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Low health literacy associated with higher medication costs in patients with type 2 diabetes mellitus: Evidence from matched survey and health insurance data

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ABSTRACT

Objective: Studies have shown that people with lower levels of health literacy create higher emergency, inpatient and total healthcare costs, yet little is known about how health literacy may affect medication costs.
This cross-sectional study aims at investigating the relationship between health literacy and three years of medication costs (2009–2011) in a sample of patients with type 2 diabetes.
Methods: 391 patients from the German-speaking part of Switzerland who were insured with the same health insurer were interviewed.
Health literacy was measured by a validated screening question and interview records were subsequently matched with data on medication costs.
A bootstrap regression analysis was applied to investigate the relationship between health literacy and medication costs.
Results: In 2010 and 2011 lower levels of health literacy were significantly associated with higher medication costs ($p < .05$).
Conclusion: The results suggest that diabetic patients with lower health literacy will create higher medication costs.
Practice implications: Besides being sensitive towards patients' health literacy levels, healthcare providers may have to take into account its potential impact on patients' medication regimen, misuse and healthcare costs.

1. Introduction

In times of rising healthcare costs, policy makers should be especially interested in understanding the mechanisms underlying the inefficient usage of healthcare services. Health literacy as an underlying variable may play an important role in identifying the causes of using healthcare services inefficiently.

Studies have shown that limited health literacy, which is often defined as the inadequate capacity to read and understand, as well as access *"basic health information and services needed to make appropriate health decisions"* [1,2], is associated with negative health outcomes. In chronically ill patients for example limited health literacy has been linked to less disease knowledge [3,4] and less effective self-care behavior [5–7], which in turn may effect healthcare costs.

Indeed research has shown that limited health literacy is associated with increased costs [8–11]. This suggests that people suffering from lower health literacy have more difficulties in navigating through the healthcare system. They are thus prone to use an inefficient mix of services and in consequence might be more likely to develop more severe diseases that need additional medical attention [10]. In that respect medication usage and adherence play an important role.

Especially for people suffering from chronic conditions such as diabetes, effective treatment will depend on the accurate intake of prescribed medications, which in turn will influence long-term health outcomes. Possible non-adherence or misusage due to problems of understanding medical information will possibly cause long-term complications and necessitate more usage of healthcare services, creating a revolving-door effect that may increase costs on the healthcare system. In Switzerland for example it is estimated that diabetes and its long-term complications cause 2.2% of the total healthcare costs [12]. For diabetic patients adequate health literacy levels are crucial as they have to

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be able to follow strict medication and dietary plans and to control their blood sugar levels on a regular basis [13,14].

1.1. Health literacy and medication costs

So far little is known about the relationship between health literacy and medication costs. Most studies in the field have focused on medication adherence and have provided mixed results [15]. Studies have shown that patients with lower levels of health literacy had less understanding of and were less likely to follow-up their medication regimen [16–21]. Also, they were less likely to adhere to their medication irrespective of the medication management strategy they were using [22]. However, other studies did not find any significant relationship between health literacy and medication adherence [23,24], and caregivers of children with lower levels of health literacy have been identified to be more likely to adhere to prescribed medication regimen [25].

Research specifically investigating the relationship between health literacy and medication adherence in diabetic patients has also provided mixed evidence so far. Two studies found significant associations between health literacy and diabetes medication adherence [26] and antidepressant medication [27], whereas another study did not find any relationship [28].

Few studies have included costs when looking at health literacy and medication usage. One study included more general costs for pharmacy usage when exploring the relationship of health literacy and medical costs among Medicare managed care enrollees. It was found that people with marginal and inadequate health literacy were significantly less likely to use pharmacy services but differences in medication spending were not significant [10]. Similar results have been found by Hardie and colleagues [9] who did not find a significant association between health literacy and pharmacy spending.

