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High mortality and low access to care following incident acute myocardial infarction in individuals with schizophrenia

Paul Kurdyak [a,b,c,*], Simone Vigod [c,d], Andrew Calzavara [b], Walter P. Wodchis [b,c]

[a] Centre for Addiction and Mental Health, 250 College Street, Toronto, Ontario, Canada M5T 1R8
[b] Institute for Clinical Evaluative Sciences, G1 06, 2075 Bayview Ave., Toronto, Ontario, Canada M4N 3M5
[c] Institute for Health Policy, Management, and Evaluation, 155 College Street, Toronto, Ontario, Canada M5T 3M6
[d] Women's College Hospital, 76 Grenville St., Toronto, Ontario, Canada M5S 1B1

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ABSTRACT

Objectives: The primary objective of this study was to compare mortality following incident acute myocardial infarction (AMI) among individuals with and without schizophrenia. A secondary objective was to compare the likelihood to receive cardiac procedures and cardiologist visits.
Methods: This retrospective cohort study took place in Ontario, Canada. We studied incident AMI patients who were alive at hospitalization discharge from January 1, 2002 to December 31, 2006. 71,668 subjects were included in the study (402 subjects were excluded because of missing data). The main exposure was a diagnosis of schizophrenia. The main outcome measure was 30-day mortality post-discharge. Secondary outcomes included receipt of cardiac procedures and cardiologist visits within 30 days post-discharge.
Results: After risk adjustment, individuals with schizophrenia were 56% more likely to die within 30 days of discharge (OR 1.56, 95% CI 1.08–2.23; $p=0.02$), but approximately 50% less likely to receive cardiac procedures (OR 0.48, 95% CI 0.40–0.56; $p<0.001$) or to see a cardiologist within 30 days of discharge (OR 0.53, 95% CI 0.43–0.65; $p<0.001$).
Conclusions: Individuals with schizophrenia have a significant risk of dying following incident AMI. Despite the elevated mortality risk, individuals with schizophrenia are less likely to receive specialist care and cardiac procedures. Inequities in access to AMI care may be an important point of intervention for individuals with schizophrenia.

1. Introduction

Individuals with schizophrenia have a life span that is approximately 20 years shorter than the general population (Hennekens et al., 2005; Brown et al., 2010). There are many reasons for the reduced life span, but high rates of cardiovascular risk factors such as obesity (McEvoy et al., 2005; Bell et al., 2009) and tobacco smoking (de Leon and Diaz, 2005; Goff et al., 2005), as well as an increased rate of diabetes (that has increased with the advent of newer antipsychotics (Reist et al., 2007)), have all contributed to a greater risk of cardiovascular illness (Hennekens et al., 2005). Additionally, once a cardiovascular illness develops, individuals with schizophrenia are less likely to engage in secondary prevention strategies such as exercising, weight loss strategies and proper nutrition (McCreadie, 2003). Thus, while mental health-related mortality factors such as suicide likely play a role in the reduced life span observed among individuals with schizophrenia, early mortality is also attributable to well-established modifiable risk factors that are more prevalent among individuals with schizophrenia (Colton and Manderscheld, 2006).

Previous studies have indicated that individuals with schizophrenia are at increased risk of acute myocardial infarction (AMI) (Druss et al., 2000; Enger et al., 2004; Hennekens et al., 2005; Kilbourne et al., 2009; Laursen et al., 2009). Three of these studies (Druss et al., 2000; Kilbourne et al., 2009; Laursen et al., 2009) included psychiatric diagnoses other than schizophrenia, which will likely underestimate the relationship between schizophrenia and AMI-related mortality.

Individuals with schizophrenia or other serious mental illnesses who have had an AMI appear to be less likely to receive evidence-based treatments such as coronary artery bypass graft surgery (CABG) or percutaneous transluminal coronary angiography (PTCA) (Druss et al., 2000; Kisely et al., 2007, 2009). Three of these studies are based in the United States and did not use population-based data (Druss et al., 2000; Enger et al., 2004; Kilbourne et al., 2009) which limited the generalizability of the

Abbreviations: AMI, acute myocardial infarction; CABG, coronary artery bypass graft; PTCA, percutaneous transluminal coronary angiography; HMO, health maintenance organization; VA, Veterans Affairs; OHIP, Ontario Health Insurance Plan; OMID, Ontario MI Database; MRD, most responsible diagnosis; CIHI-DAD, Canadian Institute for Health Information Discharge Abstract Database; OMHRS, Ontario Mental Health Reporting System; NACRS, National Ambulatory Care Reporting System; RPDB, Registered Persons Database; PPV, positive predictive value; ACG, Adjusted Clinical Groups; ADG, Ambulatory Diagnostic Groups; ANOVA, analysis of variance; CI, confidence interval; COPD, chronic obstructive pulmonary disease.

* Corresponding author at: Centre for Addiction and Mental Health, 250 College Street, Toronto, ON, Canada M5T 1R8. Tel.: +1 416 535 8501x4968; fax: +1 416 979 6810.
E-mail address: paul_kurdyak@camh.net (P. Kurdyak).

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findings. The Canadian studies used population-based data, but only measured access to cardiac procedures (Kisely et al., 2007) or assessed treatment for ischemic heart disease and stroke more generally (Kisely et al., 2009). To our knowledge, there is no previous study using a population-based cohort of individuals with schizophrenia to measure both mortality and access to care following incident AMI.

