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Limited Effectiveness of Diabetes Risk Assessment Tools in Seniors Facility Residents

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ABSTRACT

Background: Undiagnosed diabetes can create significant management issues for seniors. **Objectives:** To evaluate the effectiveness of two diabetes risk surveys—the Canadian Diabetes Risk Assessment Questionnaire (CANRISK) and the Finnish Diabetes Risk Score (FINDRISC)—to identify elevated blood glucose levels in seniors. **Methods:** A cross-sectional study was conducted in senior living facilities in Edmonton, Alberta, Canada. Those with known diabetes, without capacity, considered frail, or unable to communicate in English were excluded. Participants completed the CANRISK and FINDRISC surveys and had their glycated hemoglobin A_{1c} (HbA_{1c}) measured. Correlations between seniors with elevated risk on the surveys and an HbA_{1c} value of 6.5% or higher or 6.0% and higher were assessed. **Results:** In this study, 290 residents participated; their mean age was 84.3 ± 7.3 years, 82 (28%) were men, and their mean HbA_{1c} level was 5.7% ± 0.4%. Mean CANRISK score was 29.4 ± 8.0, and of the 254 (88%) considered to be moderate or high risk, 10 (4%) had an HbA_{1c} level of 6.5% or higher and 49 (19%) had an HbA_{1c} level of 6.0% or higher. Mean FINDRISC score was 10.8 ± 4.2,

and of the 58 (20%) considered to be high or very high risk, 4 (7%) had an HbA_{1c} level of 6.5% or higher and 15 (26%) had an HbA_{1c} level of 6.0% or higher. The area under the receiver-operating characteristic curve was 0.57 (95% confidence interval 0.42–0.72) for the CANRISK survey identifying participants with an HbA_{1c} level of 6.5% or higher and 0.59 (95% confidence interval 0.51–0.67) for identifying participants with an HbA_{1c} level of 6.0% or higher. Similar characteristics were observed for the FINDRISC survey. **Conclusions:** In this group of seniors with no known diabetes history, mean HbA_{1c} level approximated that in the general population and neither survey effectively identified those with elevated blood glucose levels. These findings should be confirmed in a larger study; nevertheless, routine use of these surveys as a diabetes screening strategy does not appear to be warranted at this time.

Keywords: population screening, seniors, undetected diabetes.

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Introduction

Diabetes is a chronic disease that significantly increases the risk of morbidity (complications to the eyes, kidneys, nerves, and heart) and mortality [1,2]. This disease places a significant burden on the individual as well as on the health care system, costing an average of \$6700 per person with diabetes to manage the diabetes and its complications in 2015 [3]. At present, the prevalence of diagnosed diabetes is estimated to be 9% and by 2020, it is expected to reach 12% [3,4]. Because diabetes is chronic in nature, it is not surprising that prevalence increases with age, with population-based studies reporting 20% to 25% of people aged 65 years and older having diabetes [4–6]. In senior populations that require nursing care, diabetes prevalence approaches one in three residents [7–9].

Although the high rate of diagnosed diabetes in our senior population is concerning, there are indications that this is an underestimation of the true prevalence. When population-based studies have included the consideration of blood glucose levels, it

appears that one in three people is living with unrecognized or undiagnosed diabetes [4,10,11]. Undetected diabetes in seniors can have serious implications for management because of the higher risk of falls, urinary incontinence, and hospitalizations associated with this disease [1,11–15]. Furthermore, the economic burden associated with a case of undetected diabetes is estimated to be 8 times that of a person with prediabetes [16]. Concern regarding undetected diabetes in seniors is illustrated in guidelines and position statements from Australia, the United States, the United Kingdom, and the International Diabetes Federation that recommend screening for diabetes on admission to care homes [17–20].

Although testing blood glucose levels is considered the criterion standard for identifying diabetes [21], coordinating seniors' care to obtain blood samples can be challenging. A simple, noninvasive method to evaluate an individual's diabetes risk and prioritize for additional screening is needed. Indeed, some organizations recommend using a self-administered survey

Conflicts of interest: This was an investigator-initiated, unfunded study. The authors do not have any conflicts of interest to disclose.

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identifying risk factors for diabetes to measure a patient's level of overall diabetes risk and guide further assessment [17,21,22]. Of the many diabetes risk scores that have been developed, the Finnish Diabetes Risk Score (FINDRISC) questionnaire is perhaps the most widely recognized internationally [23,24]. This questionnaire, however, was developed in a predominantly white population and its applicability in an ethnically diverse population has been questioned. The Canadian Diabetes Risk Assessment Questionnaire (CANRISK) was developed by adapting the FINDRISC questionnaire to include consideration of ethnicity and other variables, such as sex and education [25].

