DIRECT MEDICAL COSTS OF DIABETES MELLITUS IN CHINA: ANNUAL COST OF ILLNESS AND LONG-TERM PROJECTIONS USING A VALIDATED DIABETES MODEL

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Introduction

The prevalence of diabetes mellitus in men and women in China is high. Recently, the China National Diabetes and Metabolic Disorders Study estimated an age-standardized prevalence rate of 9.7%, with greater than half of these patients previously undiagnosed.[1]

The costs of diabetes have been well quantified globally. Previously, in China, the annual direct medical cost of diabetes mellitus was estimated as Chinese Yuan (CNY) 200 billion for the year 2007, under the assumption of 23.46 million type 2 diabetes patients nationwide.[2]

This current study sets out to provide an updated estimate of the annual cost of diabetes in China, based on disease prevalence data reported by the China National Diabetes and Metabolic Disorders Study investigators, and a modeling analysis that incorporates disease management, complication incidence and prevalence data. This approach may alert policy makers to the economic burden of the disease and the projected components of current and future costs.

Objective

The aims of this study were to estimate the annual direct costs of diabetes for patients with and without a prior diagnosis of the disease and to estimate the lifetime direct costs per patient in China.

Methods

A cohort of 60 million diabetes patients was included in the base case analysis. The cohort size was based on the 2010 census population of China (1,371 million people) and the spot prevalence of patients previously diagnosed with the disease as reported by the China National Diabetes and Metabolic Disorders Study.

All patients in the diabetes cohort were at risk of events in the cost of illness year (2011). Incidence rates of diabetes complications (microvascular and macrovascular) were mostly derived from the intensive arm of the UK Prospective Diabetes Study (UKPDS),[3] and were assumed applicable in the absence of large China-specific diabetes studies. Prevalence rates of diabetes complications were derived from a previously published modeling analysis that described the progression of disease in a type 2 diabetes cohort in China.[4]

To each diabetes complication a relevant cost was applied. Diabetes complication costs were derived from physician surveys in Beijing and Chengdu hospitals performed by IMS Health,[4] inflated to 2011 CNY. Acute event costs were applied to incident complications and follow-up costs were applied to prevalent complications. Select cost data and complication incidence and prevalence data can be found in **Table 1**.

For patients previously diagnosed with the disease it was assumed that intensive glycemic control was received in line with the UKPDS intensive arm and local expert opinion,[5] including a mix of oral agents and insulin regimens (**Table 2**). Diagnosed patients also received concomitant medications for cardiovascular risk and were enrolled in microvascular complication screening programs in line with local data.[4] Analyses were performed for previously undiagnosed patients; and assumed the exclusion of treatment and management costs.

Table 1: Complication Cost Data (CNY)

Complication	Event cost	Follow-up cost	Incidence	Prevalence
Myocardial infarction	45,901	10,544	1.47%	2.30%
Stroke	17,889	8,056	0.56%	5.90%
Peripheral vascular disease	39,606	14,623	0.46%	6.50%
Major hypoglycemia	165	0	1.00%	N.A.
Retinal photocoagulation	3,018	0	0.79%	N.A.
Amputation	6,467	0	0.01%	N.A.
Peripheral neuropathy	10,175	5,896	1.90%	23.20%
Foot ulcer	2,802	0	0.30%	N.A.

Methods (continued)

Lifetime projections of direct medical costs were made using a validated diabetes model.[6] A type 2 diabetes cohort of patients based on the China subgroup of the Asia Pacific RECAP-DM study was simulated (age 60.6 years, duration of diabetes 6.1 years, glycohemoglobin [HbA1c] 6.7%).[7] A 40-year time horizon was used and future costs were discounted at a rate of 3% per annum. It was assumed that long-term glycemic control was received in line with the UKPDS intensive arm and local expert opinion[5]. The progression of the disease (in terms of HbA1c control) and the risks of first cardiovascular events were also UKPDS derived.

Table 2: Patient Treatment and Management Data (CNY)

Complication	Annual cost	Usage*
Aspirin	260	68.00%
ACE inhibitors	1,927	69.00%
Statins	2,529	58.00%
Renal screening	45	80.00%
Eye screening	68	65.00%
Intensive control	5,196	100.00%

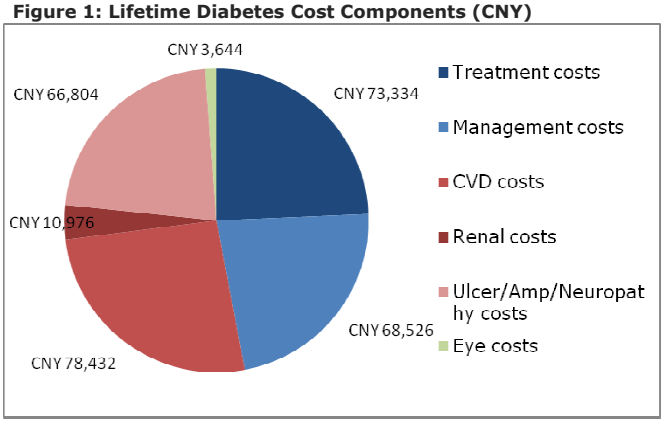
ACE = Angiotensin-converting enzyme. * = Assuming the patient was previously diagnosed with diabetes

Results

For 2011 the costs of diabetes and its complications were estimated as CNY 13,326 per patient. Based on 60 million diagnosed patients nationally, the total cost of the disease in China was estimated as CNY 806 billion. A cost of CNY 4,727 per previously undiagnosed patient was estimated, assuming the seeking of medical care and diagnosis of the disease when the first complication is experienced, with the difference attributable to treatment and management costs.

In diagnosed patients, a lifetime cost of CNY 301,716 per patient was estimated, comprising the present value of treatment costs (intensive control), complication costs and background disease management costs (complications screening and concomitant cardiovascular medications); complications comprised 53% of costs (**Figure 1**).

Figure 1: Lifetime Diabetes Cost Components (CNY)



Limitations

All modeling analyses are subject to limitations. The limitations of the present analyses included:

- The use of complication costs derived from physician surveys in Secondary and Tertiary hospitals in China, reflecting a high standard of care but also resulting in higher cost estimates
- The exclusion of indirect costs (e.g. lost working days due to complications and death in the working age population)
- The assumption in the cost of illness year that undiagnosed and diagnosed patients experienced equal risk of complications
- The assumption that all patients in the analysis had type 2 diabetes.

Conclusion

The costs of diabetes in China are high; based on a Gross Domestic Product of CNY 47,156 billion for 2011, appropriate care for every diabetic patient in China may cost up to 2.6% of GDP. Based on a modeling analysis, managing the disease to a high standard of care in a diagnosed patient may cost CNY 301,716 over a lifetime .

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