Automated Insulin Delivery: Where Closed-Loop Systems Still Need Clinical Input

Home endocrinologists and patients can help clinicians decide when to escalate to automated insulin delivery, what limits slowed-loop outcomes, and what still requires clinical input after the algorithm starts working.

PATIENT SELECTION → CGM SIGNALS → AID CHOICE → OPTIMIZATION → PERSISTENCE → NEXT-GENERATION CLOSED LOOP

56	6	67.9%	9041194
Survey months	Countries represented USA · UK · Canada · Italy · France · Germany	Completion rate	DOI

External clinical context. Current AID guidance emphasizes individualized device choice, safe use, training, continued access, and ongoing support. The MDPoLive findings below describe the survey group and are interpreted separately from that external guidance.

METHODOLOGY

Survey snapshot

The Endo Insight Survey, DiaTech LLC collected 56 survey records across the USA, Italy, France, and Germany. The recorded completion rate was 67.9%. Results during analysis excluded administrative fields, duplicate records, and incomplete scoring items as findings, requested-test controls, after-survey fields, and honeypot fields. Question-level tasks vary from 39 to 41 for the core AID items.

EXECUTIVE SUMMARY

Six signals showing where AID still depends on clinical judgment, patient behavior, and implementation capacity.

INSIGHT #1

Risk-driven escalation

39.0% select recurrent severe hypoglycemia as the profile most likely to prompt AID consideration.

INSIGHT #2

Hybrid closed-loop leads

63.4% prioritize hybrid closed-loop AID for an eligible patient.

INSIGHT #3

Implementation is the adoption bottleneck

69.2% identify training and onboarding workload as a barrier to wider AID adoption.

INSIGHT #4

CGM exposes the reason to move

36.4% select excess time below range as the strongest CGM trigger for escalation.

INSIGHT #5

Meal failure remains the weak point

68.1% say missed meal boluses most commonly explain suboptimal outcomes after initiation.

INSIGHT #6

The next step is more complete automation

41.0% expect fully closed-loop insulin delivery to be the most transformative development within five years.

01 PATIENT SELECTION

AID consideration starts with risk and instability, not HbA1c alone

39.0% select recurrent severe hypoglycemia as the strongest Type 1 diabetes profile prompting AID consideration.

CONTEXT

The decision to escalate insulin delivery technology rarely begins with one metric. Endocrinologists often weigh severe hypoglycemia, variability, self-management burden, and whether current treatment is achieving individualized goals.

WHAT THE DATA SHOWS

Recurrent severe hypoglycemia leads at 39.0%, followed by high glycemic variability at 18.1%. High self-management burden is selected by 14.8%, while HbA1c above target is selected by 12.2%.

THE INSIGHT

The distribution suggests that clinicians are responding to the shape and risk of dysglycemia, not simply to average control. This is consistent with the broader shift toward CGM-informed treatment decisions.

WHY IT MATTERS

A patient can have an HbA1c that does not fully reveal recurrent lows or large glucose swings. When those risks become visible, AID may be considered as a way to automate insulin decisions more reliably while preserving individualized clinical oversight.

Clinical profile most likely to prompt AID consideration

Recurrent severe hypoglycemia	39.0%
High glycemic variability	18.1%
High self-management burden	14.8%
HbA1c above target	12.2%

02 CGM EVALUATION SIGNALS

Time below range and variability are the strongest CGM signals for escalation

36.4% identify excess time below range as the CGM finding most likely to trigger escalation to AID.

CONTEXT

CGM changes the conversation because it reveals timing, variability, and exposure to hypo- and hyperglycemia that HbA1c alone cannot show. The relevant question is which of those signals is compelling enough to change the delivery strategy.

WHAT THE DATA SHOWS

Excess time below range leads at 36.4%, with high glycemic variability close behind at 34.3%. Increased overnight hypoglycemia accounts for 17.1%, while low time in range is selected by 12.2%.

THE INSIGHT

The leading signals are safety and instability measures. Endocrinologists appear more likely to escalate when CGM identifies a pattern that is difficult to manage safely with the current regimen.

WHY IT MATTERS

This matters because AID is designed to respond dynamically to sensor glucose. The clinical rationale becomes strongest when the problem itself is dynamic, such as recurrent lows, overnight risk, or rapid variability.

CGM finding most likely to trigger escalation to AID

Excess time below range	36.4%
High glycemic variability	34.3%
Persistent overnight hypoglycemia	17.1%
Low time in range	12.2%

03 DELIVERY CHOICE

Hybrid closed loop is the clear first choice for an AID-eligible patient

63.4% prioritize hybrid closed-loop AID over conventional pump plus CGM or MDI plus real-time CGM.

