Retrospective:

Policy Reporter by mercalis

100 Years of Diabetes Management Evolution

2023 marks the 100th anniversary of the first commercialization of self-administered insulin for diabetes management, so we thought that it would be interesting to review the past 100 years of innovation for this patient population. Our curiosity started as part of our prescription digital therapeutics study, where we found that separate payment for diabetes management apps is not typically approved by payers. In this article, we will focus on how patient access and payer coverage of glucose monitoring and insulin dosing technology has evolved, with an eye towards incorporating this information into the emerging workflow of provider reimbursement for remote patient monitoring (RPM).

Diabetes Innovation & Coding Timeline

The timeline below highlights key developments in Glucose Monitoring and Insulin Delivery, along with key developments in coding/payment and integration with the physician workflow. Over time, automated insulin delivery based on integration of data from the continuous glucose monitor is drawing diabetes management into a "closed loop" with real-time information to both the patient and the provider.

Color Key:

- Glucose Monitoring
- Insulin Delivery
- Integrated glucose-insulin
- Coding Development
- Other Important Developments

Glucose Monitoring

Insulin Delivery

	1908	First commercialized urine glucose test (Benedict's)
Discovery of insulin (Banting & Best)	1921	
First commercial production of self-administered insulin from animal sources	1923	Introduction of the exchange system for diabetes meal planning. The exchange system for diabetes meal planning is a method of meal planning that was developed by the American Dietetic Association and the American Diabetes Association in the 1950s. It was designed to provide people with diabetes with a flexible approach to meal planning that would help them achieve and maintain healthy blood glucose levels.
Longer acting insulin (Neutral Protamine Hagedorn)	1946	
First disposable insulin syringe	1950s	
	1962	First portable blood glucose meter (Ames Reflectance Meter)
	1965	First blood glucose test strip (Ames Diagnostics' Dextrostix)
	1970	First home glucose meter (Ames Pocket Chemist)
First human insulin (Humulin)	1978	
	1980	First home blood glucose meter with digital display (Dextrometer)
First biosynthetic human insulin (Humulin R) First insulin pen (Disetronic)	1982	
First commercialized portable infusion pump, worn externally (MiniMed 502)	1983	
First long-acting insulin (Humulin NPH)	1985	A4256 Glucose Monitor, all components
	1986	E0607 Blood glucose monitor home
First insulin pen with replaceable cartritches (Novopen)	1987	
First rapid-acting insulin analog (lispro, Humalog)	1991	
First inhaled insulin (Exubera)	1995	
	1996	A4258 Lancet device E0784 External ambulatory insulin infusion pump
	1998	G0108 Diabetes outpatient self-management training services
	1999	First continuous glucose monitoring (CGM) system (MiniMed CGMS)
	2000	98960-1 Diabetes self management education and training (DSMT) codes
First insulin glargine (long-acting) (Lantus)	2001	
	2002	E2101 Blood glucose monitor with integrated lancing
	2006	A9275 Home glucose monitor test strips
First integrated insulin pump and CGM (MiniMed Paradigm REAL-Time Insulin Pump & CGM)		

