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Original Research

Using Avoidable Admissions to Measure Quality of Care for Cardiometabolic and Other Physical Comorbidities of Psychiatric Disorders: A Population-Based, Record-Linkage Analysis

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Objective: Quality of care for comorbid physical disorders in psychiatric patients can be assessed by the number of avoidable admissions for ambulatory care sensitive (ACS) conditions. These are admissions for physical conditions that, with appropriate primary care, should not require inpatient treatment. Avoidable admissions for ACS conditions feature prominently in Australia's National Health Performance Framework and have been used to assess health care provision for marginalized groups, such as Indigenous patients or those of lower socioeconomic status. They have not been applied to people with mental illness.

Methods: A population-based, record-linkage analysis was used to measure ACS admissions for physical disorder in psychiatric patients of state-based facilities in Queensland, Australia, during 5 years.

Results: There were 77 435 males (48.0%) and 83 783 females (52%) (total *n* = 161 218). Among these, 13 219 psychiatric patients (8.2%) had at least 1 ACS admission, the most common being for diabetes (*n* = 6086) and angina (*n* = 2620). Age-standardized rates were double those of the general population. Within the psychiatric group, and after adjusting for confounders, those who had ever been psychiatric inpatients experienced the highest rates of ACS admissions, especially for diabetes.

Conclusions: In common with other marginalized groups, psychiatric patients have increased ACS admissions. Therefore, this measure could be used as an indicator of difficulties in access to appropriate primary care in Canada, given the availability of similar administrative data.

Utiliser les hospitalisations évitables pour mesurer la qualité des soins pour les comorbidités physiques et cardio-métaboliques des troubles psychiatriques : une analyse populationnelle par couplage de dossiers

Objectif : La qualité des soins pour les troubles physiques comorbides des patients psychiatriques peut être évaluée par le nombre d'hospitalisations évitables pour des affections propices aux soins ambulatoires (PSA). Il s'agit d'hospitalisations pour des affections physiques qui, avec les soins de première ligne appropriés, ne devraient pas nécessiter de traitement à l'hôpital. Les hospitalisations évitables pour les affections PSA se trouvent principalement dans le cadre du rendement de la santé nationale d'Australie et servent à évaluer la prestation des soins de santé pour les groupes marginalisés, comme les patients autochtones et ceux faible socioéconomique. Elles n'ont pas été appliquées aux personnes souffrant de maladie mentale.

Méthodes : Une analyse par couplage de dossiers, dans la population, a servi à mesurer les hospitalisations PSA pour un trouble physique de patients psychiatriques venant d'établissements publics du Queensland, en Australie, durant 5 ans.

Résultats : Il y avait 77 435 hommes (48,0 %) et 83 783 femmes (52 %) (total *n* = 161 218). Parmi ceux-ci, 13 219 patients psychiatriques (8,2 %) avaient au moins 1 hospitalisation PSA, les plus communes étant pour le diabète (*n* = 6086) et l'angine de poitrine (*n* = 2620). Les taux standardisés pour l'âge étaient le double de ceux de la population générale. Au sein du groupe psychiatrique, et après correction pour les variables de confusion, ceux qui avaient déjà été des patients psychiatriques hospitalisés avaient les taux d'hospitalisations PSA les plus élevés, spécialement pour le diabète.

Conclusions : Comme d'autres groupes marginalisés, les patients psychiatriques ont augmenté les hospitalisations PSA. Cette mesure pourrait donc être utilisée comme indicateur des difficultés d'accès aux soins de première ligne appropriés au Canada, étant donné la disponibilité de données administratives semblables.

Psychiatric patients have a significantly higher mortality rate from physical illness than the general population, even after adjusting for demographic variables, such as SES.[1–7] In one Canadian study, it was more than 70% higher.[2] Mortality in psychiatric patients from chronic physical disorders is nearly 10 times that from suicide yet receives far less attention.[7] Possible explanations include lifestyle, psychotropic side effects, delays in detection or initial presentation, and decreased access to services.[1,4–19] For instance, psychiatric patients are more likely to die of cancer or cardiovascular disorders but less likely to receive the appropriate treatment, such as percutaneous transluminal coronary angioplasty, surgery, or chemotherapy or radiotherapy.[6,11,19–24] Lack of access to private health insurance may be a factor in some jurisdictions, but receipt of these procedures is also lower in countries, such as Canada, with universal health care.[6,20] In addition, people with mental illness are less likely to receive appropriate medications, such as beta-blockers and statins, on discharge following myocardial infarction.[25] They are less likely to receive routine cancer screening.[26,27] Oral health is another neglected area, with the consequence that psychiatric patients are more than 3 times as likely to lose all their teeth.[28]

