Analysis of Trends in Utilization and Cost of Insulins in Canada and the US

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Presenter Disclosures

Stefan DiMario

(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

Employed by the MCPHS University Industry Fellowship Program
  • Host Company: Becton Dickinson
Learning Objectives

• Describe trends and analyze differences in insulin utilization and cost in Canada and the US

• Discuss potential reasons explaining the substantial differences in insulin utilization in the US and Canada
Diabetes Snapshot

**Canada**
- 9.3% prevalence (2015)
  - 3.4 million people
- 22.1% with pre-diabetes
  - 5.7 mm people
- Est. 2025 prevalence: 12.1%
- $14 bn cost of diabetes
- 2008/09
  - 6.8% (2.4 mm) had DM

**USA**
- 9.3% prevalence (2012)
  - 30 million people
- 37% with pre-diabetes
  - 86 mm people
- 1 in 3 will have diabetes in 2050 if trends continue
- $176 bn direct cost
  - $69 bn indirect
- 2.3x more health care costs
- 2008
  - 7.8% (23.6 mm) had DM
Definitions

• Diabetes mellitus (DM)
  – a group of diseases that affect how your body uses blood sugar

• Insulin Unit
  – Measurement of insulin dose
  – 100 insulin units = 1 mL
    • In “regular strength” insulins
Methods

• Data was extracted from the IMS Dataview database

• Evaluated:
  – Volume of insulin sold
    • In insulin units
  – Ex-manufacturer sales in USD
    • Company-reported sales
  – Info broken down into Total, Retail, Hospital, Pen, Vial

• Descriptive statistics used to analyze trends
Significance

• Insulin has recently been increasing in price

• Higher prices can make insulin unaffordable for some

• If patients do not take their insulin, a potentially larger problem can be created when diabetes complications arise

• The increasing amount of money spent on insulin cannot be sustained (think of the amount of diabetes patients on Medicare)
# Utilization of Insulin

## Volume of Insulin Sold in Insulin Units

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th></th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2014</td>
<td>2008</td>
</tr>
<tr>
<td>Total population</td>
<td>33.25 mm</td>
<td>35.5 mm</td>
<td>304 mm</td>
</tr>
<tr>
<td>Total insulin sold in Q3</td>
<td>2,180,602</td>
<td>3,181,004</td>
<td>24,833,244</td>
</tr>
<tr>
<td>Insulin units, thousands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted increase</td>
<td>Increase of 46%</td>
<td></td>
<td>Increase of 21%</td>
</tr>
<tr>
<td>Adjusted for total population</td>
<td>Increase of 37%</td>
<td></td>
<td>Increase of 15%</td>
</tr>
<tr>
<td>Insulin sold in retail setting, adjusted for population</td>
<td>Increase of 39%</td>
<td></td>
<td>Increase of 18%</td>
</tr>
<tr>
<td>Prevalence of diabetes</td>
<td>6.8%</td>
<td>9.3% (in 2015)</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td>Increase of 37%</td>
<td></td>
<td>Increase of 19%</td>
</tr>
</tbody>
</table>
Canada Insulin Trends from Q3'08 to Q3'14

Insulin Units, in Thousands

- Total R+H
- Retail Total
- Hospital Total
- Pen Total
- Vial Total
- Pen Retail
- Pen Hospital
- Vial Retail
- Vial Hospital

- Continued, steady rise of insulin utilization as prevalence (and population) increases
- Vials continue to fall out of favor as pens are most frequently used
- Insulin use in hospital remains constant
US Insulin Trends from Q3'08 to Q3'14

- Steady rise of insulin until ~2011/12
- Slowed rate of amount of insulin sold in retail setting
- Insulin pen increasing while vials decreasing (in both retail and hospital settings)
From: Prevalence and Incidence Trends for Diagnosed Diabetes Among Adults Aged 20 to 79 Years, United States, 1980-2012


Data are from the National Health Interview Survey. Joinpoint regression was conducted using the natural logarithm of the age-adjusted rate as the dependent variable and year as the independent variable.

In 1997, the diabetes diagnostic criteria for fasting plasma glucose was lowered from 140 mg/dL or more to 126 mg/dL or more; in 2010, hemoglobin A1c was adopted for the diagnosis of diabetes. To convert glucose to mmol/L, multiply by 0.0555.

Trends in Age-Adjusted Prevalence of Obesity Among Adults Aged 20 to 79 Years, 1980-2012

BMI indicates body mass index (calculated as weight in kilograms divided by height in meters squared). The prevalence of obesity was based on BMI derived from self-reported height and weight data from the National Health Interview Survey. Prevalence of obesity among adults aged 20 years or older was based on measured BMI from the National Health and Nutrition Examination Surveys (NHANES) from 1988 to 1994 (NHANES III) and 1999 to 2012 (continuous NHANES). Line is not drawn through noncontiguous surveys.
Explanations for US Slow-Down?

