The association between primary care quality and health-care use, costs and outcomes for people with serious mental illness: a retrospective observational study

Rowena Jacobs,[1*] Lauren Aylott,[2,3] Ceri Dare,[2] Tim Doran,[3] Simon Gilbody,[3,4] Maria Goddard,[1] Hugh Gravelle,[1] Nils Gutacker,[1] Panagiotis Kasteridis,[1] Tony Kendrick,[5] Anne Mason,[1] Nigel Rice,[1] Jemimah Ride,[1] Najma Siddiqi[3,4,6] and Rachael Williams[7]

[1]Centre for Health Economics, University of York, York, UK
[2]Expert by experience
[3]Hull York Medical School, York, UK
[4]Department of Health Sciences, University of York, York, UK
[5]Primary Care and Population Sciences, Aldermoor Health Centre, University of Southampton, Southampton, UK
[6]Bradford District Care NHS Foundation Trust, Bradford, UK
[7]Clinical Practice Research Datalink, Medicines and Healthcare products Regulatory Agency, London, UK

*Corresponding author rowena.jacobs@york.ac.uk

Declared competing interests of authors: Simon Gilbody is Deputy Chairperson of the National Institute for Health Research Health Technology Assessment Commissioning Board (2017 to present) and sits on the Health Technology Assessment Post-Funding Committee teleconference (Programme Oversight Committee members to attend) and Health Technology Assessment Funding Committee Policy Group (formerly the Clinical Studies Group). Rachael Williams is employed by Clinical Practice Research Datalink, which received funding from the University of York for access to research data and services used in this study. Clinical Practice Research Datalink additionally provided funding for access to research data and services used in this study.

Published June 2020
DOI: 10.3310/hsdr08250

Scientific summary

Primary care quality for people with serious mental illness

Health Services and Delivery Research 2020; Vol. 8: No. 25
DOI: 10.3310/hsdr08250

NIHR Journals Library www.journalslibrary.nihr.ac.uk

Scientific summary

Background

Serious mental illness is a set of chronic conditions, including schizophrenia, bipolar disorder and other psychoses. It is linked with high disease burden, poor health outcomes, high treatment costs and lower life expectancy. The UK population prevalence of bipolar disorder is around 1–2% and the lifetime prevalence of schizophrenia is around 1%. Total monetary costs in England in 2012 were £6.0B for bipolar disorder and £11.8B for schizophrenia and psychoses, mainly from costs to public services, informal care and lost labour market output. Most people with a serious mental illness are treated chiefly in primary care by their general practitioner.

Research questions

High-quality primary care has the potential to improve the health and well-being of patients with serious mental illness and to reduce health-care utilisation and costs. We examined the association between the quality of primary care for people with serious mental illness and seven outcome measures:

1. emergency hospital admissions for serious mental illness
2. preventable admissions – emergency admissions for ambulatory care sensitive conditions (conditions for which better-quality care should reduce the probability of an emergency hospital admission)
3. all unplanned admissions
4. attendance at accident and emergency departments
5. mortality
6. re-entry into specialist mental health services
7. costs incurred for people with serious mental illness in primary and secondary care, and in community mental health services.

Outcomes 1–6 were analysed in terms of 'time to event'.

Methods

Quality measures

The Quality and Outcomes Framework incentivises general practitioners for meeting quality targets for patients with certain chronic conditions, including serious mental illness. We studied two patient-level quality indicators from the mental health domain of the Quality and Outcomes Framework: (1) whether or not a patient with serious mental illness had a care plan and (2) whether or not they had received an annual physical health review.

As the Quality and Outcomes Framework quality measures cover only some aspects of quality, we undertook a systematic literature review to identify other measures of primary care quality for which indicators could be available in routine administrative data. This led us to choose two non-Quality and Outcomes Framework patient-level quality indicators: (1) continuity of consultations with the same general practitioner and (2) antipsychotic polypharmacy.

We used three widely applied indices of general practitioner care continuity. The extent of dispersion across different general practitioners involved in the patient's care was measured using the Continuity of Care Index. The density of visits to a single general practitioner was measured with the Usual Provider of Care Index and the pattern of visits across general practitioners was measured with the Sequential Continuity Index.