Aside from equitable access to specialized procedures, quality of care can also be assessed in terms of prevention of avoidable admissions (also known as admissions for ACS conditions).[29] These include admissions from causes, among others, that are potentially responsive to prophylactic or therapeutic interventions in primary care. Thus they are conditions that, with appropriate primary care, should not become serious enough to require hospital admission, such as chronic conditions that can be managed by medication, patient education, and lifestyle. These include complications of diabetes, cardiovascular disorders, acute exacerbation of respiratory conditions, and dental diseases (Table 1). ACS admissions have been used to assess health care provision for marginalized groups, such as Indigenous patients, or those of lower SES, but have not been applied to people with mental illness.[29,30] ACS conditions can also provide a summary measure of potential health gains from primary care interventions and feature prominently in Australia's National Health Performance Framework.[30,31]

We hypothesized that, in common with other marginalized groups, psychiatric patients would have higher rates of ACS admissions than the general population. We also

Clinical Implications

- Quality of care for comorbid physical disorders in psychiatric patients can be assessed by the number of admissions for ACS conditions. These are admissions for physical conditions which, with appropriate primary care, should not require inpatient treatment, such as complications of diabetes or cardiovascular disorders.
- Using administrative data, age-standardized rates of admissions for ACS conditions were double those of the general population. Within the psychiatric group, and after adjusting for confounders, those who had ever been psychiatric inpatients experienced the highest rates of ACS admissions, especially for diabetes.
- Admissions for ACS conditions could be used as an indicator of difficulties in access to appropriate primary care in Canada given the availability of similar administrative data. They could also serve as a summary measure of potential health gains from interventions in primary care.

Limitations

- The administrative data used in our study only covered patients in the publically provided system, and not patients of private specialists or GPs.
- Admission rates for specific medical conditions depend on a wide range of factors, not just the quality of primary care.
- Data on specific psychiatric diagnoses were only available for people who had received inpatient care.

Abbreviations

ACS	ambulatory care sensitive
ARIA	Accessibility/Remoteness Index of Australia
CESA	Client Event Services Application
GP	general practitioner
ICD	International Classification of Diseases
QHAPDC	Queensland Hospitals Admitted Patients Data Collection
SEIFA	socioeconomic indices for areas
SES	socioeconomic status
SMI	severe mental illness
STROBE	STrengthening the Reporting of OBservational studies in Epidemiology

hypothesized that within the psychiatric group, those who had ever been an inpatient, and those with more SMIs, would have higher rates.

Method

Where applicable, we followed the STROBE guidelines.[32] Ethics approval was received from the relevant university and Queensland Health—Human Research Ethics committees.

Data Sources

We measured ACS admissions by psychiatric status using a population-based, record-linkage analysis of all new psychiatric presentations to state-based facilities in Queensland during 5 years. In the absence of unique identification numbers, records were linked by probabilistic matching with the ChoiceMaker software package[33] using name, residential address, date of birth, and sex. This estimates the probability that any 2 records represent the same person (or event), while allowing for the possibility of errors or changes in the identifying information. We used the following data sets: the QHAPDC, the CESA, and the Registrar-General's Death Register. The QHAPDC data covered all admissions to Queensland public hospitals but not residential care. CESA captured all patients who had had contact with any clinician within state-run, community-based, or outpatient mental health services. This included medical, nursing, and allied health staff. At each community or outpatient contact, the date, time, setting, diagnosis, and type of clinician were recorded. Alcohol and drug services were not covered.

Data for calculating comparison rates for the entire population of Queensland were provided in the form of counts of events by sex, age group (in 5-year age groups), remoteness, and SES.

