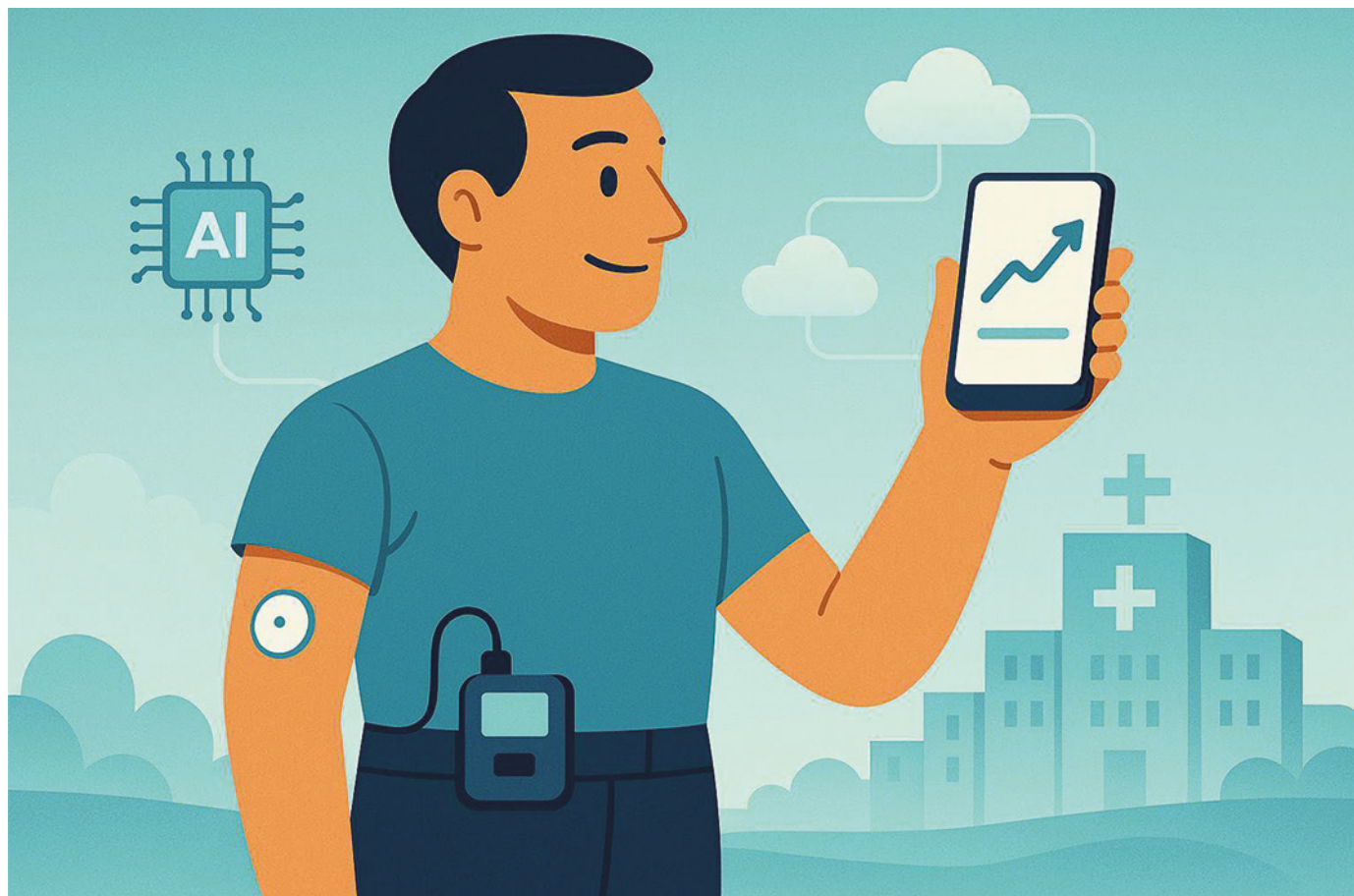




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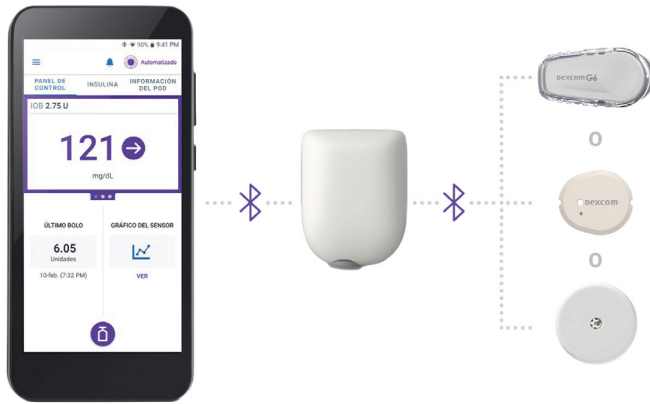


