Hybrid closed-loop systems for managing blood glucose levels in type 1 diabetes: a systematic review and economic modelling

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Plain language summary

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Plain language summary

Type 1 diabetes mellitus is a lifelong condition whereby an individual's pancreas significantly reduces or stops producing the hormone insulin that manages blood glucose levels. The individual must self-administer insulin and monitor their blood glucose levels.

Hybrid closed-loop systems provide a control algorithm that reviews data and the impact of its past actions. Hybrid closed loop can reduce the burden on the patient by taking responsibility for handling the number of data and providing insulin when needed.

The aim of this project is to review the clinical and financial benefits of hybrid closed-loop systems for managing glucose in people who have type 1 diabetes mellitus and are having trouble managing their condition.

We looked at published studies following precise scientific approaches. We searched several online resources to find these studies. The National Institute for Health and Care Research provided additional studies that had not been published. The studies we found included the following information:

- people – with type 1 diabetes mellitus (any age group and including pregnant women)
- technology – people using a hybrid closed-loop system
- comparison – people using flash or intermittent glucose monitoring + pump therapy
- results – type 1 diabetes mellitus-related outcomes, such as glucose management, quality of life, heart disease, and complications related to the use of hybrid closed loop.

Our online search found 12 randomised controlled trials that compared hybrid closed loop with continuous glucose monitoring + pump therapy. People in the hybrid closed-loop group had better glucose management (their glucose levels dropped by 0.28%). People in the hybrid closed-loop group had better glucose levels in the recommended range (between 3.9 and 10.0 mmol/l). People in the hybrid closed-loop group experienced less hyperglycaemic levels (above 10.0 mmol/l).

The financial costs of hybrid closed loop suggest that it is more expensive (£1500) than continuous glucose monitoring + pump therapy.

Studies that looked at hybrid closed loop in people with type 1 diabetes mellitus seem to suggest that it is better for diabetes management in terms of glucose levels, better time in range between 3.9 and 10 mmol/l, and less hyperglycaemic levels.

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This article

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