Data Quality

In epidemiology, data quality is generally assessed by the precision of the disease estimate, the control of confounders, and the degree of sampling or information bias. In this case, sampling bias was limited through the use of administrative data covering 4.7 million people. It was also minimized through coverage of all public sector inpatient, outpatient, and community contacts within Queensland Health. Identity errors were reduced through the use of aliases and phonetic spelling in probabilistic linkage protocols to minimize linkage failures owing to name changes and spelling variants, as well as cross linkage with other databases in the system. Regarding data quality checks, demographic features, such as Indigenous status, were correctly identified in 89% of patients when checked with other sources. In addition, a manual review of records identified as having definite links using ChoiceMaker[33] found only 0.28% false matches. Finally, linkage of different databases covering the same population increased the chance that variables missing in one database may be available in another, thereby increasing the ability to control for confounders.

Selection of Psychiatric Patients

We defined psychiatric cases as initial psychiatric admissions recorded in QHAPDC and community contacts in CESA between July 1, 2002, and December 31, 2007. A care episode was defined as new if there was no previous psychiatric admission recorded in QHAPDC for the previous 5 years (1997 to 2001) and no record of previous contact with community mental health in CESA for the previous year (2001). This reduces the possibility of survivorship bias, given that excess mortality in psychiatric patients generally occurs within the first 7 years after contact with mental health services or antipsychotic prescription.[3,34] It also permitted the comparison of mortality rates with work elsewhere.[3] Follow-up was 5 years, the main outcomes being mortality and ACS admissions (Table 1).

Analyses

We carried out 2 separate sets of analyses. First, we compared mortality and ACS admission rates by event for the psychiatric patients with those of the remainder of the Queensland population by age and sex standardization. We used direct standardization, the standard weights being taken from the average population distribution of Queensland from 2002 to 2007. In the case of mortality, we were also able to stratify results by SES and rurality, as the relevant information was available both for psychiatric patients and for the general population. This was determined by the place of usual residence at the time of death, using the SEIFA and ARIA, respectively.

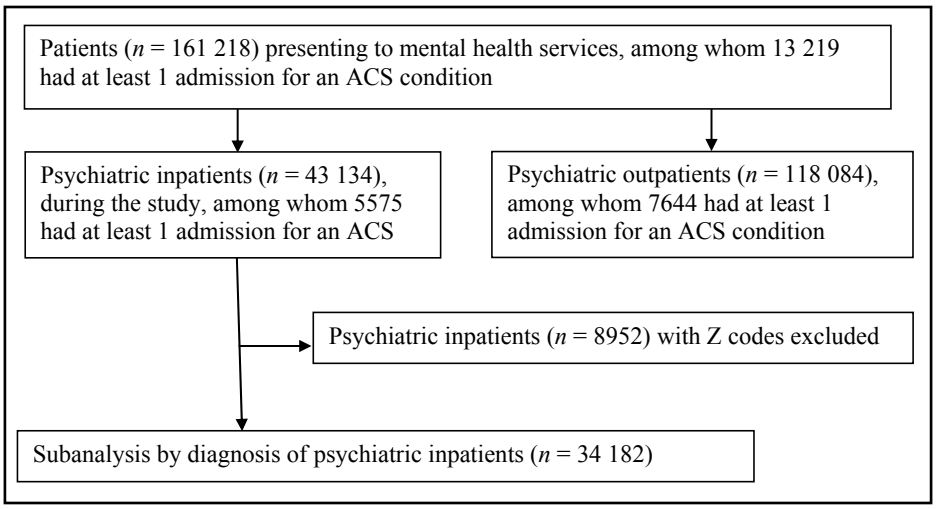
Second, within the psychiatric group, we used multivariate analyses to investigate any differences in mortality or ACS admissions by severity (ever an inpatient, compared with outpatient treatment only) and type of psychiatric diagnosis (for example, dementia, alcohol or substance use, nonaffective psychoses, and mood disorders) while adjusting for confounders, such as sociodemographic characteristics and clinical features (Figure 1). We used survival analyses for mortality. However, survival analyses were not appropriate for ACS conditions, given they could occur more than once. Therefore we used multiple regression of log-transformed data, as well as logistic regression of dichotomized data, to make the results easier to interpret. This was necessary, given their non-normal distribution. We also investigated ACS conditions by cause, such as diabetes and angina. SES and rurality were determined by the place of usual residence at the time of admission, using the SEIFA and the ARIA, respectively. A principal psychiatric diagnosis was assigned, using the following procedure. Inpatient diagnoses took precedence over any outpatient contact, given better data reliability. Within in- or outpatient settings, diagnosis was assigned using a predetermined diagnostic hierarchy from previously published work. This gave precedence to organic and psychotic disorders, allowed conditions, such as substance dependence, to be considered as potential comorbidities, and then gave preference to conditions within Chapter 5 in ICD-9, or equivalent.[3] Nonspecific disorders outside