We defined antipsychotic polypharmacy as the concurrent use of two or more antipsychotic substances for at least a 30-day period. As a check on the robustness of this, we also considered longer and shorter periods (thereby respectively reducing and increasing the amount of polypharmacy).

Data

We used a retrospective observational study design and followed four cohorts of primary care patients with serious mental illness. We drew our patient samples from primary care practices in England that contribute to the Clinical Practice Research Datalink GOLD database. Clinical Practice Research Datalink linked the general practice records of patients with (1) their records in the Hospital Episode Statistics admitted patient care data and attendances at accident and emergency departments, (2) community mental health service records in the Mental Health Minimum Data Set and (3) mortality data from the Office for National Statistics. The Clinical Practice Research Datalink classified practices as rural or non-rural. We provided the Clinical Practice Research Datalink with data on the distances from all English general practices to the nearest hospital and nearest mental health inpatient facility, and the Clinical Practice Research Datalink attached four categorical indicators of these distances to the practices in our sample.

In addition to the quality and outcome measures, we constructed a set of covariates for each patient from the electronic patient records. Covariates included age (19–35, 36–45, 46–55, 56–65, > 65 years), sex, number of Charlson Comorbidity Index comorbidities, depression, smoking status, alcohol status, type of serious mental illness diagnosis (e.g. schizophrenia) and time since their first serious mental illness diagnosis. For each patient, the Clinical Practice Research Datalink attached a categorical measure of deprivation from the Index of Multiple Deprivation rank of the small area (lower-layer super output area) in which the patient lived.

Hospital Episode Statistics hospital admission data covered the period of 1 April 2000 to 31 March 2014. Accident and emergency data were available for the period of 1 April 2007 to 31 March 2014. We used data from the Mental Health Minimum Data Set for the period of 1 April 2011 to 31 March 2014, as earlier data were in an alternative format.

The start of the observation period for a patient was the latest of the following: 365 days after their date of registration with the practice, 1 January of the year after the patient turned 18 years of age or the date of their serious mental illness diagnosis. The end of the observation period was the earliest of the following: the end of their registration with the practice, date of death or 31 March 2014.

The four sample sizes for analyses varied because of differences in data availability on key characteristics and outcomes, and inclusion criteria for each specific analysis. For the analyses of the associations of unplanned hospital admissions and accident and emergency attendances with care plans, annual reviews and continuity, data were available for 19,324 individuals. For models in which the quality measure was polypharmacy, patients had to have had at least one record of an antipsychotic drug and the sample size was 17,255 patients for unplanned admissions and mortality, and 13,247 patients for accident and emergency attendance. We had data on 9907 patients for models of re-entry to specialist mental health services. The models of NHS cost used samples of 16,485 patients. The analysis samples were drawn from 214 or 215 general practices.

Statistical methods

We used survival analysis to examine the relationship between quality and all of the outcomes, except NHS costs. Hospital admissions, accident and emergency attendances, re-entry to specialist mental health services and mortality are events for which occurrence should be reduced or delayed by higher-quality primary care. We therefore used survival models to investigate whether or not the time to first occurrence of the outcome of interest was associated with the quality measure.

We used discrete-time survival analysis, which is appropriate when time to an event is recorded in discrete intervals rather than continuous time, for our analyses of continuity of care. This was because the measures of continuity were based on consultations with general practitioners within a 12-month period. We divided time into 3-month blocks and investigated the association between quality indicators in the prior 12 months (four blocks) and occurrence of the outcome in a 3-month period. We fitted a complementary log–log proportional hazards model for each outcome. The hazard function is the probability that the outcome event occurs during a particular (usually very small) period, given that it has not occurred before the start of the period and that the individual is still observed in the data. We were interested in the effect of the quality measures (which vary from period to period) on the hazard rate. We also allowed the hazard function to vary between 3-month periods by specifying dummy variables for each 3-month period so that the hazard function is constant within each period, but can vary across periods. This allows for greater flexibility in the modelling.

