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Admission to Acute Mental Health Services Following Contact with Crisis Resolution and Home Treatment Teams: An investigation in two large mental healthcare providers

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Abstract

Background: Crisis resolution and home treatment teams (CRTs) offer an alternative to hospital admission. Few studies have examined predictors of relapse and readmission following contact with CRTs.

Methods: The Clinical Record Interactive Search (CRIS) was used to identify all patients receiving care from CRTs in two mental health Trusts in London from 2008-2014 (n=17,666). Rates and predictors of 12-months admission to acute mental health services following contact with CRTs were examined using Cox regression.

Findings: Approximately 50 patients per 100 person-years were admitted to acute services within 12 months post-CRT. In both cohorts, non-affective psychotic disorders (C&I: adjusted HR=1.25, 95% CI: 1.09-1.44, SLaM: adjusted HR=1.27, 95% CI: 1.17-1.38) and older age (age 65+ adjusted HRs: 1.18, 1.01-1.37; 1.32, 1.12-1.56) increased risk of admission, whereas first contact with services (adjusted HRs: 0.57, 0.52-0.62; 0.69, 0.63-0.75), anxiety disorders (adjusted HRs: 0.81, 0.69-0.96; 0.77, 0.67-0.87) and longer index CRT episodes (adjusted HRs per day: 0.996, 0.994-0.998; 0.989, 0.987-0.991) reduced risk of admission.

Interpretation: Past mental health service utilization and a diagnosis of non-affective psychosis are markers of severity of mental illness, and older age is a marker of chronicity, all more likely to be risk factors for future relapse. These findings might help clinicians and policy-makers to offer more targeted, cost-effective, services to reduce relapse rates.

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Introduction

Acute and crisis services in the UK include inpatient wards - reserved for those who are most unwell, many of whom are detained under the Mental Health Act; Crisis houses - smaller and less medical than a ward, provided within the National Health Service (NHS) or the voluntary sector; and Crisis resolution and home treatment teams (CRTs) - specialist NHS teams who respond to major mental health crisis and provide rapid assessment, home treatment, and facilitation of early discharge from hospital^{1,2}. CRTs were implemented nationally in the UK following The NHS Plan in 2000. They were designed as ward 'gatekeepers', providing intensive short-term care to vulnerable patients considered for admission or discharge³. CRTs provide multi-disciplinary interventions, including assessment and engagement of patients in crisis, psychological support and education, medication review and administration, and social support and advocacy⁴. In 2000, only a few areas of the UK were covered by CRTs, but they are now available in most Trusts in the UK⁵, and have similarly become an integral part of community care in a number of settings internationally, for example in Norway⁶ and Germany⁷.

In its 2015 review of crisis care, the UK Care Quality Commission found that only around half of community teams were able to offer an adequate 24/7 crisis service and only 14% of adults felt they were provided with the right response when in crisis⁸. In order to improve crisis care and outcomes, an England-wide national agreement between services and agencies involved in the care and support of people in crisis was launched in 2014 - The Mental Health Crisis Care Concordat⁹. The Crisis Care Concordat focuses on improving the quality and availability of crisis care and aims, among other things, to promote recovery and well-being by preventing future crises. Similarly, the NHS five year forward view for mental health stipulated that by 2020/21, NHS England should ensure that a 24/7 community-based mental health crisis response is available in all areas across England and that services are adequately resourced to offer intensive home treatment as an alternative to acute inpatient admission¹⁰.

Findings regarding the effectiveness of CRTs in reducing number of hospital admissions have been mixed. Several studies reported that CRTs contribute to reducing rates of acute psychiatric admissions¹¹⁻¹⁴ and shortening length of in-patient stay^{11, 14}. Tyrer et al.¹⁵ found a reduction in

voluntary admissions following contact with CRTs, but this was offset by a greater number of involuntary admissions. Jacobs and Barrenho¹⁶ found no evidence that CRTs affected admissions, taking into account other possible explanatory factors which may influence admission rates over time.

A recent systematic review on available models of care for people with mental health problems and in crisis concludes that while CRTs were found to be both clinically effective and cost-effective, with benefits including reductions in probability of hospital admission, the quality of evidence was low because of the small number of studies, high risk of bias in included studies, and high heterogeneity of models of care that were included¹⁷.

Few studies have examined factors associated with hospital admission following contact with CRTs. Patient characteristics that have been found to be associated with hospital admission in the short-term following contact with CRTs include social deprivation¹⁸, psychotic symptoms¹⁹, more severe mental health problems¹⁸, suicidal ideation and plans^{19,20}, and previous hospital admissions¹⁹⁻²¹.

Given the importance of community alternatives to in-patient care, and the current emphasis on improving the experience of crisis care, further studies are needed to understand the effectiveness of such services and characterize the patients who benefit from them. This study uses routinely collected electronic health records from two large mental healthcare providers in London to examine predictors of admissions to acute mental health services, following contact with CRTs between 2008-2014. Specifically, the study aims to 1) describe baseline characteristics of patients who are admitted to CRTs in the two Trusts; 2) examine rates and predictors of admission to acute mental health services (crisis teams, crisis houses or in-patient wards) within 12-months of contact with CRTs; and 3) examine predictors of admission to in-patient wards within 12-months of contact with CRTs, as this is the most costly outcome and the one least desired by patients.