Some researchers have investigated the relationship between health literacy and other healthcare costs [8–11]. In the United States (US) it was found that lower levels of health literacy were associated with higher emergency room costs [10], higher inpatient costs [9] and higher total healthcare costs [11]. On the other hand a study from Switzerland found that health literacy was not associated with inpatient costs but that lower levels of health literacy were associated with higher total and higher outpatient costs [8].

Most studies looking at the relationship of health literacy and costs so far have been conducted in the US with samples that often consisted of participants who were enrolled in Medicare or other health plans with relatively complex drug plans [29]. This suggests that people who were not covered by health insurance or any other health plans were excluded from these studies. Yet evidence shows that those who are not insured are more likely to be of lower socioeconomic status [30,31] and to have lower health literacy [32–35], which might result in worse health outcomes [36].

The United States Census Bureau estimated that in 2012 15.4% of the population (48 mio.) in the US was not covered by any health insurance plan [37]. In contrast to the US, mandatory health insurance in Switzerland has been in place for more than 15 years, guaranteeing coverage for most parts of the population with only few exceptions [38]. Also, even though medical care in Switzerland has to be co-financed by out-of-pocket payments and was found to prevent some people to use healthcare services when they needed them [39], a comparative study showed that in contrast to other countries relatively few insured people in Switzerland do not receive care or are not able to pay medical bills due to financial reasons [40].

Swiss health plans consist of an excess and a deductible. In exchange for higher premiums insured persons can choose to pay lower annual excess; the minimum threshold set by law is 300 Swiss Francs (CHF). Only once the insured person exceeds the threshold the insurers start covering costs. The insurance will cover 90% of the additional costs and 10% will be covered by the insured person for medical services over and above the excess but by law it is limited to CHF 700 per year [41]. Premiums are subsidized for those having lower income [40], which reduces economic barriers to receive appropriate medication in contrast to what has been suggested by studies from the United States [42].

1.2. Objective

So far most studies that investigated the relationship between health literacy and healthcare costs used cross-sectional designs measuring costs at one point in time, a design that potentially underestimates the effects found. In addition, as previously stated, most studies have been conducted in the US, where obligatory health insurance has come into place only recently. A large part of the population in the US is still uninsured, making it difficult to obtain data on costs from participants who are potentially more likely to be less health literate and to suffer from worse health outcomes. Therefore, the present study aims at investigating the relationship between health literacy and three years of medication costs (2009–2011) in a sample of insured diabetic type 2 patients in Switzerland, where most of the population is covered by obligatory health insurance plans.

2. Methods

2.1. Study design

This study was part of a larger survey investigating Swiss diabetic patients' self-management behaviours and their relation to medical costs. Data was collected from a sample of insured persons of the basic health insurance plan of the largest health insurer in Switzerland. In order to be included in the study, participants had to be between 35 and 70 years old and not live in a long-term care institution. The age limit was chosen since studies have shown that older age is associated with lower levels of health literacy. Furthermore, due to the mode of data collection by telephone, potential hearing impairments or other disabilities might have made it difficult to conduct interviews. Given that insurance data was not available on whether possible participants actually suffered from diabetes, only people who had been reimbursed for diabetes medication two years prior to the study were included.

The current study focuses on the German-speaking part because data obtained was more comprehensive for this part than for the two other language regions in Switzerland. A weighted randomized sample of 7550 persons in the German-speaking part of Switzerland was contacted by letter. In order to be enrolled in the study people had to send back a signed consent form indicating whether they suffered from diabetes type 2. Data collection took place in spring/summer 2012. Interviews in German and Swiss–German were conducted via telephone and lasted up to 25 min.

The study was approved by the appropriate institutional review board of the Canton Ticino in Switzerland (Comitato Etico Cantonale, Bellinzona, Switzerland).

2.2. Measurements

2.2.1. Functional health literacy

Functional health literacy was measured by one validated screening item. Since measures such as the Short Test of Functional Health Literacy in Adults (S-TOFHLA) [43] or the Rapid Estimate of Adult Literacy in Medicine (REALM) [44] are not suitable for administration on the telephone, an adapted version of the Chew