Although we included observed characteristics of individuals in the model, it is possible that the hazard of the outcome is affected by unobserved patient characteristics, which may also be correlated with the observed quality indicators. These are often referred to as unobserved confounding factors and their omission from a model can lead to biased estimates of the treatment of interest. In models in which the outcome is a linear function of the explanatory variables, it is possible to control for unobserved time-invariant patient factors by including a dummy variable for each individual. This is often termed a fixed-effects model. This does not, however, extend to models in which the outcome is a non-linear function of the explanatory variables, which is the case for our models. Instead, we adopted an alternative procedure. We assumed that the effect of the unobserved patient characteristics is random and follows a normal distribution. The mean of this random error can be modelled as a function of the mean of the observed time-varying patient characteristics. These variables capture confounding by unobserved time-invariant patient factors (e.g. long-standing illness, health-seeking behaviour) that affect both primary care quality and health-care utilisation, and approximate a fixed-effects approach. As the three continuity measures were highly correlated, we estimated three separate models to investigate their association with outcomes.

We also investigated the association between polypharmacy and the occurrence of three outcomes: (1) unplanned hospital admissions (all cause), (2) accident and emergency attendances and (3) mortality. We again estimated survival models, but as we did not study continuity of care as a quality indicator in these models, we estimated continuous-time survival models instead. These models have the advantage of examining the exact timing of events, which provides more precise inference than can be obtained with a discrete-time survival model.

For the analysis of the relationship between primary care quality and NHS costs incurred for people with serious mental illness, we calculated costs of primary care, general hospital care (including accident and emergency) and specialist mental health care (including inpatient- and community-based care) for each quarter in each year for each patient. We then constructed a panel data set of repeated observations on each patient.

As patient health-care costs are highly skewed, with a long right tail and a non-trivial proportion of zero costs, we estimated two-part models. The first part models the probability of non-zero costs using a probit model. The second part models the level of cost for those with positive costs using a generalised linear model with a gamma variance function and log-link function. These were chosen on

the basis of specification tests for best fit to data. The models contained three quality measures (care plan, annual review and general practitioner continuity), plus patient and practice characteristics. To allow for unobserved patient factors correlated with cost and quality, we assumed that they had random effects with a mean for each patient, which was determined by the mean of their observed characteristics.

For the survival analysis, models of unplanned hospital use, accident and emergency attendances, re-entry to specialist mental health services and mortality, we report hazard ratios (the proportional change in the underlying hazard of the outcome for a unit change in the quality measure). The quality variable increased the outcome if its hazard ratio is > 1 and reduced it if the hazard ratio is < 1.

Patient and public involvement

Two members of the research team had lived experience of serious mental illness and contributed to all aspects of the study.

Results

Having a care plan was associated with lower hazard for accident and emergency attendances of 26% (hazard ratio 0.74, 95% confidence interval 0.69 to 0.80), 33% for serious mental illness admission (hazard ratio 0.67, 95% confidence interval 0.59 to 0.75) and 27% for preventable admission (hazard ratio 0.73, 95% confidence interval 0.64 to 0.83). Care plans were associated with lower overall health-care costs (£53 per patient, on average), primary care costs (£9), hospital costs (£26) and mental health-care costs (£12) in the current 3-month period. There was no statistically significant association of having a care plan with re-entering specialist mental health care.

Annual reviews were associated with a reduction of 20% for accident and emergency attendances (hazard ratio 0.80, 95% confidence interval 0.76 to 0.85), 25% for serious mental illness admission (hazard ratio 0.75, 95% confidence interval 0.67 to 0.84) and 24% for preventable admission (hazard ratio 0.76, 95% confidence interval 0.67 to 0.87). Annual reviews were associated with lower primary care (£9), mental health care (£30) and total costs (£34), but not hospital costs.

High general practitioner continuity on the Continuity of Care Index (results similar for the other indices) was associated with 11% lower hazard of accident and emergency presentation (hazard ratio 0.89, 95% confidence interval 0.83 to 0.97) and 23% lower hazard of preventable admission (hazard ratio 0.77, 95% confidence interval 0.65 to 0.92), but not with risk of serious mental illness admission. High continuity was associated with lower primary care costs (£3), but not with other costs.