Method

Settings

Data for this study were obtained from two large secondary mental health Trusts in London using

the Clinical Record Interactive Search (CRIS) system. CRIS is a platform developed to enable searches in anonymised routine electronic health records, using an explicit de-identification process²². South London and Maudsley NHS Foundation Trust (SLaM) is a large secondary mental health provider serving a geographic catchment area of four inner- and outer-city London boroughs - Croydon, Lambeth, Lewisham and Southwark - with approximately 1.36 million residents. The database currently contains full but anonymised information from over 278,000 individuals who have previously received or are currently receiving mental healthcare from SLaM²³. Camden & Islington NHS Foundation Trust (C&I) provides mental health services to two inner-city London boroughs, and approximately 440,000 residents. The C&I database contains full but anonymised information from over 108,000 mental health patients. CRIS at SLaM received ethical approval as an anonymised data resource from the Oxfordshire Research Ethics Committee C (08/H0606/71+5), and C&I CRIS received comparable ethical approval from the NRES Committee East of England - Cambridge Central (14/EE/0177).

Participants

Using the SLaM and C&I databases, we identified 18,403 individuals who were treated by CRTs between 1st January 2008 and 31st August 2014 (n=9,261 for SLaM; n=9,142 for C&I) and then followed them for 12 months. The first contact with CRTs during this time period was defined as the index CRT episode. Individuals who resided outside of the Trusts' catchment areas at time of the index episode were removed from the analysis (n=354 for SLaM; n=383 for C&I).

Outcome measure

The main outcome was defined as admission within 12-month to acute mental health services, including crisis teams, crisis houses (available only in C&I) or in-patient wards. Data on all admissions were extracted from structured fields within CRIS, to derive this outcome as a binary variable.

Socio-demographic and clinical exposures

The following variables were extracted and examined as predictors of admission: sex, age, ethnicity, marital status, social deprivation, severity of psychopathology and diagnosis. All data

obtained were those recorded closest to the date of the index CRT episode.

Severity of psychopathology was measured using the Health of the Nation Outcome Scales (HoNOS), which is a widely used and validated instrument routinely used by professionals to describe health and functioning in individuals with mental health problems²⁴. It comprises 12 items measuring different aspects of behaviour, impairment, symptoms, and social functioning, shown to be related to illness severity^{25, 26}. Every item is rated on a Likert-style scale, ranging from 0 (no problem) to 4 (severe problem), yielding a total score from 0 to 48. Higher scores are indicative of more severe psychopathology.

Neighbourhood-level Index of Multiple Deprivation (IMD) was used to estimate the level of social deprivation. The IMD combines national Census information from 38 distinct indicators into seven separate domains of deprivation (income; employment; health and disability; education, skills and training; barriers to housing and services; living environment and crime) to create an individual score of deprivation for each of the 32,482 Lower Super Output Areas (LSOAs) in England, with specific weighting of each domain. Higher scores indicate higher levels of deprivation. These LSOAs characteristically have an average population of 1,500 people (about 400 households)²⁷. IMD scores were obtained by linking the LSOA code of the patient's permanent address (as recorded in routine patient registration data at time of index CRT episode) with national data. For the purposes of this study, IMD and HoNOS scores were categorised into tertiles.

Mental healthcare diagnoses in the UK are routinely recorded using the 10th edition of International Classification of Diseases (ICD) classification system, and the following groups were derived: substance use disorders (F10-F19), schizophrenia and other non-affective psychotic disorders (F20-F29), affective disorders (F30-F39), anxiety disorders (F40-F49), personality disorders (F60-F69) and other psychiatric disorders.

Additionally, date of first contact with the Trust was extracted from clinical records. Participants with no more than 30 days between date of first contact and date of index CRT episode were defined as 'first contact' patients. Duration of the index CRT episode was defined as the number of days that elapsed between admission and discharge from the CRT. For purposes of this study, episodes that were closed and re-opened on the same day were collapsed and considered as

one single episode.

Statistical analysis

Our main outcome was defined as admission to acute mental health services (crisis teams, crisis houses or in-patient wards) within 12 months of the index CRT episode. Descriptive statistics for the study cohorts and comparisons between those with and without admissions were examined. Next, hazard ratios (HR) and their corresponding 95% confidence intervals (CI) were estimated using univariate and multivariable Cox regression models. All analyses controlled for year and team of index CRT episode. Time to admission was defined as the number of days from the index CRT episode until admission to acute services, death or end of the 12-month follow-up period. The analysis was then repeated for the narrower outcome of admission to in-patient wards. In compliance with data security and information governance regulations, data from each Trust were analysed on site, and only aggregated data were shared across sites. SLAM data were analysed using Stata version 14.0²⁸. C&I data were analyzed using SPSS version 22.0²⁹.

Multiple imputation of missing data

In the C&I database information on ethnicity, marital status, diagnosis and HoNOS was incomplete. Missing data were imputed using multiple imputations based on Multivariate Imputation by Chained Equations^{30, 31}. The multiple imputations procedure was performed in SPSS by generating 100 different data sets, and pooling their results using Rubin's rules³².