Innovation in diabetes technology: what the near future holds

In recent years, continuous glucose monitoring and hybrid closed-loop systems (HCLS) have transformed diabetes management, improving glycemic control, reducing daily decision burden, and increasing quality of life for many people with diabe-

tes 1-3. These systems are now part of routine clinical practice and have opened the door to a new generation of technology in which pumps, sensors, applications, and artificial intelligence are integrated into increasingly connected ecosystems (1, 4)

1. NEXT-GENERATION AUTOMATED PUMPS



Omnipod 5

1.1. Omnipod 5

Omnipod 5 is a tubeless, wearable, waterproof HCLS that integrates the reservoir and cannula into a single device adhered to the skin. The SmartAdjust® algorithm is housed directly in the POD and communicates every 5 minutes with Dexcom G6, Dexcom G7, and FreeStyle Libre 2 Plus to adjust insulin delivery, helping correct hyperglycemia and protect against hypoglycemia (5).

The system is operated through a dedicated controller (or, in some countries, a mobile application), allowing visualization of glucose and insulin data, modification of settings, establishment of customizable glucose targets by time blocks, and use of advanced functions such as the SmartBolus calculator—which integrates sensor trends and “custom foods”—and the Activity mode for situations of higher hypoglycemia risk, such as physical exercise (5).

Insulet’s roadmap includes compatibility with FreeStyle Libre 3 Plus starting in 2026 and development of SmartAdjust 2.0, with a target of 100 mg/dL and improvements in automated time, as well as fully closed-loop systems for type 1 and type 2 diabetes mellitus (5). In our setting, the introduction of Omnipod 5 with a dedicated controller is expected during 2026, subject to regulatory and reimbursement processes.

1.2. Tandem Mobi and Control-IQ+

The Tandem Mobi insulin pump is a very small and discreet device (5.1 cm × 3.7 cm × 1.4 cm; 28 g) that can be worn on the body or clipped, with disconnect option, refillable cartridge, and wireless charging⁵. It uses the Control-IQ+ algorithm, an HCLS integrated with Dexcom G6, Dexcom G7, and FreeStyle Libre 3 Plus (depending on country), which predicts glucose 30



Tandem Mobi

minutes ahead, adjusts basal insulin every 5 minutes, delivers automatic correction boluses, and includes dedicated sleep and exercise modes. It is indicated for individuals ≥ 2 years (≥ 9 kg) with a total daily insulin dose > 5 IU (5).

Configuration and monitoring are performed via Tandem’s mobile application, which displays real-time glucose and insulin data, allows parameter adjustments, and activates the different algorithm modes. Data synchronize with the Tandem Source platform, enabling structured review of time-in-range and control patterns by people with diabetes and healthcare teams. In Spain, the arrival of this reduced-format pump and the advanced algorithm version could occur in late 2026, depending on authorization and funding timelines⁵. The roadmap also includes a 7-day infusion set and, in parallel, development of Sigi, a tubeless patch pump by Tandem, global integration with Libre 3 Plus, and, in the medium term, dual glucose-ketone sensors and a fully closed system (5).

1.3. Medtronic: Instinct, Flex/Fit, and the Vivera Algorithm

Medtronic’s innovations are organized along 3 axes (5). First, the new Instinct sensor, developed with Abbott, is expected to become the reference sensor for the company’s future HCLS, alongside evolution of the Simpleria Sync family toward simpler monitoring integrated with pumps. Second, the MiniMed Flex pump, a smaller tubed pump controlled via mobile app, and the MiniMed Fit, a patch pump with up to 300 units designed for up to 7 days of use with extended-wear infusion sets, have been announced. Finally, the Vivera algorithm (NMx-AID) represents the third generation of closed systems based on neural networks, an evolution beyond traditional mathematical algorithms, enabling simplified meal announcements (“small/medium/large meal”), time-based insulin adaptation, and faster activation of automatic mode (5).