There was no statistically significant association of continuity with re-entering specialist mental health care.

Polypharmacy was not statistically significantly associated with the risk of accident and emergency presentation, unplanned admission or death.

Limitations

Patients were included in our analyses on the basis of serious mental illness diagnosis codes in their practice record. Thus, patients who were not permanently registered with a general practice or with undetected, unrecorded or as yet undiagnosed serious mental illness, were not included. General practitioners may also prefer to use free-text comments to record the mental health status of the patient. Thus, the number of patients with serious mental illness in a practice may be under-reported.

Concerns about identification of practices in the Clinical Practice Research Datalink means that there was relatively sparse information on practice characteristics, such as staffing, location, performance on other quality measures or patient-reported access, which may affect outcomes.

Conclusions

Our study provides the first systematic identification of indicators of quality of primary care for people with serious mental illness. These indicators were tested for their effect on outcomes in a robust way, using linked primary and secondary data. The results confirmed the value of processes enshrined in current incentive schemes. Care plans and annual reviews function as good-quality indicators in the Quality and Outcomes Framework. The results also suggest continuity of care as an important indicator. In particular, seeing the same general practitioner over time can improve the physical health of people with serious mental illness. Higher continuity may reduce the risk of preventable admissions through improved management of physical health, by facilitating familiarity, communication, trust and quality of relationship between doctor and patient.

Recommendations for research

- Better evidence is needed on the impact of primary care quality on a broader set of health outcomes. Routine recording of measures of social functioning, health-related quality of life, patient experience and key outcomes, such as employment and housing status, are central to the ability to undertake research that goes beyond consideration of process measures.
- The mechanisms by which primary care quality affects utilisation of secondary care needs to be better understood.
- Understanding variations in an individual's capacity to benefit from specific interventions could enable clinicians to target efforts and deliver person-centred care.
- A better evidence base is needed on what outcomes are valued by people with serious mental illness, so that efforts can be prioritised according to what matters most to patients.
- Evidence is needed on the interfaces between health care, social care and informal care. Focusing only on one or two parts of the system risks ignoring wider social determinants of health.
- A fuller understanding of resource implications is needed to inform resource allocation, for example how resources 'saved' across sectors could be reinvested.
- Data coverage and linkage, specifically for mental health, should be improved to address further research needs.

Funding

This project was funded by the National Institute for Health Research (NIHR) Health Services and Delivery Research programme and will be published in full in *Health Services and Delivery Research*; Vol. 8, No. 25. See the NIHR Journals Library website for further project information.

Health Services and Delivery Research

ISSN 2050-4349 (Print)

ISSN 2050-4357 (Online)

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: journals.library@nihr.ac.uk

The full HS&DR archive is freely available to view online at www.journalslibrary.nihr.ac.uk/hsdr. Print-on-demand copies can be purchased from the report pages of the NIHR Journals Library website: www.journalslibrary.nihr.ac.uk

Criteria for inclusion in the *Health Services and Delivery Research* journal

Reports are published in *Health Services and Delivery Research* (HS&DR) if (1) they have resulted from work for the HS&DR programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

HS&DR programme

The HS&DR programme funds research to produce evidence to impact on the quality, accessibility and organisation of health and social care services. This includes evaluations of how the NHS and social care might improve delivery of services.

For more information about the HS&DR programme please visit the website at https://www.nihr.ac.uk/explore-nihr/funding-programmes/health-services-and-delivery-research.htm

This report

The research reported in this issue of the journal was funded by the HS&DR programme or one of its preceding programmes as project number 13/54/40. The contractual start date was in January 2015. The final report began editorial review in July 2019 and was accepted for publication in January 2020. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HS&DR editors and production house have tried to ensure the accuracy of the authors' report and would like to thank the reviewers for their constructive comments on the final report document. However, they do not accept liability for damages or losses arising from material published in this report.

Published by the NIHR Journals Library (www.journalslibrary.nihr.ac.uk), produced by Prepress Projects Ltd, Perth, Scotland (www.prepress-projects.co.uk).