Supplementary Material

Methods

Data sources and literature search

Keyword search terms included smart insulin pen, digital insulin pen, connected insulin pen, wireless-enabled insulin pen, smart insulin delivery system, connected insulin injection devices, insulin dose logging, smart pen cap insulin, Novopen®, Novopen® 6, Novopen® Echo, Novopen® Echo Plus, Ypsodose®, Inpen™ System, Esysta, Insulclock®, Gocap®, Clipsulin®, Humapen Memoir®, KwikPen®, and Timesulin®. The reference lists of all relevant publications identified were searched to identify additional papers. A hand search of several German language journals (Diabetologie und Stoffwechsel; Diabetes, Stoffwechsel und Herz; Der Diabetologe; Gesundheitsbericht Diabetes; Diatec Journal) was also performed.

Study selection and quality assessment

Publications found in the literature search were critically reviewed using the above criteria by two independent data analysts (Masem Research Institute GmbH). If there was a question as to the article's suitability for inclusion, further discussion between the researchers occurred. Articles deemed suitable for inclusion were investigated further by the data analysts via successive rounds of article assessment using the title, then the abstract, and then the full text. Articles on connected systems for use with an insulin pen were included; articles discussing the need for smart insulin pens, smart insulin pens with connectivity, or connectivity systems were included to assess how systems were evaluated; articles that included smart insulin pens with a memory function and articles discussing pens in general were included for further analysis at later selection stages.

The quality of the publications was assessed using the size of the patient population, the outcomes examined, and the tools used for assessment (e.g., interviews, questionnaires).

Data extraction

Data of interest included device details, study participants (patients, healthcare providers), administration details (drug, frequency, device, duration), aspects of pen use (patient preference, usability, etc.), measuring tools used (interviews, surveys, etc.), patient adherence, and any clinical outcomes measured.