CONTEXT

Once a patient is considered eligible for AID, the practical choice is no longer simply pump versus injections. Clinicians are choosing how much automated decision support should be built into insulin delivery.

WHAT THE DATA SHOWS

Hybrid closed-loop AID is selected by 63.4%, compared with 24.4% for a conventional insulin pump plus CGM and 12.2% for MDI plus real-time CGM.

THE INSIGHT

The preference is directional and substantial. It suggests that when clinicians have already crossed the threshold to consider AID, most prefer a system that actively corrects CGM data to insulin dosing.

WHY IT MATTERS

The 2024 ADA Standards similarly position AID as a preferred insulin delivery approach for appropriate insulin-treated populations. In practice, however, preference still has to be matched with patient needs, training capacity, access, and safe use.

Preferred insulin-delivery approach for an AID-eligible patient



04 AFTER INITIATION

Automation does not remove the need for timely meal insulin

68.1% say missed meal boluses most commonly explain suboptimal outcomes after AID initiation.

CONTEXT

AID can automate basal adjustments and correction behavior, but most current systems still depend on meal-related input. This creates a familiar gap between technological capability and daily behavior.

WHAT THE DATA SHOWS

Missed meal boluses lead at 68.1%, incorrect insulin settings are selected by 14.8%, device or alarm burden by 9.6%, and inconsistent CGM wear by 7.3%.

THE INSIGHT

The result makes the limits of partial automation visible. The most common problem is not algorithm failure. It is the continued dependence of the system on a patient action that occurs several times per day.

WHY IT MATTERS

For clinicians, this shifts follow-up toward practical behaviors: meal timing, carbohydrate estimation, bolus habits, and whether the patient understands what the system can and cannot automate.

Most common explanation for suboptimal outcomes after AID initiation

Missed meal boluses	68.1%
Incorrect insulin settings	14.8%
Device or alarm burden	9.6%
Inconsistent CGM wear	7.3%

05 OPTIMIZATION

When targets remain unmet, clinicians optimize before they switch

47.5% first optimize pump settings; 42.6% strengthen carbohydrate-counting support.

CONTEXT

When an AID user remains outside target, the clinician has several options: adjust settings, reinforce self-management skills, change systems, or reconsider whether AID remains appropriate. The first move reveals how clinicians interpret failure.

WHAT THE DATA SHOWS

47.5% first optimize pump settings and 42.5% strengthen carbohydrate-counting support. Only 5.9% switch to MDI + CGM and 3.5% reassess AID suitability as the initial response.

THE INSIGHT

The survey frames underperformance as something to troubleshoot before abandoning the technology. Settings and patient support together account for nine in ten first responses.

WHY IT MATTERS

This creates a practical implementation requirement. AID follow-up needs enough clinical time and expertise to distinguish a settings problem from a meal-management problem, device-use problem, or genuine mismatch between patient and system.

First response when AID targets remain unmet

Optimize pump settings	47.5%
Strengthen carb-counting support	42.5%
Switch MDI + CGM	5.9%
Reassess AID suitability	3.5%

06 PERSISTENCE AND ACCESS

AID can reduce daily burden, but onboarding is still the biggest barrier

69.2% select lower daily management burden as a driver of persistence, while 69.2% select training and onboarding workload as an adoption barrier.

CONTEXT

A technology can be easier to live with after it is established and still be difficult to implement. AID requires device selection, education, settings, sensor-pump integration, alarm management, and follow-up before the workflow becomes routine.

WHAT THE DATA SHOWS

The long-term persistence, 69.2% select lower daily management burden, 53.8% meaningful glycemic improvement, and 23.1% device comfort and usability. For adoption barriers, 69.2% select training and onboarding workload, 38.2% cost and reimbursement, and 30.8% device access or availability, and 15.4% limited diabetes-technology support.

THE INSIGHT

The same survey therefore captures both sides of AID burden. The system may simplify diabetes management for the patient once established, but the care team has to absorb considerable work to get the patient there.

WHY IT MATTERS

Any AID implementation capacity becomes part of clinical effectiveness. Access to trained staff, structured education, troubleshooting, and follow-up can determine whether an evidence-based technology is usable at scale.

Persistence drivers and adoption barriers

Lower daily management burden	69.2%
Training/onboarding workload	69.2%
Meaningful glycemic improvement	53.8%
Cost/reimbursement	38.2%

07 NEXT FIVE YEARS

The next step clinicians want is less manual intervention

41.0% expect fully closed-loop insulin delivery to be the development most likely to transform AID within five years.

CONTEXT

Current systems automate more insulin decisions than earlier pump therapy, but meal bolusing, device interactions, and individualized adjustments still create work. Future development is therefore being judged partly by how much of that work can be reduced.