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

This study included 8,759 patients from the C&I database and 8,907 from the SLAM database who had an index CRT episode between 1st January 2008 and 31st August 2014. The socio-

demographic and clinical characteristics of both cohorts are presented in Table 1. In both cohorts, participants with index CRT episodes in the study period had a mean age of just under 40 years (C&I: 39.6 ± 14.4 , SLaM: 39.7 ± 14.1) and had a slight female predominance. The majority of participants were unmarried and around a third were in their first contact with Trust services. There was a greater proportion of individuals of White ethnic origin in the C&I cohort, and fewer participants with non-affective psychotic and affective disorders compared to the SLaM cohort. The average duration of index CRT episode for C&I participants was 14 days (SD=19.0) and 26.3 days (SD=32.6) for SLaM participants.

Rates of admission to acute mental health services within 12-month of contact with CRTs were similar in both cohorts: 53.9 per 100 person-years in C&I (3,322 of 6,160 person-years of follow-up; 95% CI: 52.1-55.8) and 51.3 per 100 person-years in SLaM (3,268 of 6,366 person-years of follow-up; 95% CI: 49.6-53.1). Table 2 compares the characteristics of participants who were admitted to acute services within 12 months of contact with CRTs and those who were not. In both cohorts, participants admitted within 12-month were more likely to be of Black ethnic origin, to have been diagnosed with non-affective psychotic disorders, and to have highest-tertile HoNOS scores (indicating more severe psychopathology). Additionally, participants admitted within 12-months were less likely to be first contact patients, and had shorter duration of index CRT episode as compared to those who were not admitted to acute mental health services within 12 months. No significant differences were observed in the distribution of sex and social deprivation.

Multivariable Cox regression models (Table 3) indicate that in both cohorts having been diagnosed with a non-affective psychotic disorder, and being over the age of 65 at the time of the index CRT episode increased the risk of admission to acute mental health services within 12-months, whereas being a first contact patient, having been diagnosed with an anxiety disorder, and having a longer duration of index CRT episode reduced risk of admission. Social deprivation was not associated with risk of admission.

Additionally, participants of Black ethnic origin were at increased risk of admission at C&I, and those of 'other' ethnic origin (non-Black, non-White) were at reduced risk of admission at SLaM.

In both cohorts, having a diagnosis that was not included in one of the pre-defined categories was significantly associated with admission within 12-months, though in opposite directions (C&I: adjusted HR=1.49, 1.24-1.79; SLaM: adjusted HR=0.59, 0.44-0.79). Finally, severity of psychopathology was associated with increased risk of admission among SLaM, but not C&I, participants.

Next, we examined rates and predictors of admission to in-patient wards within 12-months of contact with CRTs. In the C&I cohort admission rates were 23.4 per 100 person-years (95% CI: 22.2-24.6) as compared to 40.2 per 100 person-years in the SLaM cohort (95% CI: 38.7-41.8). As can be seen in Table 4, predictors of admission to in-patient wards which replicated in both cohorts were older age (65+), and having been diagnosed with a non-affective psychotic disorder. Additionally, first contact with Trust services, a diagnosis of anxiety disorder, and longer duration of index CRT episode were negatively associated with risk of admission to in-patient wards. In C&I, being female reduced the risk of admission to in-patient wards whereas being of Black ethnic origin increased the risk of admission. In SLaM, being of 'other' ethnic origin reduced the risk of admission whereas being unmarried increased the risk of admission to in-patient wards.

Discussion

Rates and predictors of admissions to acute mental health services following contact with CRTs were independently investigated two large mental health Trusts serving different catchment areas in London. The findings indicate that the rate of admission to acute services (crisis teams, crisis houses or in-patient wards) within 12 months is approximately 50 per 100 person-years. The longer duration of stay under the care of CRTs and the higher proportion of in-patient admissions observed in SLaM compared to C&I represent differences in patterns of referral and bed use which may stem from clinician and team preferences or Trust policy.

As replicated in both Trusts, having been diagnosed with a non-affective psychotic disorder and being over the age of 65 at the time of the index CRT episode increased the risk of admission within 12-months whereas being a first contact patient, having been diagnosed with an anxiety disorder and having a longer duration of index CRT episode reduced risk of admission. Social deprivation was not associated with admission within 12-months in either cohort.

When examining in-patient admissions, the most costly and least desired outcome, we found that the same variables that were associated with admission to acute mental health services within 12-months in both Trusts were also associated with the more narrowly defined outcome of admission to in-patient wards, though the magnitude of the associations differed.

Similar to our findings, Hasselberg et al.¹⁹ reported that psychotic symptoms were associated with increased risk of admission following contact with CRTs, whereas Cotton et al.²¹ and Brimblecombe, O'Sullivan & Parkinson²⁰ found that diagnostic categories did not contribute to likelihood of admission once other variables were controlled for. The only study to examine repeat admissions to CRTs among 30 patients presenting to the Luton CRT found that a diagnosis of emotionally unstable personality disorder increased the likelihood or readmission to the CRT over a 12-months period³³. We found that first contact patients were less likely to be admitted following contact with CRTs. While other studies did not examine a variable encompassing all contacts with secondary mental health services, previous hospital admissions were repeatedly found to be associated with increased risk of admission following contact with CRTs^{19, 20, 33}. Past mental health service utilization and diagnosis of non-affective psychosis may

be indicators of severe and chronic mental illness more likely to require care in general, and in-patient care specifically.