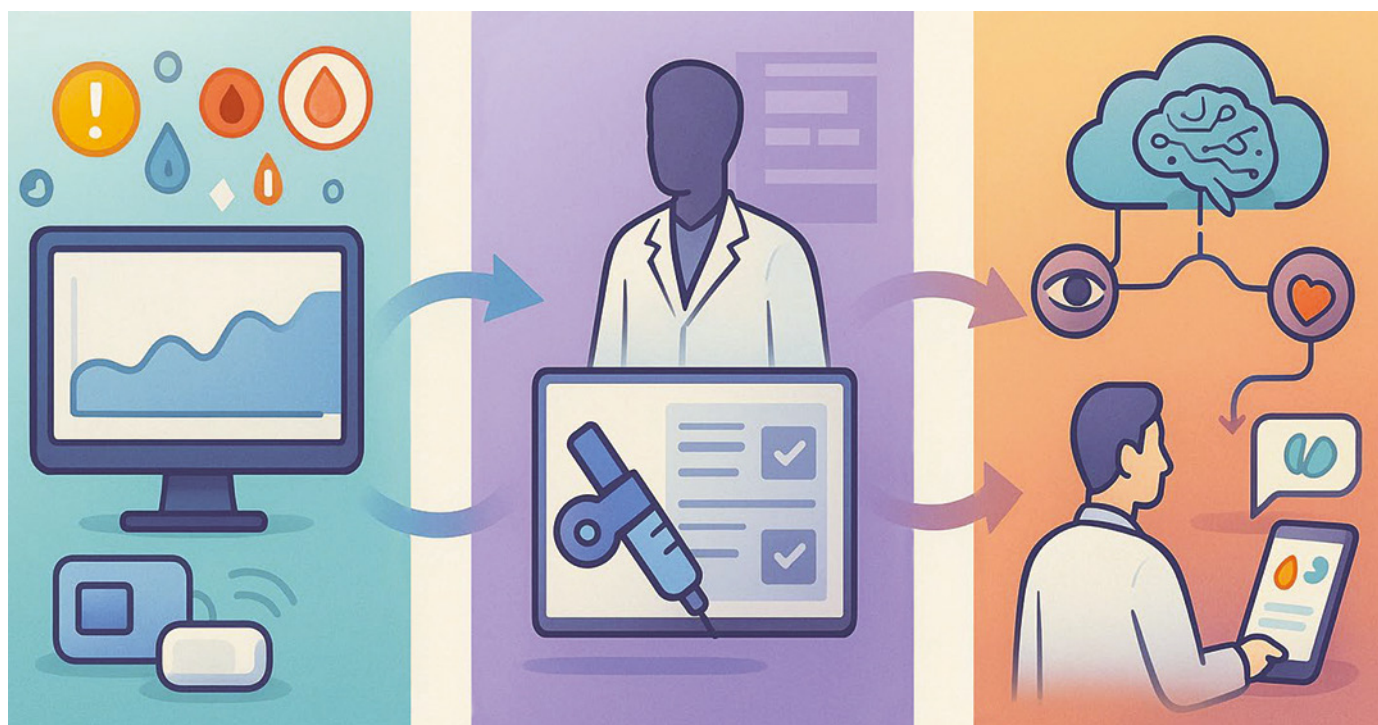


FIGURE. Main areas of application of artificial intelligence in diabetes: risk prediction, therapeutic decision support, and tools for screening and self-care.

THE CHALLENGE OF THE COMING YEARS WILL NOT BE HAVING “MORE DEVICES,” BUT MAKING THEM WORK TOGETHER IN AN INTELLIGENT, SIMPLE, AND USEFUL WAY FOR PEOPLE WITH DIABETES

» 1.4. *mylife Diabetes Care: mylife Loop*

The mylife Loop system combines the YpsoPump, the CamAPS FX application (available for Android and iOS), and Dexcom G6 or FreeStyle Libre 3/3 Plus sensors. The algorithm runs on the phone, which receives glucose data, calculates dosing, and sends commands to the pump, creating a flexible HCLS used in children, adults, and pregnant women with significant improvements in time-in-range (5). The company is developing the mylife Cloud platform for data access and telemonitoring, a future patch-type pump, compatibility with Dexcom G7, and the CamAPS HX algorithm, a fully closed system with CE marking for people with type 2 diabetes mellitus, not yet commercialized (5).

2. NEXT-GENERATION SENSORS: DURATION, INTEGRATION, AND KETONES

In recent years, glucose sensors have become more comfortable and reliable, with smaller

devices, no routine calibrations, and MARD < 10%, allowing safe therapeutic decisions (2, 3). A major step forward is the Dexcom G7 15 Day, approved for adults, with up to 15.5 days of wear including grace period. This extension maintains high accuracy and reduces monthly changes and waste, particularly important for long-term CGM users (5).

