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Original Research

## Trends in Prevalence, Incidence and Pharmacologic Management of Diabetes Mellitus Among Seniors Newly Admitted to Long-Term Care Facilities in Saskatchewan between 2003 and 2011



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## ABSTRACT

**Objective:** We aimed to describe trends in the prevalence and incidence of diabetes mellitus and also report the overall use of diabetes medications among patients newly admitted to a long-term care facility (LTCF).

**Methods:** A retrospective cohort study was done using health administrative databases in Saskatchewan. Eligible patients were newly admitted to LTCF in Saskatchewan between 2003 and 2011 and maintained LTCF residency for at least 6 months. Prevalence of diabetes was defined with physician or hospital claims in the 2 years preceding admission. Antihyperglycemic medication use was estimated from prescription claims data during the first 6 months after LTCF admission. All data were descriptively analyzed.

**Results:** The validated case definition for diabetes ( $\geq 2$  diagnostic claims) in the 2 years before or 6 months after admission was met by 16.9% of patients (2471 of 14,624). An additional 965 patients (6.6%) had a single diabetes diagnostic claim or antihyperglycemic prescriptions only. Among patients receiving antihyperglycemic therapies, 64.9% (1518 of 2338) were exclusively managed with oral medications, and metformin was the most commonly used medication. Glyburide was commonly withdrawn after LTCF admission. Insulin use was observed in 23.9% of diabetes patients, with a mean daily average consumption of 54.7 units per day.

**Conclusions:** Use of diabetes medications appear to generally align with Canadian practice recommendations as evidenced by declining use of glyburide and frequent use of metformin. Future studies should examine clinical benefits and safety of hypoglycemic agent use in LTCFs.

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## R É S U M É

**Objectif :** Notre but était de décrire les tendances de la prévalence et de l'incidence du diabète sucré, puis de rapporter l'utilisation globale des médicaments contre le diabète chez les patients récemment admis dans un établissement de soins de longue durée (ÉSLD).

**Méthodes :** Une étude de cohorte rétrospective était réalisée à l'aide des banques de données administratives sur la santé en Saskatchewan. Les patients admissibles avaient récemment été admis à l'ÉSLD en Saskatchewan entre 2003 et 2011 et avaient séjourné à l'ÉSLD au moins 6 mois. La prévalence du diabète était définie par le médecin ou la facturation des services hospitaliers dans les 2 années précédant l'admission. L'utilisation de médicaments antihyperglycémiques était estimée d'après les données de réclamations de médicaments sur ordonnance durant les 6 premiers mois suivant l'admission à l'ÉSLD. Toutes les données étaient analysées de manière descriptive.

**Résultats :** La validation de la définition de cas du diabète ( $\geq 2$  réclamations liées au diagnostic) 2 ans avant ou 6 mois après l'admission était atteinte par 16,9 % des patients (2471 sur 14 624). Neuf cent soixante-cinq (965) patients additionnels (6,6 %) avaient seulement une réclamation liée au diagnostic

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du diabète ou aux ordonnances de médicaments antihyperglycémiques. Chez les patients recevant des thérapies antihyperglycémiques, 64,9 % (1518 sur 2338) étaient exclusivement traités par des médicaments oraux dont la metformine était le médicament le plus communément utilisé. Le glyburide était généralement interrompu après l'admission à l'ÉSLD. L'utilisation de l'insuline à raison d'une consommation moyenne quotidienne de 54,7 unités était observée chez 23,9 % des patients diabétiques.

*Conclusions* : L'utilisation de médicaments contre le diabète semble généralement s'aligner sur les recommandations canadiennes de la pratique comme le confirment l'utilisation décroissante du glyburide et l'utilisation fréquente de la metformine. Des études subséquentes devraient examiner les avantages cliniques et l'innocuité de l'utilisation des agents hypoglycémiques dans les ÉSLD.