Although both surveys have been tested in community-dwelling adults aged 78 years and younger and shown to have acceptable levels of discrimination to identify people with elevated blood glucose levels, their utility in seniors residing in facilities is uncertain [24,26–28]. In contrast to community-dwelling seniors, those living in facilities have unique characteristics that may impact perceived risk. For example, seniors living in facilities have a threefold higher need for physical assistance for daily living activities (personal hygiene, toilet use, locomotion, and eating) and a three- to fourfold higher prevalence of cognitive problems, and significantly more such residents take nine or more medications compared with community-dwelling seniors [29].

With these issues in mind, the purpose of this study was to evaluate the effectiveness of the CANRISK and FINDRISC surveys as screening tools to identify elevated blood glucose levels in residents of senior living facilities.

Methods

Setting

This cross-sectional study was conducted in 10 senior living facilities comprising independent senior lodges and multicare senior assisted living/retirement facilities within Edmonton, Alberta, Canada. Residents of independent facilities are given a minimal level of nursing support and are responsible for their own health care, meals, and daily activities. Assisted living/retirement facilities with nurse-assisted residents only and long-term care facilities were excluded.

The University of Alberta Research Ethics Board approved the conduct of this study and all participants provided informed, written consent. In addition, the Alberta Health Services Continuing Care Research Committee and the administrative leadership at each facility reviewed the study protocol and approved the implementation of the study.

Study Population

All residents aged 55 years and older with no known history of dementia were eligible for participation. From this group, residents were excluded if they had a known history of prediabetes or diabetes, were presently using antidiabetic medications, were unable to communicate in English, did not have capacity to sign their own consent, or were considered frail (Clinical Frailty Scale score ≥ 7) [30]. The remaining residents were contacted and invited to participate in the study.

Instruments and Measurements

Participants completed a questionnaire and also had their HbA_{1c} measured. The questionnaire contained questions from the CANRISK and FINDRISC surveys to gather information on diabetes risk (see Appendix) [24,25]. The CANRISK survey is an adaptation of the FINDRISC survey with questions about sex, giving birth to a large baby, ethnicity, and education added to the original eight questions (Table 1). Although both CANRISK and

FINDRISC surveys contain eight overlapping questions about age, body mass index (BMI), waist circumference, physical activity, vegetable and fruit consumption, history of high blood pressure, history of high blood glucose, and family history of diabetes, the response categories vary slightly (Table 1). To calculate risk scores from both surveys, we simply asked respondents to provide a value (e.g., age) or respond to a list of options (e.g., family history of diabetes). We then assigned these responses to survey-specific response categories during the data analysis stage of the study. A research assistant was available if the participants needed help interpreting a question.

Table 1 – Comparison of questions and response options from the FINDRISC and CANRISK surveys.

Variable	FINDRISC response categories	CANRISK response categories
Age (y)	18–44/45–54/55–64/ ≥65	40–44/45–54/55–64/ 65–74
BMI (kg/m ²)	<25/25–29.9/≥30	<25/25–29/30–34/ ≥35
Waist circumference (cm)	Women: <80/80–88/ Men: <94/94–102/ >102	Women: <80/80–88/ Men: <94/94–102/ >102
Physical activity >30 min daily	Yes/No	Yes/No
Eat vegetables and fruits daily	Yes/No	Yes/No
History of high blood pressure	Taken medication for high blood pressure on a regular basis? (Yes/No)	Told by a doctor or nurse you have high blood pressure or taken high blood pressure pills? (Yes/No or do not know)
History of high blood glucose	Yes/No	Yes/No or do not know
Family history of diabetes	Grandparent, aunt, uncle, first cousin/parent, brother, sister, child/No	Mother/father/brother or sister/child/other/No or do not know
Sex		Female/Male
Birth to a large baby (>4.1 kg)		Yes/No
Parents' ethnic group		White/Aboriginal/black/East Asian/South Asian/other nonwhite
Highest level of education		Some high school or less/high school diploma/some college or university/university or college degree

BMI, body mass index; CANRISK, Canadian Diabetes Risk Assessment Questionnaire; FINDRISC, Finnish Diabetes Risk Score.

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