

How Much Do Forgotten Insulin Injections Matter to Hemoglobin A1c in People with Diabetes? A Simulation Study

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Abstract

Background:

Forgotten or omitted insulin injections are an important contributing factor to poor glycemic control in people with type 1 diabetes. This study uses mathematical modeling and examines the impact on hemoglobin A1c (HbA1c) levels if insulin injections are forgotten. The simulation concerns people with type 1 diabetes on intensive insulin therapy.

Methods:

Five sets of blood glucose profiles with and without a forgotten injection were obtained. The difference to HbA1c was calculated using an HbA1c estimator on the profiles and was multiplied by the frequency of forgotten events. A frequency of 2.1 forgotten injections per week was found in the literature.

Results:

Calculations showed that forgetting 2.1 meal-related injections per week would lead to an increase in HbA1c of at least 0.3–0.4% points, and similarly 0.2–0.3% points related to forgotten injections of the long-acting insulin. In case of even more pronounced nonadherence (e.g., if 39% of all injections are forgotten) there is a possible increase of HbA1c of 1.8% points.

Conclusions:

The magnitude of the possible improvement in HbA1c agrees well with other studies in the relation between adherence and HbA1c levels. The estimated numbers suggest that missing injections are an important reason for suboptimal treatment.

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Abbreviations: (BG) blood glucose, (CGM) continuous glucose monitoring, (DCCT) Diabetes Control and Complications Trial, (DirecNet) Diabetes Research in Children Network, (HbA1c) hemoglobin A1c, (MPG) mean plasma glucose

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