Patient and Service-Level Factors Affecting Length of Inpatient Stay in an Acute Mental Health Service: A Retrospective Case Cohort Study

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Abstract

Background:
Despite the focus on community-based care, demand for inpatient psychiatric care still remains high. Trusts strive for safe, efficient patient throughput with reduced length of stay.

Previous studies have attempted to analyse factors influencing length of stay in mental health units, focusing mostly on patient factors. These models fail to sufficiently explain the variation in duration of inpatient stay. We assess how the type of service delivered by a trust, in addition to patient factors, influences length of stay.

Methods:
We conducted a retrospective case cohort study in a large inner-city NHS mental health trust for all admissions in a one month period. Data was gathered from electronic notes of 105 patients and analysed using IBM SPSS version 26. Descriptive univariate and bivariate analyses were conducted on the data, with multiple regression analysis conducted on statistically significant data.

Results:
Short-stay assessment ward admission significantly reduced length of stay. Patients under outpatients or under care co-ordination, admitted through Mental Health Act assessment and formally detained all had longer length of stay. Out of area admissions, locum Consultant care, changing Responsible Clinician and ward transfers all led to longer length of stay. Factors indicating more severe illness such as increased observation level and polypharmacy, as well as diagnoses of psychosis or bipolar disorder were associated with longer duration of stay. Discharges requiring referral to accommodation or rehabilitation led to longer stays. The most significant factors that influenced length of stay were higher observation levels, diagnosis of psychotic illness or bipolar, and discharge to rehabilitation placement.

The final model, taking into account all these factors, was able to account for 59.6% of the variability in length of stay.

Conclusions:
The study backs up existing literature which shows patient factors have an influence on length of stay. The study also demonstrates that service-level factors have an impact on the duration of stay. This data may be used to inform further studies which may aid provision of inpatient and community services in the future.

Introduction:

Background
Mental health policy in the UK is focussed on community-based care and reducing inpatient admissions[1]. Alongside this vision, the number of NHS inpatient mental health beds was reduced by 72.1% between 1987 and 2017, but the number of patients requiring secondary care services has continued to grow[2]. There is therefore a clear necessity to provide the most efficient inpatient services for those who need it, providing safe, effective care and facilitating timely discharge to maintain throughput in the system. Concerns that brief admissions may lead to a pattern of recurrent admissions do not seem to be supported by the evidence, and therefore provide a cost-effective model of service provision[3].

In order to provide this care, mental health providers need to understand what factors may have an impact on length of stay. Many studies in recent years have looked at patient factors, demographics, diagnosis and severity in order to predict length of inpatient stay, with varying and sometimes conflicting results[4, 5, 6].

Attempts to develop an accurate model to predict length of stay have yielded poor results due to the complexity of mental health admissions[7]. Patient factors have not fully explained variations in length of stay, suggesting that other factors exert an influence. We hypothesise that factors associated with how mental health services are delivered have an impact on length of stay, potentially explaining the variation in length of stay between UK trusts[8]. There is a lack of studies addressing service factors such as the type of ward, use of locum Consultant, change in Consultant and ward transfers.

Our study aims to address this area, while also gathering more evidence of the patient-level factors to develop a better understanding of factors influencing length of stay. This information may be powerful to help trusts develop operational procedures and design services to minimise length of stay.

Aims of the Study
The aim of the study is to identify which patient and service level factors influence length of stay for general adult psychiatric inpatient admissions in a busy urban mental health NHS Trust.

Methods:

Current Setting
Our study is based in an inner-city Mental Health Trust that supports a population of around 500,000. 66.6% of the population is White British, compared to the UK average of 85.4%, with Asian or Asian British representing the highest proportion of the black and minority ethnic population. There are areas of significant social deprivation, and has a higher proportion of social housing (31.6% vs 17.7%) and unemployed households (35.8% vs 33.3%) compared to the national average. The trust expects to provide care for around 53,000 service users per year.

