VALUE OF SIMPLE INSULIN INFUSION IN THE US – A PRAGMATIC HEALTH ECONOMIC MODEL ANALYSIS

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INTRODUCTION

- Continuous subcutaneous insulin infusion (CSII) in patients with type 2 diabetes (T2DM) improves glycemic control (HbA1c) and reduces insulin dosage compared to multiple daily injections (MDI).[1] However, CSII has not been widely adopted in T2DM due to costs, complexity and training requirements.

- New delivery devices, like PAQ®, a simple 3-day insulin delivery device (CeQur Corporation, Marlborough, MA) provide simple insulin infusion (SII) and diminish traditional CSII obstacles.[2] This analysis investigated cost-effectiveness in the United States of SII compared to MDI in patients with T2DM not in glycemic control, with the aim to assess the value of SII devices.

METHODS

- Calculations included costs of insulin, needles and pens. Assuming equal effectiveness of CSII and SII, daily insulin doses for SII (97 units/day) and MDI (122 units/day) were taken from the OpT2mise study.[1]

- The unit cost of a SII devise was varied to obtain pre-defined Incremental Cost-Effectiveness Ratios (ICERs) of costs per quality adjusted life-years (QALYs) gained. ICERs below 1xGDP per capita (2016: USD 57,467) were defined as 'highly cost-effective' and below 3xGDP as 'cost-effective'.

- Data from a recent meta-analysis of 5 randomized clinical studies of CSII vs. MDI were used to assess the relationship between baseline HbA1c levels and the difference in effect of treatment with SII vs. MDI:
  (HbA1c difference = 1.575 - (0.216 x Baseline HbA1c).[3]

- Estimated HbA1c differences between SII and MDI were then applied on results from a recent systematic review on the long-term relationship between reduced HbA1c levels and increased life-expectancy along with increased QALYs:
  (1% decrease in HbA1c = 0.642 increase in life years);
  (1% decrease in HbA1c = 0.371 increase in QALYs).[4]

- Costs and outcomes were discounted at 3%, and a mean life expectancy of 17 years was assumed for patients on MDI.

- The value (unit cost in USD per patient per day) of a SII device was then estimated over a range of baseline HbA1c values and cost per QALY gained thresholds.

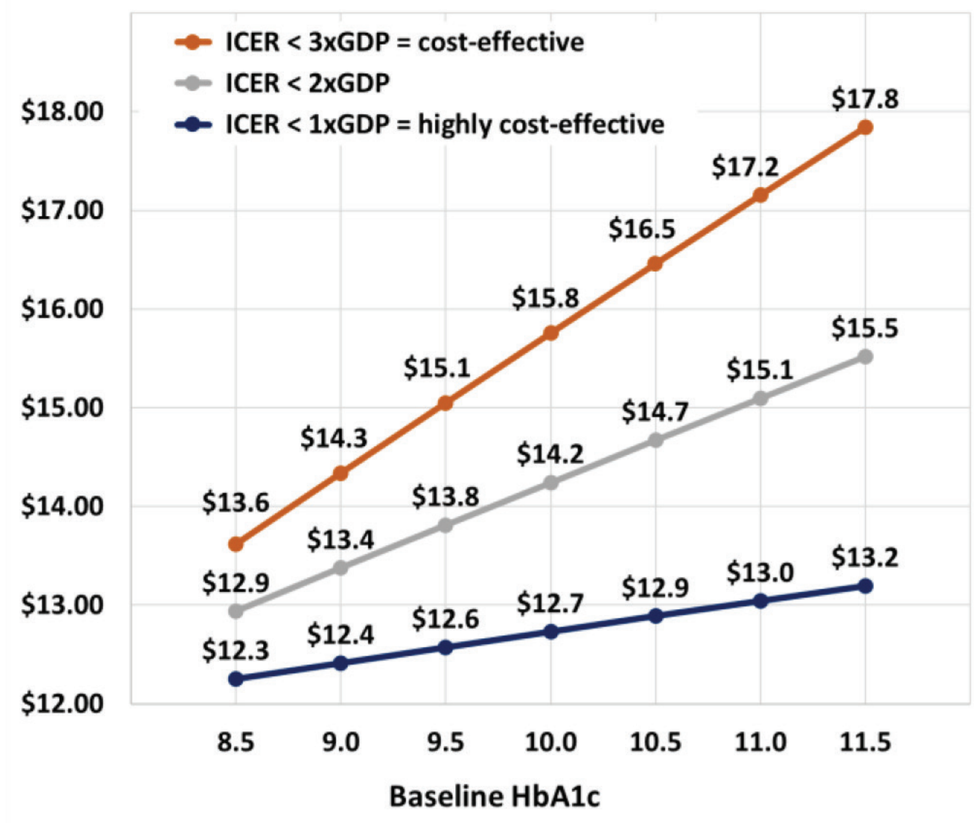
- One-way sensitivity analyses were made on key variables to assess uncertainty of the estimates.

RESULTS

- Annual insulin costs (August 2017) were estimated to be USD 9,757 for SII and USD 14,086 for MDI (including needles and pens).

- Base-case results indicated that the unit cost of a SII device is cost-effective in a price range around $12 to $18 per patient and day, depending on baseline HbA1c value and the cost-effectiveness criteria used (Figure).

Value of a SII device by baseline HbA1c in USD per patient per day



- For illustration, discounted results when using a baseline HbA1c of 10.5 and a cost-effectiveness threshold of 1xGDP (USD 57,467) are displayed in the Table.

	Difference SII - MDI
HbA1c change (%)	- 0.693
Life Years	0.271
QALYs	0.157
Therapy costs (USD)	- 56,058
SII device costs (USD)	65,080

Incremental costs / QALYs gained: (65,080 - 56,058) / 0.157 = ICER < USD 57,467

- Sensitivity analyses showed that the estimated cost-effectiveness of a SII device is more uncertain the:
  - lower the QALY difference is for any reason (e.g. baseline HbA1c), since the difference in costs comes closer to be divided by zero QALYs in the ICER;
  - lower the difference in insulin costs is;
  - longer the mean life expectancy is.

CONCLUSIONS

New simple insulin infusion devices like the PAQ® have the potential to become highly cost-effective treatment alternatives in patients with T2DM on MDI not in glycemic control.

REFERENCES

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