Similar to the current findings, Brooker et al.¹⁸ found that increasing age was associated with the likelihood of being admitted, while Cotton et al.²¹ found a greater risk of admission for younger patients both at 8-weeks and 6-months following contact with CRTs. Increased age, as suggested by our findings, may reflect increased chronicity of mental health problems and a greater need for care.

In the C&I cohort, participants of Black ethnic origin were more likely to be admitted within 12-months of the index CRT episode. This is in-line with the findings of a report on acute and crisis mental health care in the UK¹, concluding that once assessed by a CRT, Black and Minority Ethnic (BME) groups are generally more likely to be admitted to hospital, particularly Black Caribbean people. Similarly, Cotton et al.²¹ found higher rates of admissions in patients of Black African origin (significant in univariate but not multivariable analysis), and increased risk of compulsory admissions, suggesting a need to pay particular attention to the needs of this group when planning crisis services. This finding did not replicate in the SLaM cohort.

A consistent finding in both cohorts is the lack of association between social deprivation and risk of admission following contact with CRTs. This is in contrast with evidence from previous studies suggesting that individuals with greater social deprivation are less likely to have positive outcomes^{34, 35} and more likely to be admitted¹⁸ following contact with CRTs.

Two main differences between our study and previous studies should be noted. First, the outcome in the majority of previous studies was in-patient admission¹⁸⁻²¹ whereas the primary outcome in the current study was admission to CRTs, crisis houses or in-patient wards. Second, previous studies examined short-term predictors of admission (ranging from immediately after CRT episode²⁰ to 6 months later) while the follow-up period in this study was 12 months. It is possible that some of the differences between our findings and those of other researchers are attributable to these factors.

Strengths and limitations

This study has several limitations. First, the data were obtained from routine electronic clinical records and were not collected for research purposes. In addition, information was restricted to the period after routine recording of electronic health records had commenced (2006 at SLaM and 2008 at C&I). Hence, important information on events before that date may have been omitted, such as any prior contact with CRTs. Second, while comorbidity may increase use of acute mental health services, the current study examined only primary diagnoses listed in patients' records. We did not attempt to capture co-occurring or changing diagnoses which present potentially complex issues for analysis in a secondary care cohort³⁶. Third, the measurement of social deprivation used in this study relied on statistical data obtained from the IMD. This measure relates to census information for the area in which the person lived rather than their personal circumstances, and therefore may reflect the experience of living in an area of deprivation rather than personal deprivation experienced. Finally, variables that are not related to participants' characteristics, such as national policy, availability of beds, and team characteristics (such as staffing levels and availability of psychological input) could affect rates of admission. These variables could not be taken into account in the current analyses though we did control for year of CRT episode in an attempt to account for annual fluctuations in admission rates.

Despite these limitations, we have identified several predictors of admissions to acute mental health services within 12-months of contact with CRTs using two large databases of clinical information that are representative of everyday, real-world, clinical practice in secondary mental health services. The replication of findings across Trusts provides further validation for the findings, suggesting they are not a result of local policies or practices. The main strength of our study is that the inclusion such a large sample, namely all patients treated by CRTs during the study period. The study used data from two mental health Trusts, covering 6 inner-city London boroughs, and is likely to be generalizable to other urban settings with government-based healthcare systems.

While it can be difficult to identify all the factors contributing to admission following contact with CRTs, the current findings suggest that markers of severity and chronicity of mental illness (such as older age and a diagnosis of non-affective psychosis) are likely to increase risk for future

relapse. Identification of such factors might help clinicians and policy-makers to offer more targeted, cost-effective, services to reduce future relapse rates.

Contributors

NW, JH and DO conceived and designed the study.

NW, MB and CKC extracted and analyzed the data.

NW and CKC drafted the manuscript.

NW, CKC, MB, JH, RS and DO made substantial contributions to interpretation of the data, critically revised the manuscript for important intellectual content and approved the final version to be published.

Declaration of interests

All authors state they have no conflicts of interest relating to this manuscript.