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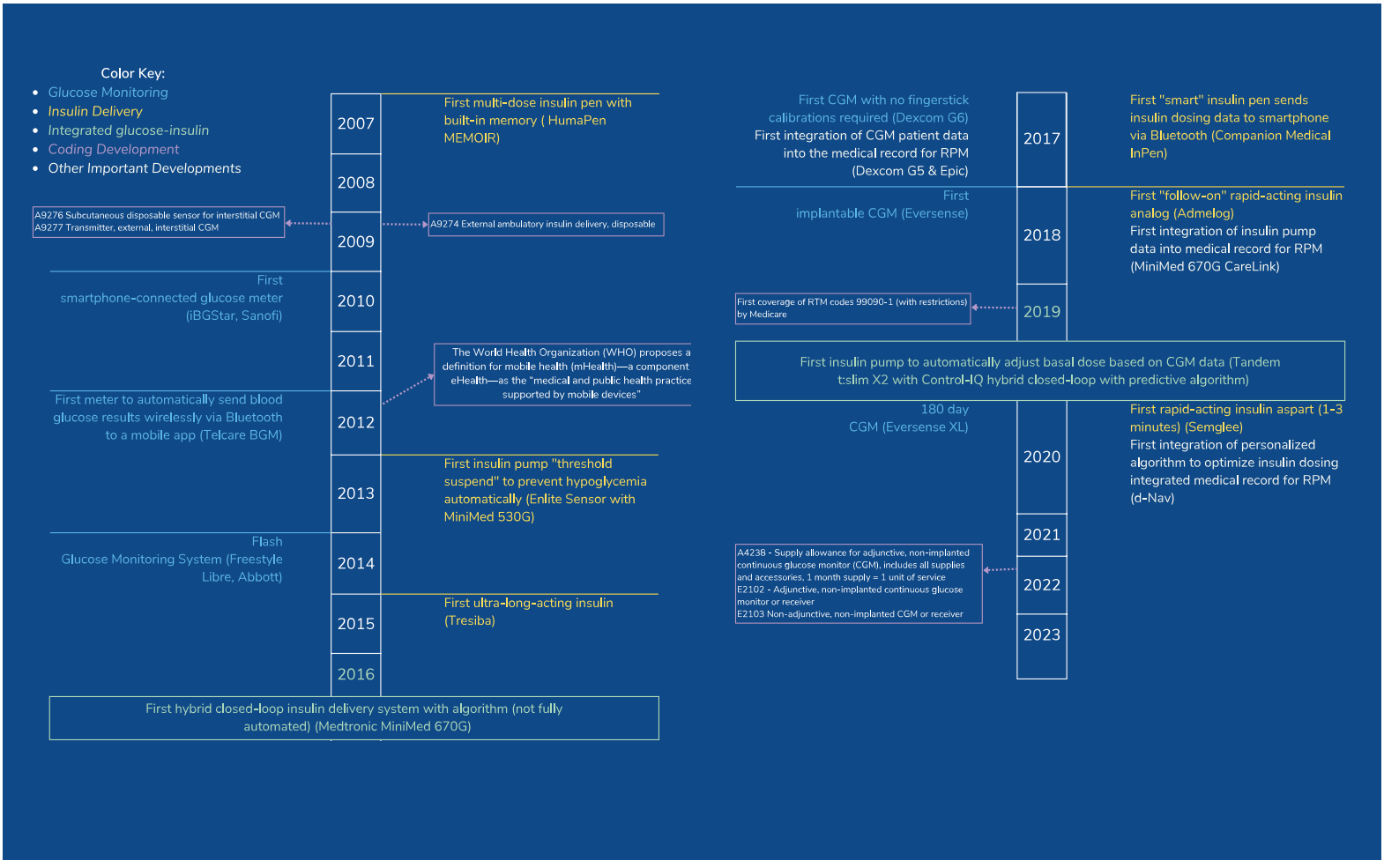
Diabetes digital therapeutics can include a number of features, such as glucose monitoring, meal planning, medication reminders, and remote patient monitoring that ports information about the patient into the clinical medical record. Early apps were standalone programs, but today many diabetes Continuous Glucose Monitoring (CGM) and Insulin Pump devices have digital components integrated with the patient's smartphone and the physician's RPM system. To look back on how this technology has evolved to this point, we created this timeline.