Table 1 Definitions and codes of ambulatory care sensitive conditions

Condition	ICD-10 AM code	Additional information
Diabetes complications	E10.1–E10.8, E11.0–E11.8, E13.0–E13.8, E14.0–E14.8	In any diagnosis fields
Angina	I20, I24.0, I24.8, I24.9	Principal diagnosis only
Dental conditions	A69.0, K02–K06, K08, K09.8, K09.9, K12; K13	Principal diagnosis only
Asthma and chronic obstructive pulmonary disease	J45, J46 J41, J42, J43, J44, J47 J20	Principal diagnosis only Principal diagnosis only Principal diagnosis only with additional diagnoses of J41, J42, J43, J44, J47
Congestive cardiac failure	I50, I11.0, J81	Principal diagnosis only Exclude patients with procedures blocks: 600–693, 705–707, 717 and procedure codes: 38721–00, 38721–01, 90226–00
Hypertension	I10, I11.9	Principal diagnosis only

AM = Australian Modification; ICD = International Classification of Diseases

Figure 1 Flow chart of the ascertainment of patients for the psychiatric cohort



Chapter 5 in ICD-9, or equivalent, came last. Unless it was not lower in the diagnostic hierarchy, the last available diagnosis was generally used to allow for revision of preliminary diagnoses following observation or treatment.

There were 2 models for every analysis. In the first, all variables were entered into the model based on being associated with either psychiatric status or the outcome of interest (mortality or ACS admission), theoretically, or on bivariate analysis. In the second, we ran a forward stepwise model, where variables were entered according to their association with the outcome until no more reached statistical significance. Therefore, only variables significantly associated with the outcome of interest were included in the final model.

Results

There were 77 435 males (48.0%) and 83 783 females (52%) (total *n* = 161 218), with an average age of 33.9 years (SD 21.8). Among these, 13 219 psychiatric patients (8.2%) had at least 1 ACS admission for medical comorbidity, the most common being for diabetes (*n* = 6086) and angina (*n* = 2620). There were 1702 ACS admissions for dental causes. There were 9777 patients (6.1%) who died during the 5 years of the study.

Table 2 shows the standardized rates by event for the most common causes of ACS admission, including those for dental disease. Both males and females had higher admission rates than the general population. In the case of males, the age-standardized rates for ACS admissions for diabetes

and angina were double those of the general population (Table 2). We did not find higher ACS admissions in psychiatric patients for other causes of ACS admissions, such as respiratory conditions, hypertension, or congestive cardiac failure.

All-cause mortality rates in psychiatric patients were also elevated 3-fold, especially for men (Table 2). Stratified analyses by SEIFA and ARIA showed excess rates in psychiatric patients by SES and rurality.

Comparing Inpatients With Outpatients

During the course of the study, 13% of the 43 134 patients who had ever had inpatient psychiatric treatment experienced at least 1 ACS admission for a chronic medical illness (Figure 1). This was in contrast to 6.5% of those only seen as psychiatric outpatients (OR_{crude} 2.14; 95% CI 2.07 to 2.22).

Tables 3 and 4 show the results adjusted for all variables in the table. Patients who were older, less affluent, or of Indigenous descent were more likely to have experienced an ACS admission. By contrast, female sex, rurality, and being married or Australian-born were associated with reduced odds of an ACS admission. There were similar findings for the subcategories of diabetes and angina (Table 4). The only exceptions were age in diabetes and marital status in angina where the reverse was true. After considering all the above sociodemographic factors, we found that patients who had ever required psychiatric inpatient treatment were more than 80% more likely to require an ACS admission. This also applied to the subcategories of diabetes and angina, especially the former. We found similar results for other causes of ACS admission, such as respiratory disorders (OR_{adj} 1.89; 95% CI 1.72 to 2.07), hypertension (OR_{adj} 1.73; 95% CI 1.43 to 2.09), and congestive cardiac failure (OR_{adj} 2.27; 95% CI 2.06 to 2.49) (all $P < 0.001$). However, in the case of dental disease, there was no association between ACS admissions and a past history of inpatient treatment for psychiatric conditions.

