with DAMA from acute hospitals in England for admissions where the patient has been diagnosed with AW, compared with AW patients who are discharged by the clinical team (i.e. planned discharge).

The HES dataset is primarily an administrative dataset, however previous studies have demonstrated the benefit of using this data in research and alcohol research specifically (Burns et al., 2012; Chaudhry et al., 2017; Phillips et al., 2019). The HES Admitted Patient Care (HES-APC) Dataset contains a pseudo-anonymised patient identifier to ensure admission data can be linked without identifying the individual, as well as ICD-10 diagnostic codes associated with the admission (allocated on discharge by the clinical team and medical coders).

## **Methods**

We conducted a cross-sectional retrospective analysis using 2017/18 HES-APC care records for England. This dataset contains a nationally representative sample of all adults admitted to a NHS hospital between 1<sup>st</sup> April 2017 to 31<sup>st</sup> March 2018. Each admission is made up of 1 or more Finished Consultant Episodes (FCEs), and this data set included over 9.3 million FCEs experienced by 5.3 million adults. A single FCE is the period of care under a specified consultant. The dataset contains a start and finish date for each FCE which allows for the identification of individual admissions, and up to twenty ICD-10 diagnostic codes, permitting identification of admissions where AW has been diagnosed (ICD10 code F10.3). Diagnostic codes within all FCEs for each admission were searched using the *regexm* command in STATA 15SE (Stata Corp.).

### *Selection of Cases*

For the purposes of this study the unit of analysis was admissions and cases were selected based on the presence of the ICD-10 F10.3 diagnostic code. Patients who DAMA from hospital were identified using the “Discharge Method” variable in the HES dataset, which determines whether the patient was discharged, DAMA or died in hospital. Admissions were excluded from analysis where the patient had died in hospital, or the admission remained open at the cut-off point of 31<sup>st</sup> March 2018.

### *Characteristics and predictors of DAMA*

Demographic variables including age, sex and ethnicity were considered for inclusion. Consideration to inclusion of indices of multiple deprivation (IMD) scores was given, however, this variable was dropped as those deemed to be of no fixed abode (NFA), were excluded from the variable.

Therefore, NFA was retained as a dichotomous variable and as a proxy measure of deprivation.

Admission method (emergency vs planned) was considered alongside the day of admission or discharge (weekend vs weekday), and length of stay (LOS) of the AW admission. LOS was retained as a continuous variable and was calculated using admission and discharge dates, with those admitted for <24 hours coded as LOS equal to 1 day. Clinical guidance and practice suggest initial medical treatment for AW rarely exceeds 10 days (NICE, 2011). Therefore, LOS of 11 days or more was recoded as 11+ to avoid any skewing of the LOS analysis by including values for those admitted with AW and additional comorbidities who may have been admitted for extensive periods beyond the initial management of AW. ICD-10 diagnoses were used to calculate a Charlson Comorbidity Index (CCI) score (Charlson et al., 2022).

### *Statistical Analyses*

Our dependent variable was dichotomous - DAMA or not and we conducted a logistic regression model to generate crude odds ratios for individual variables and adjusted odds ratios for the overall model. We included a site variable for each of the 195 hospitals to account for variation in coding.

Variables were examined for differences between the two groups, and incorporated demographic characteristics, features of admissions, comorbidity (CCI), length of stay, and features of discharge.

Two-way tables and Chi-squared tests were used to examine differences between groups for dichotomous variables, with non-parametric tests employed to examine differences between means for continuous variables. Categorical variables were transformed into dichotomous variables to

allow for exploration of differences and associations using Chi-squared tests. Where the association between the variable and DAMA had a statistical significance level of  $\leq 0.15$ , the variable was included in the logistic regression model.

The *vif* command in STATA 15SE was used to explore multi-collinearity within the model, where a value of 1 indicates no correlation between a given variable and any other variables in the model, a value of 1-5 indicates a moderate correlation, and a value greater than 5 indicates a potentially severe correlation. Individual and mean vif scores for this analysis did not exceed 5.

## **Results**

The HES-APC dataset contained 21,493 individuals who had a combined total of 27,444 AW admissions over the period. Once those who had died or were still in hospital at year end were removed, there were 21,263 completed AW admissions in year. Of those 2,196 admissions resulted in DAMA from hospital (10.3%), whereas 19,067 admissions ended in discharge by the clinical team (89.7%).