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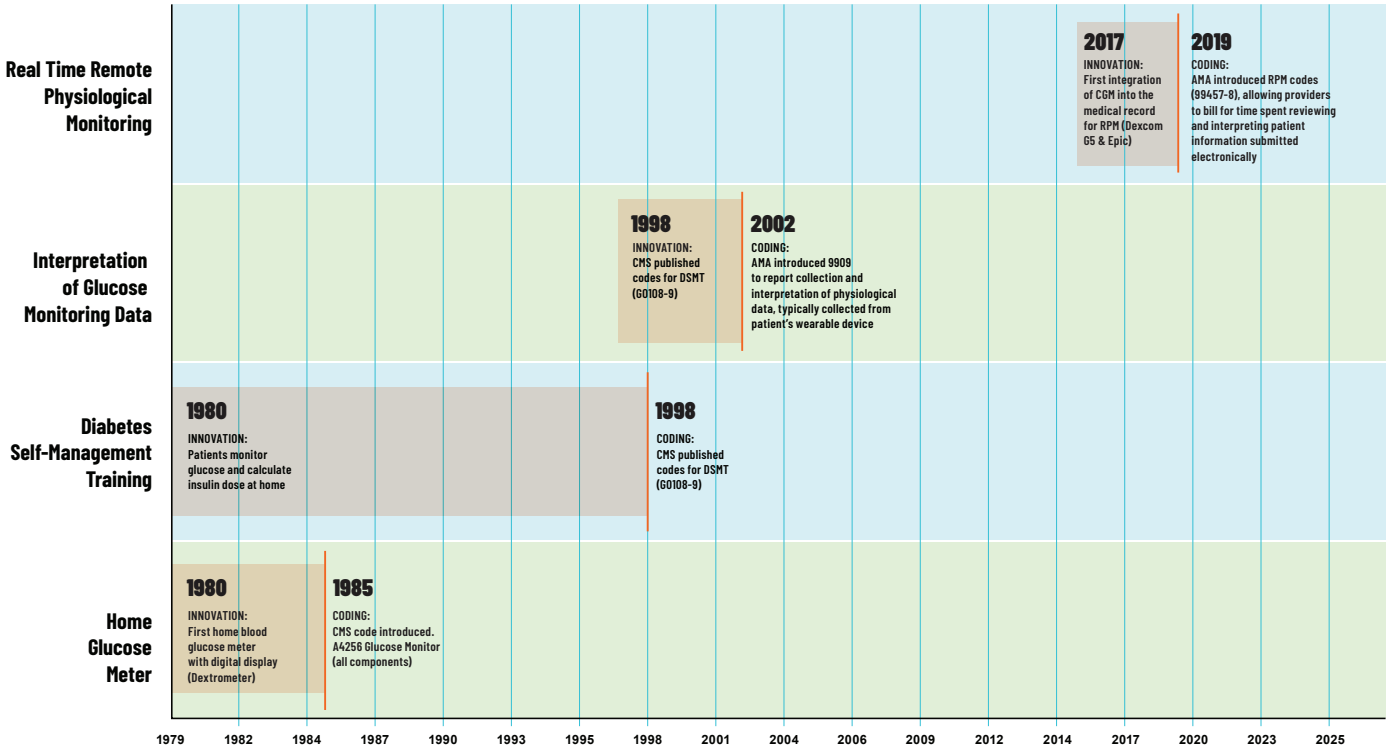
Innovation Is Often Ahead of Payer Adoption

Across many specialties and types of technology, scientific innovation and payer coverage typically have an associated lag time. This is easy to see when we look at the diabetes technology and treatment guideline. To illustrate this more clearly, the coding developments chart highlights the time between a few key innovations in the 100-year timeline, then the publication of applicable procedure codes and subsequent payment by CMS and commercial payers. Note that this is not an exhaustive list of innovations, and does not track when codes were replaced or retired.

We see from this examination that by the 1980s, technology that allowed a patient to monitor their own glucose levels and calculate their insulin doses at home had become quite common. Yet, the diabetes self-management training codes to allow providers to bill for teaching patients to use their equipment were not published by CMS until 1998 (G0108-9) - a lag of over a decade.

Similarly, the first wearable CGM with data that the physician could download and review was commercialized in 1999, and it was three years before there was even a code (99091) to allow for the physician to include the collection and interpretation of a claim. CMS finally "unbundled" 99091 for the first time in 2018, allowing physicians to receive separate reimbursement for this service - a lag of nearly two decades! Presently, commercial payers also seem to still be behind. A study we completed in 2022 found only 11% of sampled payers (among top 25 commercial, top 10 managed Medicaid, and all state Medicaid fee for service payers) had policy language to address remote patient monitoring of diabetes generally, and only 30 of 68 of those policies mentioned the code 99091.

One final (and newer) example is that the first real-time remote physiological monitoring data that integrated directly into the medical record started in 2017 (with Dexcom G5 and Epic). Again, billable codes did not emerge for RPM until 2019 (99457-8) to allow providers to bill for time spent reviewing and interpreting this data. Note that these codes are about remote monitoring generally, not specific to diabetes. This time, CMS tracked closely with the code creation, publishing physician rates for those codes the same year. The 2019 national unadjusted non-facility rate was $51.54 ($32.44 facility), and those rates are $48.89 and $31.16 respectively in 2023. Here we see a narrowing of the gap to two years for Medicare, but commercial payers are still not caught up. In our 2022 study, only 37 of the 68 RPM for diabetes policies mentioned code 99457.



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