We found similar results on multiple regression of the log-transformed data of the number of ACS admissions (Table 5).

Regarding mortality, 13.5% of patients who had ever been psychiatric inpatients died during the course of the study (5802/43 134), compared with 3.4% who have only had psychiatric outpatient treatment (3975/118 084). Using Cox regression to adjust for the same variables as above, the hazard ratio for those who had been a psychiatric inpatient was 3.25 (95% CI 3.11 to 3.39; $P < 0.001$) (Figure 2).

Comparing Diagnoses

A large number of outpatient records were only coded Z00.4 (general psychiatric examination, not elsewhere classified), rather than more formal or detailed diagnoses. Therefore, we restricted our analyses by diagnosis to those of inpatients. Among these, we included the 73% (n = 34 182) of the possible 43 134 patients who had a formal

Table 2 Standardized rates for mortality and common avoidable hospital admissions, comparing psychiatric patients with population control subjects, Queensland 2002–2007 (for other conditions see text)

	Male RR				Female RR			
	Unstandardized rate per 100 000	Standardized rate per 100 000	RR	95% CI	Unstandardized rate per 100 000	Standardized rate per 100 000	RR	95% CI
Diabetes	1433	1511	2.08	2.06 to 2.09	1002	1158	1.58	1.56 to 1.60
Angina	445	493	1.92	1.90 to 1.93	248	298	1.16	1.15 to 1.17
Dental	231	258	1.15	1.13 to 1.16	231	252	1.12	1.10 to 1.13
Mortality	2063	2013	3.64	3.55 to 3.74	1546	1385	2.83	2.72 to 2.93

RR = rate ratio

Table 3 Predictors of all avoidable admissions by psychiatric severity

Characteristic		All avoidable admissions			
		n	%	OR_{adj} [a]	95% CI
Sex	Male	8389	10.4	1.00	
	Female	4830	6.0	0.58	0.56 to 0.60
Age, years	<31	5373	6.3	1.00	
	≥31	7846	10.3	1.52	1.46 to 1.59
Marital status	Not married	10 303	13.4	1.00	
	Married	2916	3.4	0.97	0.96 to 0.99
Rurality	Urban	8323	9.9	1.00	
	Rural or regional	4896	6.4	0.90	0.89 to 0.91
Socioeconomic status	Most affluent	3357	5.7	1.00	
	Least affluent	9862	9.7	2.27	2.17 to 2.37
Country of birth	Non-Australian	5090	21.1	1.00	
	Australian	8129	5.9	0.93	0.93 to 0.93
Status	Non-Indigenous	12 609	8.3	1.00	
	Indigenous	610	7.0	1.06	1.04 to 1.08
Psychiatric inpatient status	Never admitted	7644	6.5	1.00	
	Ever admitted	5575	12.9	1.82	1.75 to 1.90
Dementia[b]	Absent	2273	7.3	1.00	
	Present	564	25.0	4.23	3.81 to 4.69

[a] $P < 0.001$

[b] $n = 34\ 182$ inpatients only

diagnosis (Figure 1). The remainder had Z codes, such as awaiting residential placement.

Mood and related disorders were the most common primary diagnosis (n = 16 937) (51%) (ICD-10 codes F30–F48). This was followed by disorders secondary to alcohol or substance use including psychoses (F10–F19) (n = 8233), nonaffective psychoses (F20–F29) (n = 4187), and dementia and other organic disorders (F00–F09) (n = 2256). The remainder of the sample had personality disorders. Among patients with recorded psychiatric diagnoses, 2837 had at least 1 ACS admission. As with the larger sample, the most common diagnoses were diabetes (n = 1292), and angina (n = 647). Patients with dementia had the highest proportion of ACS admissions (25.0%, compared with 7.5% for other diagnoses) (OR_{crude} 4.23; 95% CI 3.81 to 4.59), including diabetes and angina (Table 4). Using logistic regression to adjust for the same variables as our main analyses, we found that patients with dementia had the highest and most consistent odds of ACS admissions overall (Table 3), including diabetes and angina (Table 4). There were similar findings for respiratory disorders (OR_{adj} 2.47; 95% CI 1.96 to 3.13), hypertension (OR_{adj} 2.13; 95% CI 1.41 to 3.24), and congestive cardiac failure (OR_{adj} 5.04; 95% CI 4.00 to 3.24) (all $P < 0.001$). Multiple regression of the log-transformed continuous variable in patients with dementia gave similar results (for example, ACS admissions b = 1.15; 95% CI 1.10 to 1.17; $P < 0.00$). There was no association with ACS admissions for dental disease. No other diagnosis had increased ACS admissions, compared with the remaining inpatients (for example, the adjusted odds ratio for overall ACS admissions in mood and related disorders was 0.97; 95% CI 0.89 to 1.05; $P = 0.43$)

