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Prevalence of use and potential impact of increased use of primary care interventions to prevent cardiovascular hospitalizations in patients with diabetes

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ABSTRACT

Aims: To estimate the reduction in hospitalizations due to cardiovascular complications of diabetes which could result from greater use of interventions of known effectiveness in a primary health care setting.

Methods: In a representative survey of adults with diabetes in Porto Alegre, Brazil, we estimated current prevalence of interventions use (metformin, hypertension control, ACE inhibitors, statins, influenza vaccination, cardioprotective diet) and hospitalization rate. We calculated absolute risk reductions for interventions by applying relative risk reductions derived from literature to the baseline cardiovascular hospitalization rate. Increments in interventions use were obtained by subtracting current use prevalences from potential targets. We then modelled the number of diabetic patients needing primary health care coverage to prevent 1 hospitalization (disease impact number; DIN) and the total number of hospitalizations that might be prevented through this increased use.

Results: In 5 years, for every 100 diabetic patients in the community, we ascertained 30 cardiovascular hospitalizations. Large gaps were observed between target and current use of interventions. With greater implementation, 48% of cardiovascular hospitalizations could possibly be prevented.

Conclusions: Major reduction in hospitalizations due to cardiovascular complications of diabetes could possibly be obtained through optimized use of effective treatments in primary health care settings such as this.

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1. Introduction

A key advantage of national health systems is their ability to rationalize health care through organized programmatic activities which focus resources on evidence-based management of diseases of greatest burden. Diabetes is one such disease, being at or near the top of the healthcare agenda for most countries. The World Health Organization (WHO) estimates that epidemic chronic diseases such as diabetes may, in fact, hinder development, future economic growth, and social progress, especially in developing countries [1].

A major concern in diabetes care is prevention of its complications, particularly cardiovascular [2,3], which represent approximately 70% of diabetes' clinical outcomes [4]. One

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strategy for decreasing the diabetes disease burden is increased use of preventive interventions in primary health care. More efficient and effective management strategies, primarily based upon a broad educational approach including both those with diabetes and their care-givers are essential in this effort [5]. A higher quality of primary health care associates not only with greater satisfaction and lower health care costs, but also with better chronic disease outcomes [6–8].

Brazil, a country in which an estimated 6 million people aged 40 or more (11%) have diabetes [9], has constructed over the past two decades a vigorous universal national health system emphasizing primary care based on interdisciplinary Family Health teams. This system is the sole source of healthcare of approximately 70% of Brazilian citizens, and provides for many needs of the remaining 30% who concomitantly use private services or health insurance. More recently, management and control of chronic health problems, such as diabetes, have been integrated into the agenda of these primary health care teams [9,10].

From 2006 to 2007, we conducted a population-based representative study of adults assisted through the national health system in Porto Alegre [10], a city of approximately 1.4 million inhabitants in southern Brazil. This survey assessed current prevalences of smoking, physical activity, hypertension and medication use, as well as the frequency of cardiovascular hospitalizations in people with diabetes. The aim of this study is to combine these data with known benefits of interventions recommended to prevent cardiovascular complications in diabetes in order to theoretically model the estimated number of hospitalizations that could possibly be avoided through greater utilization of effective interventions in primary health care.

2. Subjects

2.1. *Survey assessing the prevalence of lifestyle habits, hypertension, and medication use as well as hospitalization among known cases of diabetes*

We conducted a survey from July, 2006 to September, 2007, in the urban districts of Porto Alegre interviewing 2590 adults older than 25 years of age, as previously described [10]. We ascertained prevalences of smoking, physical activity, influenza vaccination, diet and medication use, as well as a history of diabetes, myocardial infarction, ischemic cardiopathy or angina pectoris, heart failure, and of hospitalization in the last 12 months. We measured blood pressure twice, 3 min apart, after at least a 5 min rest, following a standard protocol. We defined those with systolic and diastolic blood pressures above 130 and 80 mmHg, respectively, as candidates for more intensive hypertension control. We considered that those who reported moderate physical activities in 5 or more days per week (totalling at least 150 min) or vigorous activities in 3 or more days per week (totalling at least 60 min) were physically active.

The study was approved by the Committee on Ethics in Research of the Federal University of Rio Grande do Sul and by similar committees governing research in the health care services under study.

3. Materials and methods

3.1. *Estimating the effectiveness of interventions from the literature: relative risk reductions*

As our objective was to estimate the impact of greater use of interventions not just shown to be effective by the literature, but for which at least some consensual agreement concerning recommendations for use exists, we initiated our review systematically investigating pertinent guidelines. We searched for guidelines in PubMed, the National Guideline Clearinghouse (www.guideline.gov), and the Guidelines Finder (www.library.nhs.uk/guidelinesfinder) websites. In PubMed, we searched the word ''diabetes'' using the limits: ''practice guideline'', ''all adult'', ''added to PubMed in the last 2 years''. For the National Guideline Clearinghouse we used the following criteria: Disease/condition: ''diabetes''; guideline categories: ''treatment''; methods used to assess the quality and strength of the evidence: ''weighting according to a rating scheme''; methods used to analyze the evidence: ''decision analysis'', ''meta-analysis'', ''review of published meta-analyses'', or ''systematic review''; age range: ''adult'', ''middle age'', ''aged''; publication date: ''2009'', ''2008'', ''2007''. At the Guidelines Finder website, we accessed the specialist library ''Diabetes'', selecting ''Type 2'' and the subsection ''Condition Management''. Assessing titles and abstracts, we considered 20 guidelines as possibly relevant. We fully reviewed these and retrieved the cited original articles supporting recommended interventions. Then, for each article, we searched PubMed, for more recent publications, using the ''Related Articles'' tool. We preferred meta-analyses over single clinical trials, due to their greater precision and generalizability. For interventions for which no meta-analysis was located, we considered randomized clinical trials the best source of evidence. If neither meta-analyses nor randomized clinical trials were located, we included cohort studies in our analyses. This process resulted in nine articles that best show a risk reduction of cardiovascular outcomes that cause hospitalizations in diabetes. Table 1

Table 1 – Relative risk reduction (RRR) reported in the literature supporting guidelines for each intervention of proven effectiveness in preventing cardiovascular disease in diabetes.

Intervention	RRR (95%CI)
Metformin [4]	0.32 (0.13–0.47)
Intensified hypertension control [11]	0.25 (0.06–0.39)
ACE inhibitors [12]	0.09 (0.03–0.14)
Statins [13]	0.21 (0.14–0.28)
Influenza vaccination [14]	0.19 (0.11–0.27)
Aspirin [15]	0.17 (0.07–0.26)
Cardioprotective diet [16]	0.49 (0.27–0.65)
Regular physical activity [17]	0.26 (0.04–0.39)
Tobacco cessation [18]	0.44 (0.16–0.63)

RRR = Relative risk reduction; CI = confidence interval.

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