The Trust provides inpatient care spread across two sites comprising three male acute wards, two female acute wards, one mixed-gender acute ward, one female intensive care unit, one male intensive care unit and one 72-hour assessment ward, a total of around 160 beds. The trust provides liaison services to three large emergency departments. Community services comprise Community Mental Health Teams (CMHT), Early Intervention Services (EIS), Assertive Outreach Team, Review Team, Home Treatment Team (HTT) and Secondary Care Psychology services.

Study Design

We used a retrospective observational study design which enabled us to identify a cohort of patients and follow them through the inpatient journey until the point of discharge using data extraction from the trust’s electronic patient records system. All consecutive patients admitted to Manchester general adult inpatient beds in May 2017 were identified for the study. Data was gathered for the six weeks prior to their admission, and throughout their admission until point of discharge until the cut-off point of 1st January 2018. Those discharged after the cut-off point were not included in the study as their data was incomplete.

Data were gathered on patient demographic factors; services provided in the six weeks prior to admission; location, time and mode of admission assessment; patient factors during admission including diagnosis and increased observation levels; service factors during admission including out of area admission, interward transfers, change of Consultant, Locum Consultant involvement, polypharmacy, type of ward, involvement of patient flow team (through identification of delayed transfer of care [DTOC]) and detention under Mental Health Act; and discharge service factors including referral to community teams and accommodation status at discharge. Data on diagnosis at discharge was obtained from final ward round entry or discharge summary, and was often not recorded as per ICD-10 criteria. Therefore the researchers pragmatically classed diagnoses into broad categories of depression, psychosis, bipolar disorder, personality disorder, substance misuse disorder and other (which included ‘malingering’, ‘no mental disorder’, etc).

Data was extracted from electronic records to ensure anonymity. Permission to obtain data was obtained from the Trust’s Clinical Audit Department. As this study constitutes an audit or service evaluation, no ethical approval was required from the NHS Research Ethics Committee. Data was transcribed onto an Excel spreadsheet and subsequently analysed using IBM SPSS version 26.

Data Analysis

Initial descriptive and univariate analyses were carried out on the data. Bivariate analyses were carried out using Length of Stay (LOS) as the dependent variable. LOS was calculated as number of days between admission and discharge, and was classed as 0 for some patients who were discharged within 24 hours. LOS is typically a skewed distribution due to a small proportion of patients having prolonged inpatient admission, therefore non-parametric tests were used to analyse significant effects on LOS. Categorical data was analysed using the Mann-Whitney test where only two groups exist, and the Kruskal-Wallis test where several groups exist. Continuous data was analysed using Spearman’s Rank correlation coefficient. P-value of ≤ 0.05 was considered to be significant.

Multiple regression analysis was then used with the independent variables which had demonstrated statistical significance from bivariate analysis to generate a model of factors influencing the LOS. This technique was chosen to avoid the use of an arbitrary cut-off between short- and long-stay patients which is necessary for other forms of statistical analysis.

Results

Sample:

106 patients were admitted during May 2017. One patient’s records could not be accessed due to an incorrect patient identifier number and therefore was not included in the study. A further 8 patients remained an inpatient at the point of data collection in January 2018 and therefore were not included in the study. The remaining 97 patients were included in the analysis.

The mean age of the sample was 36, with 67% being male. Psychosis (30%) was the most common reason for admission, followed by personality disorder (21%), depression (8%) and bipolar disorder (8%). While the majority of patients were admitted from some form of accommodation, 10% were street homeless.

Descriptive and Bivariate statistics:

The median LOS was 22 days, with a mean LOS of 36.1 days, demonstrating a positive skew. A number of patients had inpatient stays of less than 24 hours, with the longest admission being 226 days.

Patients under Home Treatment Team (HTT), Community Mental Health Team (CMHT) or other community teams in the six weeks prior to admission did not have longer LOS. However, those allocated to a care coordinator in the community (p = 0.033) or who were under secondary care outpatients (p = 0.034) had significantly longer admissions. Higher frequency of contacts from HTT was associated with a reduced LOS, but this was not statistically significant. Readmissions, A+E presentations and Mental Health Act assessments within the last 6 weeks were not shown to have an impact on LOS.