Another particularly striking development is Abbott’s dual glucose-ketone sensor, currently under investigation. This device is designed to measure glucose and ketone bodies simultaneously, with future integration into HCLS and advanced platforms. In practice, it could enable very early detection of ketoacidosis in pump users with type 1 diabetes, support monitoring of treatments that increase ketosis risk such as SGLT2 inhibitors, and allow algorithms to automatically adjust targets, alarms, and even insulin delivery strategies when ketosis is detected (3, 5). Although still in development, it clearly reflects the future of continuous monitoring: moving from glucose alone to a more complete real-time metabolic profile. »



Main challenges for responsible implementation of advanced diabetes technology: equity of access, continuous education, and economic and environmental sustainability.

» 3. ARTIFICIAL INTELLIGENCE IN DIABETES

3.1. Prediction and Proactive Management: Beyond the Trend Arrow

Until recently, CGM provided mainly a number and a trend arrow. Artificial intelligence (AI) transforms this information into clinically meaningful predictions. Tools such as Roche's Accu-Chek Smart-

Guide analyze current glucose, recent trends, and longer-term personal history to estimate how glucose may evolve over the next hours, calculate short-term hypoglycemia or hyperglycemia risk, and present it through simple indicators such as "high risk of glucose < 70 mg/dL in the next hours" or nocturnal hypoglycemia risk (1, 3, 4). This enables intervention before problems arise and allows clinicians to quickly identify high-risk time periods,

reducing alarm fatigue by focusing on situations with true clinical impact (1, 3).

3.2. Therapeutic Decision Support: Smart Basal and Treatment Adjustment

AI also assists treatment decisions. An example is Smart Basal, a basal insulin optimizer for people with type 2 diabetes mellitus that uses sensor data (Dexcom G7 15 Day) and recorded doses to propo-»



Diabetes technology ecosystem: integration between pump, sensors, mobile applications, cloud platforms, and interaction with the healthcare team.

» se personalized adjustments under professional supervision (3, 5). Such tools facilitate insulin initiation and titration, support time-constrained professionals, and standardize decisions often made intuitively (1, 3). Similar solutions are expected for prandial bolus adjustment and titration of non-insulin therapies.

3.3. AI for Screening, Prediction, and Self-Care

Beyond pumps and sensors, AI is applied to many aspects of diabetes care. Models analyze retinal images, lab data, and clinical records to detect diabetic retinopathy, neuropathy, or diabetes risk even at very early stages; algorithms estimate risk of severe hypoglycemia, ketoacidosis, or hospitalization from electronic health records and wearable data; and digital assistants provide guidance on nutrition, physical activity, and

simple treatment adjustments, reinforcing daily diabetes education (1, 3). Near-future developments include “digital twin” or personal simulation models to virtually test treatment changes before real-world application (1, 3). In all cases, AI does not replace people with diabetes or healthcare teams but adds a decision-support layer that simplifies management of a complex disease in an increasingly technological environment (1, 4).

4. OTHER DEVELOPMENTS ON THE HORIZON

Recent major scientific meetings (ATTD, ADA, EASD 2025) indicate a clear trend toward hardware convergence: reducing the number of components a person wears and integrating functions previously separate (pump, sensor, connectivity) into a single device (2, 3, 5). Prototypes of “all-in-one” systems »

THE COMBINATION OF ADVANCED SENSORS, INTELLIGENT ALGORITHMS, AND REMOTE MONITORING CAN BRING SPECIALIZED CARE CLOSER TO PEOPLE WHO WERE PREVIOUSLY FAR FROM IT

» combining patch pump and glucose sensor in a compact wearable and long-term implantable continuous monitoring devices—inserted once and designed to function for several years measuring blood glucose directly—have been presented. The shared goal is to reduce physical and logistical burden while maintaining or improving accuracy and reliability.

5. CHALLENGES: A PROMISING FUTURE THAT MUST BE EQUITABLE

International organizations emphasize that AI and advanced technologies offer enormous opportunity to improve diabetes care but also pose risks if not implemented responsibly (4). The main challenges include ensuring equitable access, continuous training for professionals and people with diabetes, algorithm transparency and bias avoidance, and progress toward economically and environmentally sustainable care models (1, 4). **D**

CONCLUSIONS

1. Diabetes technology is evolving toward more automated and integrated systems.
2. New sensors will enable more continuous and precise metabolic monitoring.
3. AI helps anticipate problems and support clinical and self-care decisions.
4. Innovation is only useful when accompanied by education and strong care organization.
5. The key challenge is equitable, safe, and sustainable implementation.

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