THE VALUE OF
Medicines for Type 2 Diabetes

Overview of Diabetes

Diabetes is a chronic condition that occurs when the body cannot produce enough or effectively use insulin. There are three types of diabetes: Type 1, Gestational Diabetes, and Type 2 Diabetes Mellitus. Type 1 diabetes is caused by an auto-immune reaction, where the body's defense system attacks the insulin-producing cells in the pancreas. Gestational Diabetes occurs when a woman is not able to make or use enough insulin needed for the pregnancy.[1]

Type 2 Diabetes Mellitus (T2DM) is one of the most common, costly, and preventable chronic health problems,[2] comprising 85-90% of all diabetes cases.[3] Type 2 diabetes is a condition where on the background of insulin resistance, the pancreas produces insufficient amounts of insulin, and the body does not appropriately use the insulin that is being produced. Type 2 diabetes patients initially have hyperinsulinemia, until the insulin-producing beta cells fail in later stages of the disease. This occurs because the insulin resistance causes their body to inefficiently use the insulin being secreted.

Being obese, maintaining a poor diet, and a sedentary lifestyle are major contributors to the development of Type 2 diabetes.[4,5] Globally, there are 371 million people living with diabetes, and one half are unaware they have it.[6] By 2030, this number will grow to 552 million.[7] Epidemiological studies suggest that four out of five people with diabetes are in low- and middle-income countries,[8] making Type 2 diabetes a severe threat to public health worldwide.

Health Impact of Type 2 Diabetes

Morbidity associated with diabetes includes both microvascular (retinopathy, neuropathy, and nephropathy) and macrovascular (coronary artery disease, peripheral vascular disease, and stroke) complications, which may lead to other negative sequelae such as amputation or premature death.

- 10–20% of patients with Type 2 diabetes die of kidney failure.[9]

- 50% of people with Type 2 diabetes die of cardiovascular disease.[10]

- In the UK, 120 diabetic foot amputations occur weekly, with patient survival rates at 50% after two years.[11]

- 2% of people with diabetes become blind.[12]

- 10% of people with diabetes develop severe visual impairment due to diabetic retinopathy.[13]

- People with diabetes are at increased risk for depression, which often leads to poor blood sugar control.[14]

- In the U.S., more than 80% of patients with diabetes are overweight or obese.[15]

KEY TAKEAWAYS

Globally, there are 371 million people living with diabetes.[6] By 2030, this number will grow to 552 million.[7]

Global healthcare expenditures on diabetes are estimated to be at least $465 billion for 2011 and $595 billion in 2030.[16]

The American Diabetes Association estimates that the total cost of diagnosed diabetes has risen from $174 billion in 2007, to $245 billion in 2012.[19]

50% of people with Type 2 diabetes die of cardiovascular disease.[10]

For patients with Type 2 diabetes, for every 1% reduction in HbA1c* there is a 14% decreased risk for heart attacks, and a 14% risk reduction for all-cause mortality.[30]

Economic Impact of Type 2 Diabetes

- Global healthcare expenditures on diabetes are estimated to be at least $465 billion for 2011 and $595 billion in 2030.[16]

- In 2010, diabetes spend in the majority of countries ranged from five to thirteen percent of their total healthcare dollars, which is a substantial portion of total health care expenditures. [17]

- The American Diabetes Association estimates the indirect cost of diabetes is attributable to absenteeism, reduced productivity, inability to work. Early mortality in the U.S. was estimated to be $68.6 billion dollars.[19]

- From 2001–2011, newly diagnosed juvenile Type 2 diabetes cases increased from 3% to 45%.[18] This will represent a remarkable increase in health care costs as these patients age and studies begin to incorporate their impact on the health care system.

- The American Diabetes Association estimates the total costs of diagnosed diabetes has risen from $174 billion in 2007 to $245 billion in 2012, with hospital inpatient care being the largest component. The second largest component was prescription medications treating *diabetes complications*,[19] not the disease itself.