**\*\*CONSIDER TABLE 1 HERE\*\***

Initial analyses demonstrated that factors associated with DAMA from hospital were: being younger; being male; living NFA; the admission coded as admitted via emergency; being admitted via general medicine; lower levels of comorbidity; shorter length of stay and weekend discharge. Variables which were not significantly associated with DAMA were ethnicity and weekend admission day. Variables which met the threshold of association of  $p \leq 0.15$  were included in the regression model below. Once odds ratios were adjusted for the other significant variables, those which remained significantly associated ( $p < 0.05$ ) with DAMA were: being admitted via emergency; weekend discharge; living NFA; being male; being younger and having a shorter length of stay.

**\*\*CONSIDER TABLE 2 HERE\*\***

## **Discussion**

This study provides a conservative overview of DAMA from acute hospitals in AW patients, who exert disproportionate impact on the NHS through multiple readmissions (the likelihood of which increases following DAMA). The impact of this analysis will be of relevance to acute hospitals, Alcohol Care Teams, NHS England and commissioners given the increasing demand of alcohol related admissions. A key issue is that AW patients need to be identified quickly, with ACTs alerted to patients and responding within as short a time as possible, as this group has a shorter LOS prior to DAMA compared with the control group.

Our findings reveal that six key HES variables are significantly associated with DAMA in AW patients: being admitted via emergency, younger age, being male, living NFA, shorter length of stay and weekend discharge. This provides some key information which could potentially be used to reduce



the risk of DAMA in AW patients. For example, our study shows that those with a mean age of 46 are more likely to DAMA than those with a mean age of 50. Those who are older may be more likely to have other comorbidities which makes DAMA less likely, whereas younger patients could be targeted to support their AW care to reduce the risk of DAMA. Similarly, we found that (once other variables were controlled for), AW patients had 1.46 times the odds of discharging on the weekend compared with a weekday, which potentially indicates a need for greater clinical provision over the weekend. This information could be used to support the development and mapping of care pathways along with the roll out of Alcohol Care Teams where this is being conducted (as per the NHS England Long Term Plan)

Previous studies have identified the predictive relationship between DAMA and readmission to hospital in 30 days, and show similar associations between demographic variables in the population who DAMA such as being male and younger (Yedlapati & Stewart, 2018; Kumar, 2019). Our study adds to this by focussing specifically on the AW population, and those variables associated with DAMA. Via our analysis of HES data, we have added variables which contribute to this understanding including day of admission/discharge, comorbidity and NFA as a proxy measure of deprivation.

Future research should focus on elements of analysis which were not conducted in our study – including comparable analyses with other alcohol-related diagnostic codes (such as alcohol dependence) to further validate our findings. At the time of conducting this study we were not aware of which hospitals had an ACT, in-reach/liaison service etc, not whether these were responsive at times of DAMA. Similarly, we are not aware of the different clinical protocols being used in different hospital sites. In our predictive model we did control for hospital provider site to account for this effect, however future research could explore this further. Similarly, ethnicity was poorly coded in the data so we collapsed the ethnicity category into two groups. A potential for

future research where ethnicity is reliably coded. Other areas for future research should focus on developing the understanding of the relationship between other variables not captured in HES (e.g. time of last drink, level of alcohol dependence, quality of AW treatment, how and when AW was identified) and DAMA to promote the development of care pathways and support systems for AW patients to prevent DAMA.

The key strength of this study is the use of HES data as a representative dataset as it comprises all admissions to any hospital in England for an entire year (2017/2018). It is also a strength that it is possible to identify AW admissions using the ICD-10 diagnosis attributed to the patient on discharge. However, diagnosis of AW in this dataset will only be present if this has been clearly stated in clinical notes (or patient discharge letters) and picked up by the coding team who enter the HES data. We can therefore be confident that the number of patients identified with AW is an underestimation of the population and level of burden actually present within the hospital, as many patients may experience AW and it is not identified, or not coded in the HES data. Conversely, we can be confident that those coded as having an AW diagnosis are accurate, as only those patients with more obvious or severe AW symptoms are likely to be diagnosed in this way.

This paper characterises the variables which are significantly associated with DAMA from hospital in AW patients. Although the estimates are conservative, we have identified the potential to identify those at higher risk of DAMA, and to improve care pathways for AW patients, providing useful information to hospital staff and Alcohol Care Teams (where there is provision) within hospitals.

#### Data Availability Statement

The data underlying this analysis are available via DARS application to NHS Digital at <https://digital.nhs.uk/services/data-access-request-service-dars>.

