High-Priority Research Needs for Insulin Delivery and Glucose Monitoring Methods

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Given new technologies in insulin delivery and glucose monitoring, clinicians are now faced with determining which patient populations benefit most from the use of continuous subcutaneous insulin infusion with a pump and/or real-time continuous glucose monitoring (rt-CGM). A previous systematic review identified important gaps in the evidence on the effectiveness of insulin delivery and glucose monitoring methods.[1,2] We sought to elucidate the highest-priority questions to focus future research endeavors.

We adapted the Delphi method via a seven-step, four-phase process for consensus building.[3] Following suggestions from a previous report,[4] we identified and invited 14 experts to serve as expert stakeholders until we had at least 5 stakeholders who were able to participate in the consensus-building process. The final five-member stakeholder panel included one academic pediatric endocrinologist, three adult endocrinologists, and one patient with type 1 diabetes mellitus for more than 50 years. Stakeholders were asked to rate high priorities for future research on potential populations (children, adolescents, adult, or elderly), insulin delivery (continuous subcutaneous insulin infusion, reactive low glucose suspend pump, artificial pancreas, or sensor-augmented insulin pump), glucose monitoring methods (self-monitoring of blood glucose, retrospective continuous glucose monitoring, or rt-CGM), and outcomes [hemoglobin A1c (HbA1c), adherence, nonsevere hypoglycemia, severe hypoglycemia, hyperglycemia, or weight gain] based on the 2012 evidence report.[1,2]

In the final assessment of the panel, all five stakeholders agreed that rt-CGM was the highest priority for research on glucose monitoring methods for type 1 diabetes, while the majority agreed that the artificial pancreas was the highest priority for research on insulin delivery methods for type 1 diabetes. The majority of the panel also agreed that adolescents were the highest-priority age group for such research. The highest-priority outcomes were adherence for the younger population and severe hypoglycemia for adults and elderly.

For insulin-requiring type 2 diabetes, the majority of the panel agreed that rt-CGM was the highest priority for future research on glucose monitoring methods and that the sensor-augmented insulin pump was the highest priority for research on insulin delivery methods. The majority also agreed that adults were the highest-priority age group and that HbA1c was the highest-priority outcome.

Based on stakeholders' judgments regarding populations, interventions, comparisons, and outcomes of interest, four research questions were identified as high priorities for future research (**Table 1**). Complete details are in the full report.[5]

Table 1. High Priorities for Future Research on Insulin Delivery and Glucose Monitoring Methods
1. For adolescents with type 1 diabetes, what is the comparative effectiveness of an artificial pancreas versus other methods of insulin delivery for the outcomes of adherence and severe hypoglycemia?
2. For adolescents with type 1 diabetes, what is the comparative effectiveness of rt-CGM versus other methods of glucose monitoring for the outcomes of adherence and severe hypoglycemia?
3. For adults with insulin-requiring type 2 diabetes, what is the comparative effectiveness of a sensor-augmented insulin pump versus other methods of insulin delivery for the outcome HbA1c?
4. For adults with insulin-requiring type 2 diabetes, what is the comparative effectiveness of rt-CGM versus other methods of glucose monitoring for the outcome HbA1c?

Our consensus-building exercise had limitations. First, stakeholders did not independently identify research gaps on the basis of populations, interventions, and outcomes but rather by the limited options that we provided according to our analytic framework.[1] Second, due to the abundance of outcomes gaps in the literature, it was prohibitive to present all potential outcomes to the stakeholders for prioritization. Long-term clinical outcomes were not specifically included for prioritization by the stakeholders. While prevention of long-term macrovascular and microvascular complications is the ultimate goal of interventions for type 1 and type 2 diabetes, such trials would need an extremely long time for follow-up. Third, our small group may not be representative of all those who have a stake in research on insulin delivery and glucose monitoring. Nevertheless, in the absence of a large survey of stakeholders, our efficient consensus-building exercise helps to identify specific priorities for future research that should be pursued.

References:

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