References

1. Mind. Listening to Experience: An Independent Inquiry into Acute and Crisis Mental Healthcare. 2011 [cited 2016 30.06.2016]; Available from: https://www.mind.org.uk/media/211306/listening_to_experience_web.pdf
2. Wheeler C, Lloyd-Evans B, Churchard A, Fitzgerald C, Fullarton K, Mosse L, et al. Implementation of the Crisis Resolution Team model in adult mental health settings: a systematic review. *BMC psychiatry*. 2015; **15**: 74.
3. UK Department of Health. Crisis Resolution/Home Treatment Teams. The mental health policy implementation guide; 2001.
4. Carpenter RA, Falkenburg J, White TP, Tracy DK. Crisis teams: systematic review of their effectiveness in practice *The Psychiatrist* 2013; **37**: 232-7.
5. Lloyd-Evans B, Fullarton K, Lamb D, Johnston E, Onyett S, Osborn D, et al. The CORE Service Improvement Programme for mental health crisis resolution teams: study protocol for a cluster-randomised controlled trial. *Trials*. 2016; **17**(1): 158.
6. Karlsson B, Borg M, Eklund M, Kim HS. Profiles of and practices in crisis resolution and home treatment teams in Norway: a longitudinal survey study. *International journal of mental health systems*. 2011; **5**(1): 19.
7. Stegbauer C, Goetz K, Bauer E, Bestmann B, Ruprecht T, Szecsenyi J, et al. What contributes to good patient outcomes in the home treatment of the severely mentally ill: study protocol of a multi-centre analysis. *BMC psychiatry*. 2013; **13**: 283.
8. Care Quality Commission. Right here, right now: People's experiences of help, care and support during a mental health crisis. 2015 [cited 2016 08.11.2016]; Available from: https://www.cqc.org.uk/sites/default/files/20150630_righthere_mhcrisiscare_full.pdf
9. UK Department of Health and Concordat signatories. Mental Health Crisis Care Concordat – Improving outcomes for people experiencing mental health crisis. 2014 [cited 2016 08.11.2016]; Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281242/36353_Mental_Health_Crisis_accessible.pdf
10. Mental Health Taskforce. The five year forward view for mental health: A report from the independent Mental Health Taskforce to the NHS in England. 2016 [cited 2016 08.11.2016]; Available from: <https://www.england.nhs.uk/wp-content/uploads/2016/02/Mental-Health-Taskforce-FYFV-final.pdf>
11. Barker V, Taylor M, Kader I, Stewart K, Le Fevre P. Impact of crisis resolution and home treatment services on user experience and admission to psychiatric hospital. *Psychiatrist*. 2011; **35**: 106-10.
12. Glover G, Arts G, Babu KS. Crisis resolution/home treatment teams and psychiatric admission rates in England. *The British journal of psychiatry : the journal of mental science*. 2006; **189**: 441-5.
13. Jethwa K, Galappathie N, Hewson P. Effects of a crisis resolution and home treatment team on in-patient admissions. *Psychiatr Bull*. 2007; **31**: 170-2.
14. Johnson S, Nolan F, Pilling S, Sandor A, Hoult J, McKenzie N, et al. Randomised controlled trial of acute mental health care by a crisis resolution team: the north Islington crisis study. *BMJ*. 2005; **331**(7517): 599.
15. Tyrer P, Gordon F, Nourmand S, Lawrence M, Curran C, Southgate D, et al. Controlled comparison of two crisis resolution and home treatment teams. *The Psychiatrist Online*. 2010; **34**: 50-4.
16. Jacobs R, Barrenho E. Impact of crisis resolution and home treatment teams on psychiatric admissions in England. *The British journal of psychiatry : the journal of mental science*. 2011; **199**(1): 71-6.
17. Paton F, Wright K, Ayre N, Dare C, Johnson S, Lloyd-Evans B, et al. Improving outcomes for people in mental health crisis: a rapid synthesis of the evidence for available models of care; 2016.

18. Brooker C, Ricketts T, Bennett S, Lemme F. Admission decisions following contact with an emergency mental health assessment and intervention service. *Journal of clinical nursing*. 2007; **16**(7): 1313-22.
19. Hasselberg N, Grawe RW, Johnson S, Saltyte-Benth J, Ruud T. Psychiatric admissions from crisis resolution teams in Norway: a prospective multicentre study. *BMC psychiatry*. 2013; **13**: 117.
20. Brimblecombe N, O'Sullivan G, Parkinson B. Home treatment as an alternative to inpatient admission: characteristics of those treated and factors predicting hospitalization. *Journal of psychiatric and mental health nursing*. 2003; **10**(6): 683-7.
21. Cotton MA, Johnson S, Bindman J, Sandor A, White IR, Thornicroft G, et al. An investigation of factors associated with psychiatric hospital admission despite the presence of crisis resolution teams. *BMC psychiatry*. 2007; **7**: 52.
22. Fernandes AC, Cloete D, Broadbent MT, Hayes RD, Chang CK, Jackson RG, et al. Development and evaluation of a de-identification procedure for a case register sourced from mental health electronic records. *BMC medical informatics and decision making*. 2013; **13**: 71.
23. Perera G, Broadbent M, Callard F, Chang CK, Downs J, Dutta R, et al. Cohort profile of the South London and Maudsley NHS Foundation Trust Biomedical Research Centre (SLaM BRC) Case Register: current status and recent enhancement of an Electronic Mental Health Record-derived data resource. *BMJ open*. 2016; **6**(3): e008721.
24. Wing JK, Beevor AS, Curtis RH, Park SB, Hadden S, Burns A. Health of the Nation Outcome Scales (HoNOS). Research and development. *The British journal of psychiatry : the journal of mental science*. 1998; **172**: 11-8.
25. McClelland R, Trimble P, Fox ML, Stevenson MR, Bell B. Validation of an outcome scale for use in adult psychiatric practice. *Quality in health care : QHC*. 2000; **9**(2): 98-105.
26. Theodoridou A, Jaeger M, Ketteler D, Kawohl W, Lauber C, Hoff P, et al. The concurrent validity and sensitivity of change of the German version of the health of the nation outcome scales in a psychiatric inpatient setting. *Psychopathology*. 2011; **44**(6): 391-7.
27. Department of Communities and Local Government. The English Indices of Deprivation 2010. 2011 [cited 2016 04.07.2016]; Available from: <http://www.gov.uk/government/publications/english-indices-of-deprivation-2010>
28. Stata Corp. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP; 2015.
29. IBM Corp. IBM SPSS Statistics for Windows. 22 ed. Armonk, NY: IBM Corp.; 2013.
30. Azur MJ, Stuart EA, Frangakis C, Leaf PJ. Multiple imputation by chained equations: what is it and how does it work? *Int J Methods Psychiatr Res*. 2011; **20**: 40-9.
31. van Buuren S. Multiple imputation of discrete and continuous data by fully conditional specification. *Stat Methods Med Res*. 2007; **16**: 219-42.
32. Rubin DB. Multiple Imputation for Nonresponse in Surveys. New York: John Wiley & Sons; 1987.
33. Lunawat VK, Karale M. Repeat users of crisis resolution and home treatment team. *Psychiatria Danubina*. 2014; **26 Suppl 1**: 10-4.
34. Hunt GE, Siegfried N, Morley K, Sitharthan T, Cleary M. Psychosocial interventions for people with both severe mental illness and substance misuse. *The Cochrane database of systematic reviews*. 2013; (10): CD001088.
35. Kingsford R, Webber M. Social deprivation and the outcomes of crisis resolution and home treatment for people with mental health problems: a historical cohort study. *Health & social care in the community*. 2010; **18**(5): 456-64.
36. Chang CK, Hayes RD, Perera G, Broadbent MT, Fernandes AC, Lee WE, et al. Life expectancy at birth for people with serious mental illness and other major disorders from a secondary mental health care case register in London. *PLoS One*. 2011; **6**(5): e19590.