The day, timing and location of admission assessment did not have an impact on LOS. Admission via a Mental Health Act assessment was associated with significantly longer LOS (p = 0.005), with significantly longer admissions for those formally detained under Sect. 2 or 3 (p ≤ 0.001).
Admission to and discharge from the short-stay assessment ward was associated with significantly reduced LOS ($p \leq 0.001$), but there was no difference between people subsequently transferred to an acute ward from the assessment ward.

In terms of service factors, out of area admissions ($p = 0.002$), involvement of locum Consultant ($p \leq 0.001$), increased observation level ($p \leq 0.001$) and polypharmacy ($p = 0.031$) were all associated with longer admissions. Increasing number of ward transfers ($p \leq 0.001$) and Consultant changes ($p \leq 0.001$) were shown to be associated with increased LOS. Patients requiring rehabilitation ($p = 0.04$) or referral to accommodation at discharge ($p = 0.018$) had significantly longer inpatient stays.

In terms of patient factors, diagnosis of psychosis or bipolar disorder ($p \leq 0.001$) was associated with longer admissions. Gender, age and accommodation status was not shown to impact LOS.

The results of the analysis are shown in Table 1 (categorical data) and Table 2 (continuous data).
| Items                     | n    | Mean | Median | IQR  | Min | Max  |
|--------------------------|------|------|--------|------|-----|------|
| Length of Stay           | 97   | 36.10| 22     | 40   | 0   | 226  |
| Gender                   |      |      |        |      |     |      |
| M                        | 65   | 35.43| 17     | 38   | 0   | 226  |
| F                        | 32   | 37.44| 28     | 47   | 1   | 147  |
| Accomodation             |      |      |        |      |     |      |
| Independent              | 78   | 33.71| 19     | 41   | 0   | 147  |
| Hotel                    | 2    | 22.00| 22     | -    | 3   | 41   |
| Supported                | 3    | 36.67| 28     | -    | 28  | 54   |
| NFA                      | 10   | 61.60| 27     | 91   | 2   | 226  |
| Family                   | 2    | 3.50 | 3.50   | -    | 2   | 5    |
| Prison                   | 1    | 40   | -      | -    | -   | -    |
| Nursing                  | 1    | 55   | -      | -    | -   | -    |
| Previous admission       |      |      |        |      |     |      |
| Y                        | 9    | 35.67| 16     | 54   | 1   | 140  |
| N                        | 88   | 36.14| 22     | 42   | 0   | 226  |
| Previous A + E Presentation |   |      |        |      |     |      |
| Y                        | 28   | 36.89| 21     | 56   | 0   | 147  |
| N                        | 69   | 35.77| 22     | 33   | 1   | 226  |
| Previous MHA Assessment  |      |      |        |      |     |      |
| Y                        | 7    | 60.57| 55     | 74   | 1   | 147  |
| N                        | 90   | 34.19| 18     | 36   | 0   | 226  |
| HTT Referral             |      |      |        |      |     |      |
| Y                        | 34   | 36.91| 23.50  | 51   | 1   | 147  |
| N                        | 63   | 35.65| 19     | 40   | 0   | 226  |
| Under HTT                |      |      |        |      |     |      |
| Y                        | 35   | 36.06| 22     | 48   | 1   | 147  |
| N                        | 60   | 36.82| 20.50  | 40   | 0   | 226  |
| HTT Location             |      |      |        |      |     |      |
| A                        | 10   | 28.10| 6.50   | 45   | 1   | 123  |
| B                        | 17   | 36.06| 27     | 42   | 4   | 140  |
| C                        | 10   | 41.20| 20     | 79   | 1   | 147  |
| HTT Medical Review       |      |      |        |      |     |      |
| Y                        | 11   | 22.55| 7      | 21   | 1   | 140  |
| N                        | 86   | 37.83| 23     | 48   | 0   | 226  |
| Under CMHT               |      |      |        |      |     |      |
| Y                        | 30   | 44.87| 27.50  | 59   | 1   | 147  |
| N                        | 67   | 32.16| 16     | 35   | 0   | 226  |
| CMHT Location            |      |      |        |      |     |      |
| A                        | 1    | 61   | -      | -    | -   | -    |
| B                        | 7    | 49.43| 35     | 82   | 2   | 124  |
| C                        | 6    | 24.00| 27.50  | 34   | 3   | 41   |
| D                        | 9    | 59.33| 28     | 93   | 14  | 140  |
| E                        | 1    | 25   | -      | -    | -   | -    |
| F                        | 6    | 39.33| 16     | 77   | 1   | 147  |
| Allocated CC             |      |      |        |      |     |      |
| Y                        | 27   | 48.44| 28     | 69   | 1   | 147  |
| N                        | 70   | 31.33| 16     | 24   | 0   | 226  |
| Under RC                 |      |      |        |      |     |      |
| Y                        | 56   | 43.70| 27.50  | 54   | 1   | 226  |
| N                        | 41   | 25.71| 15     | 26   | 0   | 212  |
| Under other community team |    |      |        |      |     |      |
| Y                        | 33   | 38.45| 22     | 36   | 1   | 226  |
| N                        | 64   | 34.88| 21.50  | 46   | 0   | 147  |