Total Cost of Diagnosed Diabetes in the US 2007–2012

	Total Cost	Inpatient and Outpatient Care	Diabetes Medication and Supplies
2007	$174B	59%	12%
2012	$245B	60%	12%

Source: American Diabetes Association. The Cost of Diabetes. http://www.diabetes.org/advocate/resources/cost-of-diabetes.html

An additional driver of diabetes cost is nonadherence to therapy. Despite having access to medicines, many diabetes patients are nonadherent to treatment, either missing doses or not complying with treatment plans altogether. One study found aherence among patients with Type 2 diabetes to be as low as 60%, meaning that many patients may not be following the treatment plan that has been prescribed for them.[20] Patients who are nonadherent are far more likely to require hospitalization and incur significantly higher health care costs. Because of this, many economists and health professionals alike advocate the increased utilization of, or adherence to, diabetes medicines as a way to improve health and also lower health care costs.[20]

A 2012 study found that the odds of subsequent hospitalizations or emergency department visits were 13 percent lower with improved adherence to diabetes medications. "Based on these and other effects, the study authors projected that improved adherence to diabetes medicine could avert 699,000 emergency department visits and 341,000 hospitalizations annually, for a savings of $4.7 billion dollars."[21]

Better Adherence to Diabetes Medicines Helps Reduce Costs from Other Services

$1 MORE Spent on Diabetes Medicines = $7.10 LESS Spent on Other Services

AVERAGE ANNUAL SPENDING RELATED TO DIABETES ($)

ADHERENCE (%): 1-19, 20-39, 40-59, 60-79, 80-100

Medical Spending | Drug Spending
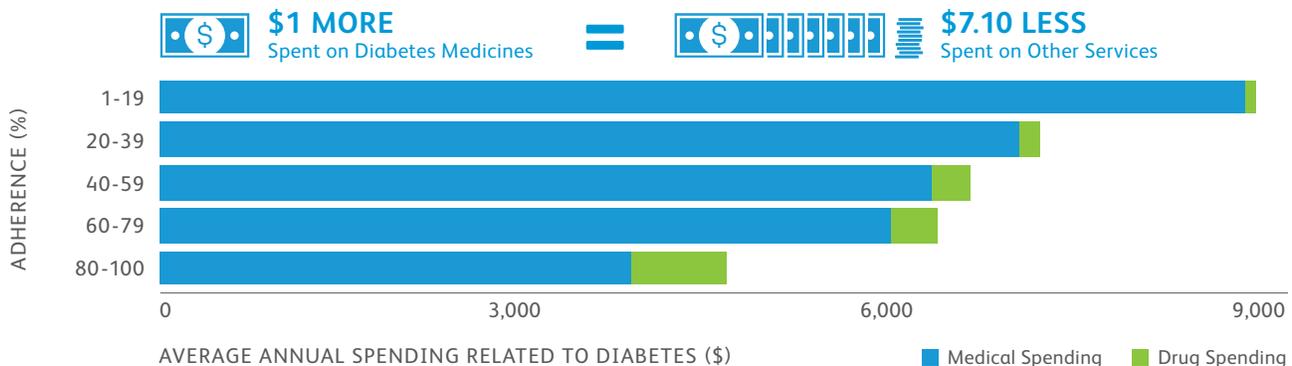
Adapted from: M. Sokol et al., "Impact of Medication Adherence on Hospitalization Risk and Healthcare Cost," Journal of Medical Care, 2005.
Notes: Adherence is the extent to which patients take medicines as prescribed, in terms of dose and duration. Return on Investment estimates reflect spending attributable to the condition listed.