Table 1. Socio-demographic and clinical characteristics of the study cohorts

		Camden & Islington (n=8,759)	South London and Maudsley (n=8,907)
Sex	Male	4,174 (47.7%)	4,017 (45.1%)
	Female	4,585 (52.3%)	4,890 (54.9%)
Age at index crisis team episode (years)	<25	1,422 (16.2%)	1,456 (16.5%)
	25-34	2,213 (25.3%)	2,261 (25.4%)
	35-44	2,119 (24.2%)	2,235 (25.1%)
	45-54	1,705 (19.5%)	1,683 (18.9%)
	55-64	790 (9.0%)	818 (9.2%)
	65+	510 (5.8%)	444 (5.0%)
Ethnicity	White	5,940 (67.8%)	4,457 (50.0%)
	Black	1,315 (15.0%)	3,017 (33.9%)
	Other / mixed / unknown	1,504 (17.2%)	1,433 (16.1%)
Marital status (unmarried)		7,527 (85.9%)	7,168 (80.5%)
Social deprivation ¹		33.4 ± 10.8	31.2 ± 9.3
First contact with Trust		3,158 (36.1%)	2,499 (28.1%)
Psychiatric diagnosis	Substance use disorders	901 (10.3%)	475 (5.3%)
	Non-affective Psychotic disorders	2,139 (24.4%)	3,092 (34.7%)
	Affective disorders	2,498 (28.5%)	3,277 (36.8%)
	Anxiety disorders	1,114 (12.7%)	1,047 (11.8%)
	Personality disorders	826 (9.5%)	302 (3.4%)
	Other	1,281 (14.6%)	714 (8.0%)
Severity of psychopathology ²		13.3 ± 6.4	11.8 ± 5.5
Duration of index crisis team episode (days)		14.0 ± 19.0	26.3 ± 32.6

¹ Higher IMD scores indicate higher levels of deprivation

² Higher Health of the Nation Outcome Scales (HoNOS) scores indicate more severe psychopathology; HoNOS scores were missing for 1.2% of the South London and Maudsley cohort.

Table 2. Differences between patients who were and were not admitted to acute mental health services within 12 months of index CRT episode