In all of these multivariate analyses (logistic and multiple regression), use of the stepwise command made no difference to the results (for example, the adjusted odds ratio for overall ACS admissions was 1.82; 95% CI 1.75 to 1.89; $P < 0.001$).

Discussion

Main Findings

To our knowledge, this is the first study to investigate ACS admissions for chronic physical illness in such a large cohort of psychiatric patients. It illustrates that people with mental illness experience significantly higher levels of ACS admissions for physical illness than the general population. Standardized rates were compared, given these were potentially recurring events. People who have required inpatient psychiatric treatment have especially high rates of ACS admissions for physical illness. Diabetes was the most common reason, and this pattern is consistent with other marginalized groups, such as Indigenous Australians.[30]

A further finding was a mortality rate ratio that was in the upper range of rates reported from elsewhere, which vary

Table 4 Predictors of diabetes and angina by psychiatric severity (for other conditions see text)

	Diabetes complications				Angina			
Characteristic	*N*	%	OR_{adj} [a]	95% CI	*N*	%	OR_{adj} [a]	95% CI
Sex								
Male	4702	5.8	1.00		1672	2.1	1.00	
Female	1384	1.7	0.34	0.32 to 0.36	948	1.2	0.54	0.50 to 0.59
Age, years								
<31	3331	3.9	1.00		484	0.6	1.00	
≥31	2755	3.6	0.72	0.68 to 0.77	2136	2.8	4.41	3.96 to 4.91
Marital status								
Not married	4784	4.1	1.00		1513	1.3	1.00	
Married	1302	3.0	0.94	0.92 to 0.96	1107	2.5	1.07	1.04 to 1.10
Rurality								
Urban	4725	5.6	1.00		1533	1.8	1.00	
Rural or regional	1361	1.8	0.80	0.79 to 0.82	1087	1.4	0.92	0.91 to 0.94
Socioeconomic status								
Most affluent	1049	1.8	1.00		692	1.2	1.00	
Least affluent	5037	4.9	4.47	4.15 to 4.81	1928	1.9	1.96	1.79 to 2.15
Country of birth								
Non-Australian	4010	16.6	1.00		890	3.7	1.00	
Australian	2076	1.5	0.87	0.86 to 0.87	1730	1.3	0.95	0.95 to 0.96
Status								
Non-Indigenous	5871	3.9	1.00		2512	1.6	1.00	
Indigenous	215	2.5	1.13	1.09 to 1.17	108	1.2	1.05	1.00 to 1.10
Psychiatric inpatient status								
Never admitted	3251	2.8	1.00		1497	1.3	1.00	
Ever admitted	2835	6.6	2.82	2.66 to 3.00	1123	2.6	1.40	1.30 to 1.52
Dementia[b]								
Absent	967	3.1	1.00		537	1.7	1.00	
Present	325	25.2	5.25	4.59 to 5.99	1123	4.9	2.92	2.37 to 3.60

[a] $P < 0.001$, except for angina and Indigenous status

[b] $n = 34\,182$ inpatients only

from below 2.0 to more than 5.5.[2,34] These variations may be explained by differences in the psychiatric diagnoses of interest, health service organization, and setting. For example, some studies include people with less severe psychiatric morbidity. An example is a Canadian paper[2] that included people who had only received psychiatric treatment in primary care and reported a rate ratio of 1.89. By contrast, our study was of patients attending publically provided specialist services. Therefore, they were the most severely ill and disadvantaged, who did not have access to office-based psychiatric care where, unlike in Canada, copayment is often required. Therefore, a more appropriate comparison may be studies of patients attending specialist mental health services in Australia. However, the Queensland rate remains high, even in comparison with psychiatric patients in Western Australian, where the mortality rate ratio is only 2.5.[3] It is unlikely that the disparity in findings is due to bias, as our results are broadly consistent with those from an earlier Queensland study, restricted to just the southeast corner of the state, that reported an age and sex standardized rate ratio of 4.26 (95% CI 4.12 to 4.41).[35] Other possible explanations include differences between the 2 jurisdictions in terms of population distribution, the proportion of Indigenous residents, or how care was organized, all for which we could not adjust through standardization, but could affect access to, or use of, health services.

