Outcomes Research in Health Care: Simulations to Drive Cost Conclusions

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In this issue of Value in Health, Caro and associates [1] report on their development of a simulation to measure the relative costs of two different oral prescription medications for the management of type 2 diabetes mellitus: nateglinide and metformin. The primary finding in the study was that patients treated with nateglinide showed a 3-year treatment cost reduction of $295 in comparison to metformin, primarily owing to a 2.4-month reduction in the time it took patients to achieve dual glycemic control, as measured by postprandial glucose (PPG) and hemoglobin A1c determinations (HbA1c). Of note is the development of a simulation tool that uses previously reported clinical data to apply the efficacy of each of the compared agents.

The United States is currently facing a diabetes epidemic. Although the reasons may be multifactorial, the aging of the population, increasing obesity, decreased physical activity, and changes in food consumption appear to be primary drivers [2]. It is estimated that by the year 2050 we will see a 46% rise in the number of US citizens with the disease [3]. Accordingly, any simulation using an easily understood methodology and readily available laboratory markers to assess or compare the long-term value of therapies could be an important contributor to the successful treatment of those who fail preventive measures and then rely on medical intervention to control the microvascular and macrovascular complications of the disease. As health-care practitioners, we should not lose sight of the simple fact that much of our current epidemic is indeed fueled by the increasing weight of younger adults and children. This, in the true sense of the word, is a preventable phenomenon given appropriate dietary and lifestyle counseling.

So, what should we make of the conclusions of this particular model? First, we must comment on the idea of "easily understood" as an important component for the wide adoption of any new information contributing to the care of a diabetic population. In this model, the attempt to describe a simulation of disease burden to estimate shorter-term results was uniformly met with confusion by our clinical practitioners. Although the authors describe their processes, the description falls short for a clinician-based audience. The study report could have benefited from a more thorough discussion of the methodologies used given that most clinical practitioners are not familiar with the modeling methodology employed.

Second, advancing the notion that the use of HbA1c and PPG in the short term is, as the authors state, novel did not resonate with our clinicians. Although it is well recognized that the control of HbA1c levels in both type 1 and type 2 diabetes is associated with a decreasing risk of microvascular complications, the use of PPG as a marker has only been shown to be of value in patients with gestational diabetes [4]. Therefore, use of these markers in the development of a model assessing relative costs between two therapies is fraught with difficulty and requires further research to determine true contributions.

In addition to this overriding issue, other concerns exist. An expert panel apparently validated the assumptions related to treatment pathways and resource use. Nevertheless, standard processes for reaching consensus with expert panels did not appear to be incorporated, which would have been critical to achieve objective, unbiased model assumptions.

The authors attempted to model real-world treatment patterns by incorporating medication persistence rates. Nevertheless, the assumption of ~80% persistency at the end of 3 years, although apparently based on one international study, seems optimistic. Additional reference to other studies of diabetes persistency would be important, as would a sensitivity analysis of persistency rates. The authors said that they conducted sensitivity analyses on all models parameters, but if so, the results were not shown.
Similarly, a real-world examination of resource use patterns, perhaps using medical claims data, would have provided greater confidence in the treatment assumptions. American Diabetes Association (ADA) guidelines were used, but the literature is rich with examples of how routine care patterns differ from clinical guidelines. Although the authors recognized this limitation, it is unclear why they did not collect actual treatment pattern data given its criticality.

In summary, the study’s likely value for informing decision-making is limited by the complexity of the analysis, the lack of consensus as to the importance of the study’s key outcome measure, and treatment pattern assumptions based on clinical guidelines rather than routine clinical care. Putting aside the validity of the dual control as an outcome measure, the difference of 2.4 months in time to reach dual glycemic control is an insufficient difference on which to base a decision. When one considers the limitations of the study and the extent to which results changed even for the limited sensitivity analyses that were presented, it becomes entirely unclear whether a 2.4-month difference would actually manifest in routine care.

Additional cost-effectiveness research is necessary to assist practitioners with important questions about which initial therapies to select. Clearly, diabetes is a progressive disease. Patients who reach their goal initially on single drug therapy are likely to require additional therapies later in life to maintain acceptable HbA1c levels. At present, the ADA treatment guidelines [5] give guidance as to what acceptable treatment goals are. What is not clear is well-researched guidance as to what initial therapy may delay progression to the need for additional add-on therapies, including both oral and injectable products. We welcome additional research in this area.

References