Ax ward = assessment ward, DTOC = delayed transfer of care
|                                | Length of Stay (days) | p value |
|--------------------------------|-----------------------|---------|
| **Day of Admission**           |                       |         |
| Mon                            | 13                    | 17.62   |
| Tue                            | 15                    | 28.53   |
| Wed                            | 16                    | 36.00   |
| Thu                            | 18                    | 51.06   |
| Fri                            | 14                    | 37.14   |
| Sat                            | 9                     | 32.33   |
| Sun                            | 12                    | 44.83   |
| **OOH**                        |                       |         |
| Y                              | 63                    | 38.52   |
| N                              | 34                    | 31.59   |
| **MHA Assessment**             |                       |         |
| Y                              | 56                    | 43.04   |
| N                              | 41                    | 26.61   |
| **Route of admission**         |                       |         |
| Community                      | 20                    | 36.50   |
| A+E                            | 62                    | 40.44   |
| **Legal Status**               |                       |         |
| Inf                            | 53                    | 19.85   |
| S2                             | 40                    | 49.43   |
| S3                             | 3                     | 82.00   |
| **Ax ward admission**          |                       |         |
| Y                              | 56                    | 24.86   |
| N                              | 41                    | 51.44   |
| **Ax ward discharge**          |                       |         |
| Y                              | 31                    | 5.84    |
| N                              | 66                    | 50.32   |
| **Acute Ward**                 |                       |         |
| A                              | 6                     | 33.33   |
| B                              | 4                     | 23.25   |
| C                              | 3                     | 95.00   |
| D                              | 7                     | 53.14   |
| E                              | 3                     | 96.33   |
| F (PICU)                       | 7                     | 42.14   |
| G (PICU)                       | 2                     | 67.50   |
| H                              | 3                     | 77.33   |
| **Out of area admission**      |                       |         |
| Y                              | 31                    | 46.16   |
| N                              | 66                    | 31.36   |
| **Locum Consultant**           |                       |         |
| Y                              | 28                    | 49.68   |
| N                              | 69                    | 30.51   |
| **Increased obs level**        |                       |         |
| Y                              | 24                    | 68.08   |
| N                              | 73                    | 25.58   |
| **Discharge Diagnosis**        |                       |         |
| Depression                     | 8                     | 22.88   |
| Psychosis                      | 29                    | 62.62   |
| Bipolar                        | 8                     | 53.88   |