		Camden & Islington			South London and Maudsley		
		Admission (n=3,322)	No admission (n=5,437)	p-value	Admission (n=3,268)	No admission (n=5,639)	p-value
Sex	Male	1,563 (47.0%)	2,611 (48.0%)	0.40	1,512 (46.3%)	2,505 (44.4%)	0.09
	Female	1,759 (53.0%)	2,826 (52.0%)		1,756 (53.7%)	3,134 (55.6%)	
Age at index crisis team episode (years)	<25	481 (14.5%)	941 (17.3%)	<0.0001	516 (15.8%)	950 (16.9%)	0.07
	25-34	785 (23.6%)	1,428 (26.3%)		791 (24.2%)	1,470 (26.1%)	
	35-44	857 (25.8%)	1,262 (23.2%)		840 (25.7%)	1,395 (24.8%)	
	45-54	652 (19.6%)	1,053 (19.4%)		626 (19.2%)	1,057 (18.7%)	
	55-64	328 (9.9%)	462 (8.5%)		312 (9.6%)	506 (9.0%)	
	65+	219 (6.6%)	291 (5.4%)		183 (5.6%)	261 (4.6%)	
Ethnicity	White	2,178 (65.6%)	3,762 (69.2%)	<0.0001	1,605 (49.1%)	2,852 (50.6%)	<0.0001
	Black	605 (18.2%)	710 (13.1%)		1,234 (37.8%)	1,783 (31.6%)	
	Other / mixed / unknown	539 (16.2%)	965 (17.7%)		429 (13.1%)	1,004 (17.8%)	
Marital status (unmarried)		2,891 (87.0%)	4,636 (85.2%)	0.07	2,724 (83.4%)	4,444 (78.8%)	<0.0001
Social deprivation	1 st tertile	1,103 (33.2%)	1,828 (33.6%)	0.60	1,038 (31.8%)	1,917 (31.8%)	0.09
	2 nd tertile	1,107 (33.3%)	1,846 (34.0%)		1,111 (34.0%)	1,872 (33.2%)	
	3 rd tertile	1,112 (33.5%)	1,763 (32.4%)		1,119 (34.2%)	1,850 (32.8%)	
First contact with Trust		832 (25.1%)	2,326 (42.9%)	<0.0001	628 (19.2%)	1,871 (33.1%)	<0.0001
Psychiatric diagnosis	Substance use disorders	315 (9.4%)	586 (10.7%)	<0.0001	199 (6.1%)	276 (4.9%)	<0.0001
	Non-affective Psychotic disorders	987 (29.7%)	1,152 (21.2%)		1,401 (42.9%)	1,691 (30.0%)	
	Affective disorders	859 (25.8%)	1,639 (30.0%)		1,127 (34.5%)	2,150 (38.1%)	
	Anxiety disorders	304 (9.2%)	810 (14.9%)		278 (8.5%)	769 (13.6%)	
	Personality disorders	326 (9.9%)	500 (9.4%)		120 (3.7%)	182 (3.2%)	
	Other	531 (16.0%)	750 (13.8%)		143 (4.4%)	571 (10.1%)	
Severity of psychopathology	1 st tertile	1,135 (34.2%)	1,853 (34.1%)	0.02	959 (29.4%)	1,631 (28.9%)	<0.0001
	2 nd tertile	1,009 (30.4%)	1,791 (32.9%)		1,143 (35.0%)	1,933 (34.3%)	
	3 rd tertile	1,178 (35.4%)	1,793 (33.0%)		1,161 (35.5%)	1,973 (35.0%)	
Duration of index crisis team episode (days)		13.3 ± 18.3	14.4 ± 19.4	0.02	21.7 ± 26.8	29.0 ± 35.3	<0.0001

Table 3. Risk factors for 12-months admission to acute mental health services - Cox proportional hazards model

		Camden & Islington		South London and Maudsley	
		Partially Adjusted HR (95% CI)*	Fully Adjusted HR (95% CI)**	Partially Adjusted HR (95% CI)*	Fully Adjusted HR (95% CI)**
Sex (Female)		1.03 (0.96-1.10)	1.06 (0.99-1.14)	1.06 (0.99-1.13)	1.01 (0.94-1.08)
Age at index crisis team episode (years)	<25	0.97 (0.87-1.09)	1.06 (0.94-1.19)	1.01 (0.91-1.13)	1.08 (0.96-1.20)
	25-34	1	1	1	1
	35-44	1.15 (1.04-1.27)	1.07 (0.97-1.18)	1.06 (0.96-1.17)	0.99 (0.90-1.09)
	45-54	1.09 (0.98-1.21)	0.99 (0.89-1.10)	1.10 (0.99-1.22)	1.01 (0.9-1.12)
	55-64	1.24 (1.09-1.41)	1.12 (0.98-1.27)	1.12 (0.98-1.27)	1.06 (0.93-1.21)
	65+	1.40 (1.20-1.61)	1.18 (1.01-1.37)	1.42 (1.21-1.67)	1.32 (1.12-1.56)
Ethnicity	White	1	1	1	1
	Black	1.33 (1.21-1.46)	1.23 (1.11-1.35)	1.14 (1.06-1.23)	1.03 (0.95-1.12)
	Other / mixed / unknown	0.99 (0.89-1.09)	1.01 (0.92-1.12)	0.80 (0.72-0.89)	0.82 (0.74-0.92)
Marital status (unmarried)		1.11 (0.98-1.25)	1.05 (0.93-1.19)	1.25 (1.14-1.37)	1.10 (1.00-1.21)
Social deprivation	1 st tertile	1	1	1	1
	2 nd tertile	1.00 (0.92-1.08)	0.99 (0.91-1.07)	1.10 (1.01-1.19)	1.04 (0.96-1.14)
	3 rd tertile	1.03 (0.95-1.12)	1.03 (0.94-1.12)	1.10 (1.01-1.19)	1.02 (0.93-1.11)
First contact with Trust		0.55 (0.51-0.59)	0.57 (0.52-0.62)	0.57 (0.52-0.62)	0.69 (0.63-0.75)
Psychiatric diagnosis	Substance use disorder	1.01 (0.84-1.21)	0.91 (0.77-1.09)	1.28 (1.10-1.48)	1.18 (1.01-1.37)
	Non-affective Psychotic disorders	1.41 (1.22-1.62)	1.25 (1.09-1.44)	1.37 (1.26-1.48)	1.27 (1.17-1.38)
	Affective disorders	1	1	1	1
	Anxiety disorders	0.79 (0.67-0.94)	0.81 (0.69-0.96)	0.74 (0.65-0.85)	0.77 (0.67-0.87)
	Personality disorders	1.14 (0.94-1.39)	1.08 (0.90-1.30)	1.21 (1.00-1.46)	1.06 (0.87-1.28)
	Other	1.33 (1.13-1.58)	1.34 (1.15-1.57)	0.54 (0.46-0.65)	0.59 (0.49-0.70)
	Severity of psychopathology	1 st tertile	1	1	1
2 nd tertile	0.96 (0.87-1.05)	0.95 (0.87-1.05)	1.05 (0.96-1.14)	1.11 (1.02-1.21)	
3 rd tertile	1.09 (0.99-1.21)	1.06 (0.95-1.17)	1.07 (0.98-1.16)	1.16 (1.06-1.26)	
Duration of index crisis team episode (days)		0.996 (0.994-0.998)	0.996 (0.994-0.998)	0.989 (0.987-0.991)	0.989 (0.987-0.991)