There may be several explanations for the excess of ACS admissions in psychiatric patients. For instance, it is possible that physical ill health goes unrecognized among patients with SMI.[13] They may be less likely to report a medical complaint and have more difficulty interpreting physical symptoms, or distinguishing them from symptoms of their mental illness.[13] Even if physical health problems are diagnosed, they may be less likely to receive or adhere to adequate treatment.[14] Despite physician consultation

Figure 2 Comparing the 5-year survival of inpatients with outpatients

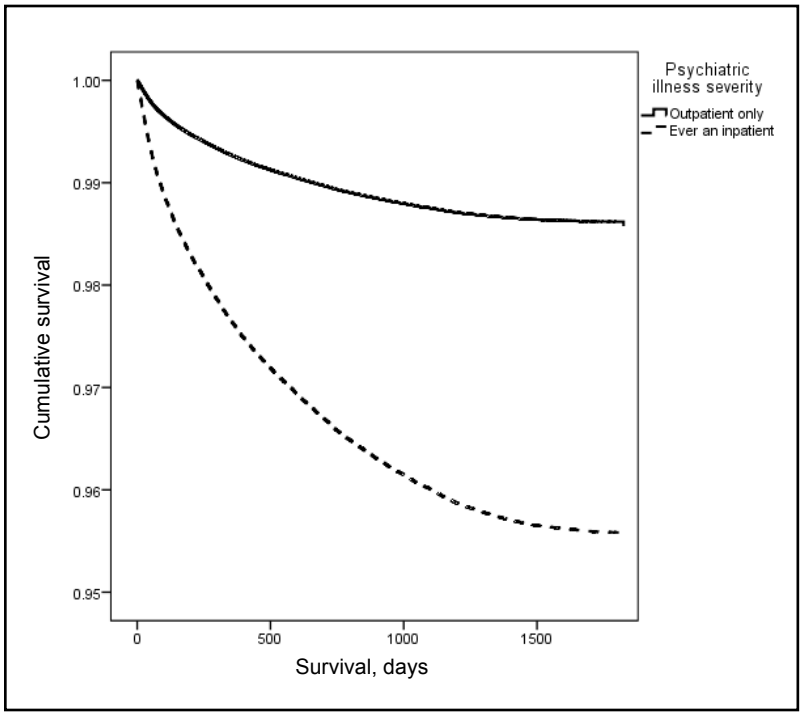


Table 5 Associations between psychiatric severity and numbers of ambulatory care sensitive (ACS) admissions (log-transformed scores)

	Unadjusted coefficient[a]			Adjusted coefficient[a,b]		
	Value	95% CI	*P*	Value	95% CI	*P*
All ACS admissions	1.250	1.239 to 1.259	<0.001	1.191	1.180 to 1.202	<0.001
Diabetes	1.146	1.138 to 1.153	<0.001	1.186	1.180 to 1.191	<0.001
Angina	1.038	1.033 to 1.042	<0.001	1.009	1.005 to 1.012	<0.001
Dental conditions	1.002	1.000 to 1.005	0.05	1.002	1.000 to 1.005	0.05
Respiratory conditions	1.054	1.050 to 1.057	<0.001	1.012	1.007 to 1.016	<0.001
Congestive cardiac failure	1.047	1.042 to 1.050	<0.001	1.016	1.014 to 1.019	<0.001
Hypertension	1.007	1.007 to 1.009	<0.01	1.002	1.000 to 1.002	<0.05

[a] Exponentiated back to the normal scale

[b] Adjusted for sex, age (continuous variable), marital status, rurality, socioeconomic status, country of birth, and Indigenous status