The objective of this study was twofold. The primary objective was to measure mortality within 30 days of incident AMI hospitalization discharge among individuals with and without schizophrenia. Using incident AMI cases ensured that the risk of AMI-related mortality was comparable between individuals with and without schizophrenia. Measuring mortality within a short period of time from the index AMI hospitalization discharge increased the likelihood that the index AMI was the cause of death (Herlitz et al., 1994). The secondary objective was to compare processes of care subsequent to incident AMI between individuals with and without schizophrenia. The first process of care outcome was the relative likelihood to receive procedures (a composite measure of either CABG surgery or PTCA) within 30 days of AMI admission. The second process of care outcome was cardiologist visits within 30 days of discharge. Cardiologist visits, compared to visits with general internists, following AMI hospitalization have been shown to reduce mortality (Ayanian et al., 2002). The study used clinical administrative data from Ontario, Canada, where all residents have access to universal health care coverage. All medically necessary physician and hospital services are provided with no co-payment or deductible, so the ability to pay for health care is not a factor related to access to procedures and specialists.

2. Methods

2.1. Setting and design

We used a retrospective cohort study design to measure the risk of mortality following incident AMI among subjects with and without a diagnosis of schizophrenia in Ontario, Canada. Subjects were included in the cohort when they had their first discharge for AMI. Subjects were excluded if they were younger than 20 or older than 105 years of age, died before leaving the hospital, or had a previous AMI (measured since 1991). Subject accrual commenced on January 1, 2002 and ended on December 31, 2006. The maximum follow-up date was 30 days after the final date of subject accrual (January 30, 2007). This study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre, Toronto.

2.2. Data sources

Patient records were linked using unique, anonymized, encrypted identifiers across multiple Ontario health administrative databases containing information on all publicly insured, medically necessary hospital and physician services. These included the Ontario Health Insurance Plan (OHIP) for physician billings for outpatient visits including patient diagnosis codes and procedures; the Ontario MI Database (OMID) for AMI hospital discharges, procedures and transfers includes the most responsible diagnosis (MRD) for patient length of stay; the Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD) for acute hospitalizations and Ontario Mental Health Reporting System (OMHRS) for inpatient mental-health hospitalizations include schizophrenia diagnosis codes; the National Ambulatory Care Reporting System (NACRS) records ED visits; finally the Registered Persons Database (RPDB) includes patient demographic information and deaths. Neighborhood income and rurality were derived from Statistics Canada 2001 and 2006 census estimates.

2.3. Diagnosis of AMI

OMID is a database of patients with an incident AMI. For the purposes of this study, an AMI was incident if no AMI occurred since 1991. Validation of the diagnostic codes used to identify AMI cases revealed a sensitivity, specificity, and positive predictive value of 92.8%, 88.8%, and 88.5% respectively (Austin et al., 2002).

2.4. Schizophrenia algorithm

Having a diagnosis of schizophrenia was the main exposure variable. Individuals were deemed to have schizophrenia if they met any of the following criteria: 1) a primary diagnosis of schizophrenia from a general hospital bed (ICD-9 code — 295.x; ICD-10 code F20 or F25); 2) a DSM-IV Axis I diagnosis of schizophrenia (DSM-IV code — 295.x) from a psychiatric hospital bed; or 3) two outpatient ICD-9 codes for schizophrenia from outpatient physician billings. The OHIP and CIHI-DAD databases were scanned from January 1, 1991; OMHRS was scanned from its inception date — April 1, 2005. This diagnostic algorithm has not been validated, but is identical to algorithms for other diagnoses using Ontario health administrative data that all have excellent sensitivity and specificity (Austin et al., 2002; Hux et al., 2002; Gershon et al., 2009), has been used in previous publications (Becker and Hux, 2011), and yields a prevalence of schizophrenia in Ontario that is less than 1%, similar to previous Canadian prevalence estimates (Goldner et al., 2002).

2.5. Outcomes

The primary outcome was mortality following incident AMI hospitalization discharge. We used a 30-day mortality observation window to increase the likelihood that AMI was the cause of death (Herlitz et al., 1994) as per the standard for performance measurement of AMI outcomes (Krumholz et al., 2009; Ross et al., 2010).

Secondary outcomes included receipt of CABG surgery or PTCA procedure following index AMI (including procedures during index hospitalization). Since either procedure could have occurred during the index hospitalization, the observation window for procedures was 30 days from the admission date. The positive predictive value (PPV) of CABG and PTCA codes in Ontario administrative data is 97% and 94% respectively (Lee et al., 2011). We also measured whether or not an individual had an outpatient visit with a cardiologist within 30 days following discharge for AMI as a secondary outcome. For both cardiac procedures and follow-up with a cardiologist, subjects were excluded if they died within 30 days of incident AMI discharge to ensure that all patients were alive and eligible to receive care.

2.6. Covariates

We compared individuals with schizophrenia to individuals without schizophrenia across measured covariates and included these variables in the multivariate logistic regression models. The variables included demographic information including age, sex, rural residence (living in a community with a population of 10,000 residents or less), and income (neighborhood-level income quintiles). We adjusted for hospitalization length of stay (LOS), frequency of primary care visits, and whether subjects had any cardiologist visits in the year prior to admission for AMI. Finally, we measured medical comorbidities in two ways. First, we measured Johns Hopkins Adjusted Clinical Groups® (ACG®) (The Johns Hopkins ACG System, 2010), an approach to measuring morbidity using disease patterns in health administrative data, age and gender. This system identifies individuals as falling into any of 32 possible Ambulatory Diagnostic Groups (ADGs) characterizing different medical conditions. Individuals were categorized based on their health service utilization in the two years prior to incident AMI. The ADGs were summed to generate a comorbidity score that could range from 0 to 29 after excluding ADGs associated with psychosocial issues. The Ambulatory Diagnostic Groups (ADGs) generated from the ACG® system have been validated to predict mortality in the general population (Austin et al., 2011) and to predict mortality in a population-based