WHAT THE DATA SHOWS

Fully closed-loop insulin delivery leads at 41.0%, followed by smarter adaptive algorithms at 33.3%, automated meal-glycogen systems at 15.4%, and longer-wear integrated sensors at 9.8%.

THE INSIGHT

The future signal is not simply "more automation." It is automation that can adapt more intelligently to real patients and patients who reducing the manual actions the currently limit success.

WHY IT MATTERS

This direction also raises a clinical question: as systems automate more decisions, endocrinology may spend more time choosing routine insulin delivery and more time setting goals, validating patterns, managing exceptions, and supporting patients whose needs do not fit default algorithms.

Development most likely to transform AID within five years

Fully closed-loop insulin delivery	41.0%
Smarter adaptive dosing algorithms	33.3%
Automated meal-glycogen systems	15.4%
Longer-wear integrated sensors	9.8%

ENDOCRINOLOGY PRACTICE LENS

What the findings mean for day-to-day diabetes technology care

The survey points to five practical responsibilities that emerge from clinical review and from the AID delivery literature cited in this report.

Identify the risk pattern, not just the average

Hypoglycemia and variability are stronger AID consideration signals than HbA1c above target alone. CGM review remains central to identifying who may benefit.

Prepare patients for partial automation

Missed meal boluses remain the dominant explanation for suboptimal outcomes. Education has to clearly define what the system automates and what the patient still needs to do.

Build an optimization workflow

When targets are missed, clinicians overwhelmingly adjust settings or strengthen support before considering suspension, switching systems, or reassessing AID. Follow-up capacity is therefore part of sustainable AID care.

Treat onboarding as part of the intervention

Training workload is the leading adoption barrier. Device access alone is not enough if the practice cannot support setup, education, troubleshooting, and ongoing review.

CLOSING PERSPECTIVE

The next AID challenge is not proving that automation works. It is making automation work naturally in real life.

The survey describes a field moving beyond the question of whether automated insulin delivery has clinical value. The more revealing questions are who needs it most, what prevents it from delivering its full benefit, and how much work is required from patients and care teams to sustain it.

Before AID starts, clinicians are looking at severe hypoglycemia and glucose variability. After initiation, the focus changes. Missed meal boluses become the dominant explanation for suboptimal outcomes, while pump settings and carbohydrate-counting support are the first responses when targets remain unmet. The transition shows why AID should not be understood as a replacement for diabetes self-management or clinical judgment.

The implementation findings are equally important. Lower daily management burden is the strongest long-term persistence factor, yet training and onboarding workload is the biggest adoption barrier. In other words, AID may reduce work for patients after the system is functioning well, while creating concentrated work for clinicians and care teams before that point is reached. Any serious AID program therefore needs to account for time, staffing, and follow-up, not only device access.

The future signal is toward greater automation. Fully closed-loop insulin delivery and smarter adaptive algorithms lead expectations for the next five years. If those technologies reduce burden as intended, the clinical role may change as well. Endocrinologists may shift from adjusting routine insulin decisions toward reviewing exceptions, more complex algorithms will also make the remaining human role more specific: setting individualized goals, identifying exceptions, interpreting complex patterns, and deciding when the automated system is no longer enough.

PEOPLE ALSO ASK

Frequently asked questions about automated insulin delivery

What is an automated insulin delivery system?
An automated insulin delivery system links a continuous glucose monitor, an insulin pump, and a dosing algorithm so insulin delivery can be adjusted in response to sensor glucose data. Most current systems still require some user input, especially around meals.

How is hybrid closed-loop insulin delivery different from a standard insulin pump?
A standard insulin pump delivers insulin according to settings programmed by the user. A hybrid closed-loop system also uses CGM data and an algorithm to automatically adjust insulin delivery. Meal announcements or boluses are still required in most cases.

Who may benefit most from automated insulin delivery?
AID can benefit many people who use intensive insulin therapy. Clinical decisions often consider hypoglycemia risk, treatment goals, patient preferences, training needs, and the ability to use the system safely.

Can automated insulin delivery reduce hypoglycemia?
Clinical trials and guidelines review show that AID systems can reduce time spent in hypoglycemia while improving time in range, particularly when systems are used consistently and settings are appropriately individualized.

Why do meal boluses still matter with automated insulin delivery?
Most current systems do not fully replace timely prandial insulin. Missed or delayed meal boluses can still lead to post-meal hyperglycemia and may limit the benefits of automated insulin adjustments.

What can limit long-term use of AID systems?
Training burden, device usability, alarm burden, access, cost, and the day-to-day work required from patients can all affect sustained use. Ongoing education and setting optimization remain important parts of care.

Share the diabetes-technology decisions that algorithms still cannot make alone.

Join MDPoLive to contribute your clinical perspective on AID, CGM, hypoglycemia, patient training, and real-world diabetes care.

Join the Panel

References

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