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## Introduction

The prevalence of diabetes mellitus has increased substantially over the past 2 decades, and elderly patients are most commonly affected. Nearly 1 in every 3 Canadians (23% to 29%) aged 75 to 79 years has been diagnosed with diabetes, and many more may have impaired glucose tolerance or undiagnosed disease (1). The 2013 Canadian Diabetes Association (CDA) guidelines advocate for an individualized approach to diabetes management among elderly patients (2). Diabetes medications can cause hypoglycemia, especially among frail elderly patients residing in long-term care facilities (LTCF); thus, management of many elderly patients requires lower treatment intensity to ensure patient safety. Also, medications such as glyburide (3–5) and insulin have been associated with a substantially increased risk for hypoglycemia (6,7). Both of these medications should be used cautiously for elderly patients residing in LTCF because the level of frailty observed in these institutions is typically high.

Despite the rising prevalence and high risks for adverse events among frail elderly, the literature describing diabetes epidemiology and management among residents of Canadian LTCFs is limited. In the province of Saskatchewan, diabetes prevalence was found to range from 21% to 25%, depending on the data source (8). A lower prevalence of 17% was reported in a survey of 5 LTCFs in the province of British Columbia (9). Although it is expected that the prevalence of diabetes among LTCF patients is increasing corresponding to community-based estimates, time trends of diabetes in Canadian LTCFs have not been examined previously.

A systematic review of 20 studies with a total sample of 779 707 LTCF residents outside of Canada reported a mean prevalence of diabetes of 18.5% (10). In this systematic review, only 16% of residents with diabetes were managed with oral medications alone (i.e. without insulin), whereas 39% received insulin (alone or in combination with oral antihyperglycemic agents), and nearly half received no antihyperglycemic therapy at all (10). These findings may have been confounded by the use of survey methods rather than electronic databases in the majority of studies examined; certainly, the low rate of oral antihyperglycemic agent use would not be expected in a Canadian LTCF. In contrast, a small Canadian survey of a LTCF reported the use of oral agents without insulin in 30% of residents, whereas insulin use was estimated as 45% (9). However, the data were not confirmed by electronic prescription records, and no information was available to characterize the intensity of insulin therapy used in this small sample.

The aim of our study was to describe trends in the prevalence and incidence of diabetes among patients newly admitted to LTCFs in the province of Saskatchewan between 2003 and 2011, and also to describe the overall use of diabetes medications after LTCF admission.

## Methods

### Data source

This study was based on information derived from health administrative databases from the province of Saskatchewan, Canada. Provincial government health care benefits cover approximately 99% of all residents in Saskatchewan. Excluded persons are those covered by the federal government, such as the Royal Canadian Mounted Police, Canadian Armed Forces and inmates in federal penitentiaries (11). Data from the Institutional Care Home (ISCH) database and prescription drug database as well as person registry were electronically linked at the individual level to perform this study. The ISCH database includes dates of LTCF admission and discharge, along with LTCF characteristics. The prescription drug database includes all provincial formulary prescription medications dispensed to beneficiaries who are outpatients or residents of most LTCFs in the province. Prescription medications dispensed for registered First Nations residents, who represent nearly 9% of the population, are not included because their prescriptions are paid through federal government benefits. Each prescription medication record includes the date of dispensation and national drug identification number as well as quantity dispensed. The person registry database includes dates of health insurance coverage and demographic information such as date of birth, date of death, gender, marital status and location of residence. Numerous studies have demonstrated the accurateness and comprehensiveness of Saskatchewan's administrative health data for research (12–14).

Ethics approval for database access was obtained from the University of Saskatchewan Biomedical Research Ethics Board (Bio-REB 12-354).

### Study cohort

We identified a cohort of patients aged 60 years or more who were newly admitted to a LTCF in Saskatchewan between January 1, 2003, and December 31, 2011. A new admission was defined as no LTCF admission in the 2 years preceding the index LTCF admission; thus, patients must have been receiving provincial health benefits during this period. Also, they must have remained in a LTCF continuously for at least 6 months after the initial admission. Transferring from one facility to another during this follow-up period was allowed if the difference between a LTCF discharge date and a subsequent admission was less than 2 days.

### Identification of patients with diabetes

Prevalent diabetes was identified using the Canadian Chronic Disease Surveillance System definition (i.e.  $\geq 2$  claims in the physician services file or  $\geq 1$  hospital discharge with a diagnosis of diabetes) within 2 years preceding LTCF admission (15). An alternate case definition that required only 1 physician claim or 1

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