- US utilizing more orals or non-insulin injectable
- US is waiting longer to “insulinize” its patients
- Prevalence of diabetes is leveling off in the US\(^1\)
- Less patients able to afford their insulin
- Less insulin waste in pen vs. vial

<table>
<thead>
<tr>
<th>Drug</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Januvia (sitagliptin)</td>
<td>2006</td>
</tr>
<tr>
<td>Onglyza (saxagliptin)</td>
<td>2009</td>
</tr>
<tr>
<td>Victoza (liraglutide)</td>
<td>2010</td>
</tr>
<tr>
<td>Tradjenta (linagliptin)</td>
<td>2011</td>
</tr>
<tr>
<td>Bydureon (exenatide ER)</td>
<td>2012</td>
</tr>
<tr>
<td>Nesina (alogliptin)</td>
<td>2013</td>
</tr>
<tr>
<td>Invokana (canagliflozin)</td>
<td>2013</td>
</tr>
<tr>
<td>Trulicity (dulaglutide)</td>
<td>2014</td>
</tr>
<tr>
<td>Tanzeum (albiglutide)</td>
<td>2014</td>
</tr>
<tr>
<td>Jardiance (empagliflozin)</td>
<td>2014</td>
</tr>
<tr>
<td>Farxiga (dapagliflozin)</td>
<td>2014</td>
</tr>
</tbody>
</table>

2. FDA
# Manufacturer Sales

**Amount of Insulin Sold in USD**

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th></th>
<th>US</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2014</td>
<td>2008</td>
<td>2014</td>
</tr>
<tr>
<td>Total population</td>
<td>33.25 mm</td>
<td>35.5 mm</td>
<td>304 mm</td>
<td>319 mm</td>
</tr>
<tr>
<td>Total Sales Q3, (USD, 1000’s)</td>
<td>78,036</td>
<td>139,672</td>
<td>1,689,652</td>
<td>5,542,367</td>
</tr>
<tr>
<td>Unadjusted increase</td>
<td>79% increase</td>
<td></td>
<td>228% increase</td>
<td></td>
</tr>
<tr>
<td>Adjusted for total population</td>
<td>68% increase</td>
<td></td>
<td>212% increase</td>
<td></td>
</tr>
</tbody>
</table>
Insulin sales begin to show signs of plateau.

Vial sales remain low.

Hospital sales remain constant.
<table>
<thead>
<tr>
<th>Quarter, Year</th>
<th>US Insulin Sales, USD (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q3'08</td>
<td>1,000</td>
</tr>
<tr>
<td>Q3'09</td>
<td>2,000</td>
</tr>
<tr>
<td>Q3'10</td>
<td>3,000</td>
</tr>
<tr>
<td>Q3'11</td>
<td>4,000</td>
</tr>
<tr>
<td>Q3'12</td>
<td>5,000</td>
</tr>
<tr>
<td>Q3'13</td>
<td>6,000</td>
</tr>
<tr>
<td>Q3'14</td>
<td>7,000</td>
</tr>
</tbody>
</table>

**Insulin sales skyrocket**

**Hospital sales increase, but not as much**
## Price/Insulin Unit

### Total Insulin Units Sold/Total Sales, USD

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2014</td>
</tr>
<tr>
<td>Average USD/unit, All insulin</td>
<td>0.036</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>12.2% increase</td>
<td>171% increase</td>
</tr>
<tr>
<td>Average USD/unit, Retail</td>
<td>0.037</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>19% increase</td>
<td>168% increase</td>
</tr>
<tr>
<td>Average USD/unit, Pen Retail</td>
<td>0.039</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>18% increase</td>
<td>105% increase</td>
</tr>
</tbody>
</table>
Our Findings Similar to Others

**Shadow Pricing**

Prices for some competing drugs go up in lockstep, rising the same amount at about the same time.

Average price/unit for insulin sold in a pen in the US retail setting = $0.232

This means average price/mL = $23.20

Source: Bloomberg Intelligence analysis of Symphony Health Solutions data
Explanations for Price Differences?

• May expect initial prices to be higher in the U.S.
  – Do not expect to see prices growing exponentially

• Government in Canada limits prices
  – To ensure they are not excessive

• No such system exists in the U.S.
Explanations for Price Differences?

- U.S. cannot buy in bulk
- Medicare cannot negotiate with pharma
- No comparative research group

- Insulin market monopoly
  - Only a few companies play in this space
- Analogue insulins nearing the end of patents
  - Contributing most to price increase
  - Collect profits before biosimilars (price cut of 20-30%)

- Quite simply, price increases occur because they can
N.A. has 7% of World’s diabetes patients, but accounts for over 50% of insulin sales.
Implications

• Insulin prices (and drug prices in general) cannot continue to grow at their current rate

• Measures for setting and controlling drug prices need to be put into place
  – “Free market” price control in the US not working, largely because it is not a free market

• US should not have to pay more than other developed countries for the same drug

• Look to Canada and EU for their success
Thank you!