ACS = ambulatory care sensitive

rates being generally high among patients with SMI,[15,16] they are less likely to have had a physical examination (for example, weight or blood pressure)[15] or to be assessed and treated for hyperlipidemia.[17,18] One concern is the finding that people with SMI are less likely to receive medical or surgical interventions for disorders, such as cardiovascular disease or cancer, than the general community.[1,6,11,19–24]

Therefore, people with SMI appear to suffer a double disadvantage regarding quality of care for their comorbid physical conditions. First, they are more likely to experience admissions for ACS conditions that might have been avoided with comprehensive primary care. Second, once they reach specialized care, they may be less likely to receive the appropriate interventions.[1,6,11,19–24] These problems may be compounded by socioeconomic disadvantage, lifestyle, and the metabolic consequences of psychotropics.[36]

Limitations

There are several limitations to our study. One is that admission rates for specific conditions depend on a wide range of factors not just the quality of primary care. These include age, sex, underlying disease prevalence and severity, SES, geographical remoteness, continuity of care, and the availability of social supports facilitating home care.[30] In some contexts, high rates of ACS admissions may reflect not only a failing in the primary care system, but also the

hospital system's ability to respond to patients with high needs.[30] However, ACS admissions may better indicate the quality of primary care, compared with hospital treatment, than 30-day readmission rates for physical illnesses, where findings for people with SMI have been equivocal.[37]

A further limitation is that the conditions currently classified as ACS do not consider population differences. For example, Indigenous Australians have high rates of ACS hospitalizations for convulsions and epilepsy, conditions that are more prevalent in this group than the general population.[30] Another example is that patients with diabetes are more prone to develop dementia of all types, thus they may be expected to have a higher prevalence of ACS admissions for the complications of diabetes.[38] A further example is that the established association between SES and ACS hospitalizations may reflect gradients in patient health status rather than in the quality of care.[39–41] However, this would not explain our finding that within the psychiatric group, greater severity of psychiatric morbidity was associated with a higher number of ACS admissions, even after adjusting for SES. Nor would it explain previous findings of inequitable access to specialized treatments, again after adjusting for SES.[11,19–24]

Regarding the sample, the data to which we had access only covered patients in the publically provided system, and not patients of private specialists or GPs. We could also only standardize for age and sex in the comparison between the psychiatric patients and the general population, thus our results may have been confounded by factors, such as SES or remoteness. However, in the case of mortality, information on SEIFA and ARIA were available. Mortality in psychiatric patients was elevated across all strata, suggesting it was unlikely that differences in SES or remoteness could be the sole explanation.

Finally, we used administrative data that may be subject to information bias. In particular, we were unable to investigate whether specific psychiatric diagnoses were associated with ACS admissions for people who had received outpatient, as opposed to inpatient, care. This was because most records were coded Z00.4 (general psychiatric examination, not elsewhere classified), or some other Z code, such as awaiting residential placement. For this reason, we have emphasized the findings regarding the presence and severity of overall psychiatric disorder. In addition, by using a diagnostic hierarchy, we were unable to evaluate the impact of comorbidity. Therefore, our conclusions concerning diagnostic subcategories should be viewed with caution. In addition, linkages are by probabilistic matching. Compared with population-based data sets in Canada, there is less information on data quality. These limitations are an expected consequence of using administrative data that were not collected for the purpose of research analysis. However, this data set has given us access to a large population of consecutive admissions that would otherwise have been unavailable.

Implications

Despite these limitations, ACS admissions for physical conditions can be an important indicator of effective and timely access to primary care for marginalized populations, including psychiatric patients, and a summary measure of potential health gains from primary care interventions.[30] As a result, ACS admissions feature prominently in Australia's National Health Performance Framework.[31] This measure could also be used as an indicator of difficulties in access to appropriate primary care in Canada, given the availability of similar administrative data. Indeed, use of this indicator in Canada might give the opportunity to further investigate whether specific psychiatric diagnoses are particularly associated with a greater risk of ACS admission. This was not possible for most records in our study.

Family physicians have an important role in managing the overall health needs of people with SMI.[42] Increasing access to screening as well as funding models for GPs to spend more time with patients who have complex problems may help. These approaches could be complemented by formal collaborative arrangements between mental health services and primary care. It would be important to include dental services, given our finding that poor oral health contributed to ACS admissions. One example is Queensland's strategy to improve the physical health of people with SMI that involves both GPs and dental practitioners, with the intent of reducing ACS admissions in future.[43]

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