## Acknowledgements

This is independent research funded by the University of Hull. RC is funded by the Society for the Study of Addiction (SSA) as part of a doctoral scholarship. TP is part funded by the NIHR Clinical Research Network for Yorkshire and The Humber and Hull University Teaching Hospitals NHS Trust. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health or the SSA.

## Funding

This project was funded by University of Hull and awarded to TP and supported by the University of Hull.

## Conflict of Interest Statement

None declared.

## Governance and Ethics

Health Research Authority assessment identified NHS REC approval was not required for this study. Approval for use of HES data was received from NHS Digital (DARS-NIC-226185) and ethical approval from the University of Hull (FHS180).

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Table 1. Characteristics of adult alcohol withdrawal admissions to non-specialist hospitals in England during 2017/18 stratified by discharge method

	DAMA	Discharged	P-value
<b>Number (% of sample)</b>	2,196 (10.3)	19,067 (89.7)	-
<b>Mean Age</b>	46.0	50.3	**<0.001
(95% CI)	(45.5-46.5)	(50.1-50.5)	
<b>Sex</b>			
Male (% col)	1,712 (78.0)	13,727 (72.0)	**<0.001
<b>Ethnicity</b> (Caucasian v. Non Caucasian)			
Caucasian (% col)	1,880 (92.3)	16,261 (92.6)	0.581
<b>No Fixed Abode (NFA)</b> (NFA v Not NFA)			
Living NFA (% col)	81 (3.7)	401 (2.1)	**<0.001
<b>Admission Method</b> (Emergency vs Not Emergency)			
Emergency (% col)	2,165 (98.6)	18,527 (97.2)	**<0.001
<b>Weekend vs Weekday Admission</b>			
Weekend (% col)	556 (25.3)	4,656 (24.4)	0.353
<b>Specialty</b>			
General Medicine (% col)	1,086 (49.5)	8,831 (46.3)	**0.005
<b>Mean Charlson Comorbidity Index</b>	2.8	4.1	**<0.001
(95% CI)	(2.6-3.1)	(4.0-4.2)	
<b>Categorical Charlson Comorbidity Index</b>			
0 (% col)	1,460 (66.5)	11,152 (58.5)	-
1-5 (% col)	334 (15.2)	3,273 (17.2)	-
>5	402 (18.3)	4,642 (24.4)	-
<b>Length of Stay</b>			
Mean number of days	2.7	4.7	**<0.001
(95% C.I)	(2.5-2.8)	(4.7-4.8)	
Median number of days	2	4	-
(IQR)	(1-3)	(1-8)	
<b>Day of Discharge (% col)</b>			
Day 1	958 (43.62)	5,194 (27.25)	-
Day 2	476 (21.68)	2,151 (11.28)	-
Day 3	263 (11.98)	1,676 (8.79)	-
Day 4	125 (5.69)	1,501 (7.87)	-
Day 5	94 (4.28)	1,411 (7.40)	-
Day 6	56 (2.55)	1,236 (6.48)	-
Day 7	46 (2.09)	1,036 (5.43)	-
Day 8	21 (0.96)	696 (3.65)	-
Day 9	15 (0.68)	456 (2.39)	-
Day 10	11 (0.50)	466 (2.44)	-
Day 11+	131 (5.97)	3,244 (17.01)	-
<b>Weekend vs Weekday Discharge</b>			
Weekend (% col)	547 (24.9)	2,982 (15.6)	**<0.001

† Criteria met ( $p = \leq 0.15$ ) for inclusion in the regression model. \*  $p < 0.05$ . \*\*  $p < 0.01$

Table 2. Adjusted odds ratios for DAMA in patients admitted to hospitals in England with alcohol withdrawal during 2017/18, controlled for hospital provider site.

<b>Variable</b>	<b>Adjusted Odds Ratios (95% CI)</b>	<b>P-value</b>
Admission via Emergency	1.70 (1.16-2.49)	**0.007
Weekend Discharge	1.46 (1.32-1.62)	**<0.001
NFA	1.41 (1.06-1.87)	*0.018
Sex	1.33 (1.18-1.49)	**<0.001
Specialty	1.08 (0.97-1.21)	0.166
Charlson Comorbidity Index	1.00 (1.00-1.01)	0.365
Age	0.98 (0.98-0.99)	**<0.001
Length of Stay (truncated)	0.85 (0.83-0.87)	**<0.001

\* p<0.05. \*\* p< 0.01