Ax ward = assessment ward, DTOC = delayed transfer of care
|                          | Length of Stay (days) | p value |
|--------------------------|-----------------------|---------|
| Personality disorder     | 20 - 20.50 6 23 1 147 |
| Substance misuse         | 11 - 20.09 16 35 2 57 |
| Other                    | 21 - 20.95 10 29 0 111 |
| Medication               | Nil - 6 23.17 20 41 2 57 0.031 |
|                          | Monotherapy - 28 20.64 9 22 2 124 |
|                          | Polypharmacy - 53 48.68 29 61 1 226 |
| Identified DTOC          | Y - 2 127.00 127.00 - 28 226 0.144 |
|                          | N - 95 34.18 19 40 0 212 |
| Discharge destination    | Home - 75 30.53 17 33 0 131 0.04 |
|                          | Supported - 2 28.00 28.00 0 28 28 |
|                          | Family - 5 26.40 16 51 2 63 |
|                          | NFA - 6 16.50 8 36 2 40 |
|                          | Rehab - 2 183.00 183.00 - 140 226 |
|                          | Other - 7 79.71 55 114 2 212 |
| Discharge Team           | CMHT - 26 45.27 28 62 1 131 0.069 |
|                          | HTT - 44 25.30 16 30 1 111 0.106 |
|                          | Other - 17 29.24 17 34 1 110 0.917 |
| Referral to accommodation| Y - 2 183.00 183 - - - 0.018 |
|                          | N - 95 33.00 19 40 0 212 |

Ax ward = assessment ward, DTOC = delayed transfer of care

|                          | r   | p value |
|--------------------------|-----|---------|
| Age                      | 0.084 | 0.414 |
| HTT Contacts             | -0.116 | 0.495 |
| CMHT Contacts            | 0.095 | 0.617 |
| Ward Transfers           | 0.523 | ≤ 0.01 |
| Consultant Changes       | 0.592 | ≤ 0.01 |

Table 2
analysis of factors influencing LOS
(continuous data)

Multiple Regression Analysis:
Statistically significant factors from bivariate analyses were used for multiple regression analysis. The results are shown in Table 3. Factors were added in a stepwise fashion based on their level of statistical significance. First order linear auto-correlation was ruled out using the Durbin-Watson calculation (d = 1.82). Multicollinearity was ruled out as tolerance was > 10. The model showed a statistically significant ability to predict length of stay (F statistic = 8.30, p ≤ 0.001). The model accounted for 59.6% of the variability displayed in LOS.

The most statistically significant factors impacting length of stay were elevated observation levels, diagnosis at discharge (personality disorders, substance-misuse disorders and ‘other’ disorders reduced length of stay compared to affective and psychotic illnesses) and discharge destination (rehabilitation).
Table 3
multiple regression analysis, $R^2 = .596$, $^*p \leq 0.05$, $^{**}p \leq 0.01$

|                               | b   | SE b | $\beta$ |
|-------------------------------|-----|------|---------|
| (Constant)                    | 19.80 | 17.87 |         |
| Allocated care coordinator (6/52 prior to admission) | 4.81 | 9.21 | .048 |
| Under RC (6/52 prior to admission) | 7.73 | 8.66 | .083 |
| Admitted under MHA            | 9.85 | 7.37 | .106  |
| Admitted to SAFIRE            | 17.07 | 9.41 | -.180 |
| Elevated observation levels   | 18.34 | 8.90 | .179* |
| Referral to accommodation on discharge | 72.75 | 28.42 | .238* |
| Out of area admission         | 20.19 | 10.34 | .189  |
| Locum RC                      | -19.21 | 10.20 | -.196 |
| Diagnosis at discharge        | -6.70 | 2.33  | -.236**|
| Medication regime             | 8.16  | 6.12  | .111  |
| Discharge destination         | 7.91  | 2.60  | .254**|
| Consultant changes            | 9.16  | 6.50  | .204  |
| Ward transfers                | 2.56  | 7.74  | .046  |

Discussion And Conclusions

Discussion:
We performed a study of a large urban NHS Trust aiming to identify which patient and service factors influenced length of stay for general adult acute inpatients. Patient factors shown to increase length of stay included diagnosis of psychotic illness, necessity for increased observation levels and detention under the Mental Health Act.

Service level factors shown to influence length of admission are the allocation of a care coordinator or secondary care outpatient appointments prior to admission, out of area admissions, management from a locum Consultant, Consultant changes, ward transfers and polypharmacy. The short-stay assessment ward was shown to have a positive impact in terms of reducing length of stay. Discharge planning, specifically around referral to accommodation and rehabilitation, was a significant delaying step, prolonging inpatient admission.