*Adjusted for year and team of index CRT episode only

**Adjusted for year and team of index CRT episode, and all other variables

Table 4. Risk factors for 12-months admission to inpatient wards - Cox proportional hazards model

		Camden & Islington		South London and Maudsley	
		Partially Adjusted HR (95% CI)*	Fully Adjusted HR (95% CI)**	Partially Adjusted HR (95% CI)*	Fully Adjusted HR (95% CI)**
Sex (Female)		0.76 (0.69-0.84)	0.84 (0.76-0.94)	1.09 (1.01-1.17)	1.04 (0.96-1.13)
Age at index crisis team episode (years)	<25	0.95 (0.79-1.14)	1.10 (0.91-1.32)	1.05 (0.92-1.18)	1.10 (0.97-1.24)
	25-34	1	1	1	1
	35-44	1.19 (1.02-1.39)	1.07 (0.92-1.25)	1.03 (0.92-1.15)	0.97 (0.87-1.08)
	45-54	1.24 (1.06-1.45)	1.07 (0.91-1.26)	1.09 (0.96-1.22)	1.02 (0.90-1.14)
	55-64	1.51 (1.25-1.83)	1.28 (1.06-1.56)	1.15 (1.00-1.33)	1.12 (0.97-1.30)
	65+	2.37 (1.94-2.89)	1.86 (1.51-2.28)	1.29 (1.07-1.56)	1.23 (1.01-1.48)
Ethnicity	White	1	1	1	1
	Black	1.79 (1.58-2.04)	1.52 (1.33-1.74)	1.10 (1.01-1.19)	1.00 (0.92-1.10)
	Other / mixed / unknown	1.07 (0.92-1.24)	1.12 (0.96-1.31)	0.82 (0.73-0.92)	0.85 (0.75-0.96)
Marital status (unmarried)		1.26 (1.06-1.51)	1.14 (0.95-1.36)	1.31 (1.17-1.45)	1.15 (1.03-1.29)
Social deprivation	1 st tertile	1	1	1	1
	2 nd tertile	1.00 (0.88-1.13)	0.99 (0.87-1.12)	1.06 (0.96-1.16)	1.01 (0.91-1.11)
	3 rd tertile	1.02 (0.89-1.15)	1.00 (0.88-1.14)	1.07 (0.97-1.18)	1.00 (0.91-1.10)
First contact with Trust		0.38 (0.33-0.43)	0.43 (0.37-0.50)	0.57 (0.52-0.63)	0.68 (0.61-0.76)
Psychiatric diagnosis	Substance use disorders	1.33 (1.03-1.71)	1.11 (0.87-1.41)	1.36 (1.16-1.61)	1.24 (1.05-1.46)
	Non-affective Psychotic disorders	2.26 (1.87-2.73)	1.79 (1.49-2.15)	1.35 (1.23-1.47)	1.25 (1.14-1.38)
	Affective disorders	1	1	1	1
	Anxiety disorders	0.50 (0.37-0.68)	0.53 (0.40-0.71)	0.78 (0.67-0.91)	0.81 (0.70-0.94)
	Personality disorders	0.79 (0.58-1.07)	0.78 (0.58-1.04)	1.32 (1.08-1.62)	1.16 (0.95-1.43)
	Other	1.90 (1.52-2.38)	1.82 (1.48-2.23)	0.57 (0.46-0.69)	0.61 (0.50-0.76)
Severity of psychopathology	1 st tertile	1	1	1	1
	2 nd tertile	0.93 (0.80-1.07)	0.92 (0.80-1.06)	1.02 (0.92-1.12)	1.06 (0.96-1.17)
	3 rd tertile	1.21 (1.05-1.40)	1.15 (1.00-1.32)	1.04 (0.95-1.15)	1.10 (1.00-1.22)
Duration of index crisis team episode (days)		0.991 (0.988-0.995)	0.992 (0.988-0.995)	0.989 (0.986-0.991)	0.989 (0.987-0.992)

*Adjusted for year and team of index CRT episode only

**Adjusted for year and team of index CRT episode, and all other variables