Diabetes Treatment

While certain risk factors for Type 2 diabetes cannot be mitigated (e.g., family history), Type 2 diabetes can often be prevented or delayed with lifestyle changes, diet, exercise, and weight loss. Therefore, a holistic approach to Type 2 diabetes health management should focus on early detection and treatment of risk factors, which can lead to 'pre-diabetes,' ("blood glucose levels that are higher than normal but not yet high enough to be diagnosed as diabetes") and metabolic syndrome ("a cluster of conditions that occur together, including obesity, insulin resistance or Type 2 diabetes, high blood pressure, high blood triglyceride levels, and low blood high-density lipoprotein levels" (HDL)).[23]

When the prevention of Type 2 diabetes is unsuccessful, the treatment goal for each patient becomes the successful attainment of recommended blood glucose levels, which are appropriate for age and other risks. Patients with diabetes who achieve gains in managing their HbA1C (two- to three-month average blood sugar levels), demonstrate improved quality of life, a key outcomes metric,[24] along with decreases in diabetes related complications. To achieve these goals, therapeutic lifestyle changes (dietary changes, increased exercise, reduced stress, etc.) are likely to be the first recommendations from health care providers. When therapeutic lifestyle changes are insufficient to control blood sugar levels, medication is necessary.[25]

Key Research Findings Suggest:

- Before insulin discovery and the availability of insulin therapy, diabetic children rarely lived a year after diagnosis; 5% of adults died within two years, and less than 20% lived more than ten.[26]

- Weight loss and physical activity lower the risk of diabetes by improving the body's ability to use insulin and process glucose.[27]

- A study evaluating 3,234 people at high risk for diabetes demonstrated that those who engaged in "modest weight loss through dietary changes and increased physical activity" reduced their risk of developing diabetes by 58%.[28]

- For patients with Type 2 diabetes, every 1% increase in HbA1c equals an 18% higher risk of Cardiovascular disease[29]; however, for every 1% *reduction* in HbA1c, there is a 37% risk reduction for micro vascular complications (retinopathy, neuropathy, and nephropathy), and a 14% decrease risk for heart attacks and all-cause mortality.[30]

- A five-year study of patients with diabetes in a managed care setting showed that those who improved their HbA1c levels averaged a savings of $685-$950 per patient annually, versus those who did not.[31]

Innovation in Diabetes Treatments

While several medications exists for treating Type 2 diabetes, it is a progressive disease, meaning initial medications effective at controlling a patient's blood sugar levels may lose efficacy years later, despite higher doses of the same medications.[32] Because many patients continue to have uncontrolled diabetes, there remains a need for new treatment options with improved durability, safety profiles, and impact on non-insulin parameters such as lipids, weight, and blood pressure.

Several classes of medicines presently being studied or recently approved for marketing to treat type 2 diabetes address this unmet need. For example, agents like sodium glucose transport-2 (SGLT2) inhibitors are focused on the role kidneys play in controlling blood sugar levels, and increase urinary excretion of glucose and lower glucose independent of insulin. G-protein-coupled receptor agonist (GPR-40) increases glucose-dependent pancreatic insulin secretion, leading to reduced incidence of hypoglycemia compared to older agents that work on the pancreas.[33] Additionally, newer formulations of glucogon like peptide-1 (GLP-1) receptor agonists that work by "increasing glucose-dependent insulin secretion, decreasing glucagon secretion, inhibiting gastric emptying, and increasing insulin sensitivity in some peripheral tissues" are being developed or currently on the market.[33] Insulin, long the staple of diabetes treatment, is also seeing innovative advances as companies focus on inhalable delivery systems and formulations that more closely resemble the insulin activity of healthy patients.

These new drug classes, formulations, and delivery systems build on the latest understanding of the pathophysiology of diabetes and the technology available to avoid and/or treat it. Their innovation offers new hope for patients, caregivers, and society, along with advancements in science for governments, academia, and industry alike. As the burden of Type 2 diabetes increases globally, so too should the armamentarium to combat it.

Endnotes

* HbA1C: According to the American Diabetes Association, HbA1C is a measurement of a person's average blood sugar levels for the past two to three months

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