Other studies have shown similar impact of observation levels and seclusion on length of stay\(^{10}\). Factors which infer a greater degree of severity of illness, such as increased observation levels, polypharmacy and detention under Mental Health Act were all shown to increase length of stay, however we did not measure illness severity per se.

Our results supported previous studies that have demonstrated a significant impact of psychosis on length of stay and a negligible impact of substance use disorders and personality disorders on length of stay\(^{10, 11, 12}\). While international studies often demonstrate reduced length of stay in detained patients\(^5\), our findings support UK studies that show the use of the Mental Health Act is related to longer admissions\(^13\), perhaps suggesting compulsory detention is used differently in the NHS.

Unlike other studies, we did not find an association between homelessness and length of stay\(^{13, 14}\) but we did find a similarly significant impact of the requirement for referral to accommodation on discharge. In keeping with the conflicting data surrounding age and length of stay, we were unable to demonstrate any significant association\(^12\).

Our study looked specifically into factors associated with services provided by the Trust. The short-stay assessment ward was demonstrated to significantly reduce length of stay, supporting results from a similar service in the UK\(^15\). Additionally, subsequent transfer from the assessment ward to an acute ward did not significantly prolong length of stay.

Out of area admissions have already been shown to increase length of stay\(^16\) and our findings support this conclusion. Additionally, within-Trust continuity of care appears to be an important factor in length of stay. We have demonstrated that transfers between wards and changes in Consultant can have a significant impact on length of stay.

Limitations:
The sample size for this study was small, relating to one NHS Trust and has follow-up data covering less than one year. Some patients who remained an inpatient at the time of data collection could not be included in the study, which may have impacted on the results. While these patients are likely to be outliers,
they could have had a considerable impact on the results.

Other studies have looked at both psychopathology and ICD-10 diagnostic criteria as factors for influencing length of stay\cite{6,7}, however due to poor and inconsistent documentation on the electronic patient record the researchers were unable to be as stringent in their data gathering for diagnosis, instead relying on broader categories. In addition, we did not record comorbidities and it is likely that a high proportion of patients may have had several diagnoses which have not been captured by this study. While severity of illness may be inferred by some of the statistics (for example the use of increased observation levels, polypharmacy and detention under Mental Health Act may suggest more severe illness), firm conclusions cannot be drawn from this. There was no recorded data using rating scales to define severity of illness, and this may have had a significant impact on length of inpatient stay.

Our data takes into account the provision of a short stay assessment ward which is included in the analysis. Other such services are seldom found in UK NHS Trusts and therefore data relating to the assessment ward and overall data may not be transferrable to other settings. While we have assessed its impact on this admission, studies have demonstrated a slight increase in risk of readmission, which has not been considered in this study\cite{15}.

Conclusions:

Our study reinforces several of the findings from previous studies regarding factors that influence length of stay for acute psychiatric patients. Length of stay is multifactoral and will likely depend on a combination of several factors including patient- and service-level factors. We have demonstrated that patient factors including diagnosis, need for increased observations and multiple medications have significant impact. Our study supports the previous findings that accommodation and support post-discharge is often a stumbling block for discharging patients who are otherwise ready for discharge.

We have also demonstrated that service-level factors play a role in length of stay. Particularly, continuity of care can be a significant factor in prolonging length of stay. While further research is needed in this area, we suggest that length of stay could be reduced by improving continuity of care wherever possible so that patients are seen within-Trust by consistent staff in a consistent location. We have demonstrated that the acute assessment ward model is effective in reducing length of stay for appropriate patients, and does not significantly prolong length of stay for those who may require a subsequent acute ward admission, however we did not assess the risk of readmission in these patients. Further research in this area would be beneficial.

Declarations

Ethics approval and consent to participate

Permission to obtain data was obtained from the Trust's Clinical Audit Department. As this study constitutes an audit or service evaluation, no ethical approval was required from the NHS Research Ethics Committee.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

NC and BS analysed and interpreted the data. NC was a major contributor in writing the manuscript. Both authors read and approved the final manuscript.

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