A Novel Economic Analysis Applied to Innovative Diabetes Digital Health Intervention Demonstrates Significant Financial Benefits

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Introduction

Historically, cost-savings estimates associated with a reduction in A1C have been computed by pooling patients' retrospective financial data and producing per person, per month (PPPM) appraisals for patients as a whole; even those studies that attempted to stratify the population did so by assigning patients to one of two segments: controlled (those with A1C<7%) and uncontrolled (those with A1C≥7%). This practice does not take into consideration the inherent differences in costs incurred between smaller subgroups of patients, and does not present an accurate estimation of savings from all starting levels of A1C. It is well established that decreasing A1C levels is correlated with reduced risks of stroke, heart attack, and early death. However, the cost-savings associated with these reductions are often unspecific and do not apply evenly to all patients: in other words, not all drops in A1C are economically equivalent.

To provide a more accurate estimation of cost-savings associated with A1C reduction, accurate patient-level lab data must first be captured from a diverse and representative segment. In the real-world, this collection presents a significant problem. A large portion of patients with diabetes do not utilize testing services on the recommended timetable. Patients who are not consistently tested and assessed by healthcare professionals are more likely to have an A1C above recommended levels. Also, a patient's A1C values may fall into different segments over the course of their treatment in the same calendar year.

Methods

Our hypothesis was that the cost savings associated with decreased A1C levels would be a function of both the change in A1C as well as the starting point in A1C. The higher the starting point and the higher the drop, the larger the economic savings potential. We collected starting and ending A1C data from over 3000 users of the digital therapeutic tool, BlueStar® (WellDoc, Inc., Columbia, MD). BlueStar is a FDA 510K-cleared digital therapeutic designed to coach adults with type 2 diabetes to self-manage their condition and enhances patient-provider communication. We counted the number of users in each of four A1C bands: 'in control' (6.0-6.9), 'elevated' (7.0-7.9), 'high' (8.0-8.9), and 'not controlled' (≥9). In addition, we determined the percentage of patients within each band who experience drops in A1C in the following increments: 0.0-0.49, 0.5-0.99, 1.0-1.49, 1.5-1.99, and ≥2.0).

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We queried data from the MarketScan® Commercial Claims and Encounters Database and the MarketScan® Medicare Supplemental and Coordination of Benefits Database (Truven Health Analytics, an IBM company, Ringwood, NJ.) These databases capture administrative inpatient, outpatient, and prescription drug data for approximately 80 million individuals. Claims are gathered from approximately 150 large employers and health plans across the United States and provide detailed diagnostic, cost, and outcomes information from fully-adjudicated claims.

Patients aged 40 and over with diabetes were captured from the databases, using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), and Tenth Revision (ICD-10-CM) diagnosis codes. The patient population was narrowed to include only those people with diabetes with at least four A1C tests in a one-year period, from January 2014 to December 2015. Results of A1C tests were tabulated, and stratifications for A1C value range were established in the same bands as specified above. Patients were then stratified as stable versus unstable, and as enrolled in commercial insurance or Medicare. Stable is defined as all four A1C readings in the same year fell into the same A1C band, and variable is defined as having at least two, but less than four, readings in the same band. From these segments, total healthcare costs were summarized, and average costs per year by A1C range were analyzed.

Results

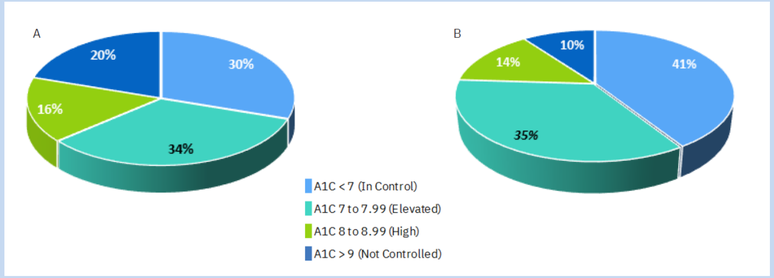

Figure 1: Starting A1C readings for (A) the commercially insured population and (B) the Medicare population. Data is from the MarketScan ® Database.

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Figure 2: Estimated per person per year (PPPY) healthcare costs for (A) the commercially insured population and (B) the Medicare population

Segment by Starting A1C Bands	Commercial Sector Estimated Cost Savings (Per patient, annually)	Medicare Sector Estimated Cost Savings (Per patient, annually)
For All Bands with A1C ≥ 7 7 to 7.99; 8 to 8.99; Above 9	$1,824	$1,392
For All Bands with A1C ≥ 8 8 to 8.99; Above 9	$3,252	$3,048
For A1C ≥ 9	$5,244	$3,672

Table 1: Estimated Annual Cost Savings by Starting A1C Bands

Conclusions

- The market opportunity to reduce the total cost of diabetes in the US is significant
- The opportunity that yields the highest cost savings is to target BlueStar to those patients with A1C above 8% (opportunity to realize near-term cost savings for the high risk population)
- An additional opportunity exists to deploy BlueStar to those with A1C between 7 and 8% (opportunity to avoid longer-term cost increases for the rising risk population)
- Digital tools like BlueStar provide cost effective, scalable solutions for patients, providers, and payers in evolving healthcare payment and practice models

References

- Quinn C et al. Cluster-Randomized Trial of a Mobile Phone Personalized Behavioral Intervention for Blood Glucose Control. *Diabetes Care.* 2011. 34:1934-1942.
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