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Use of hybrid closed-loop systems in older adults

Closed-loop systems, also known as automated insulin delivery systems or AID systems, consist of a continuous subcutaneous insulin infusion pump, a continuous glucose monitor or glucose sensor, and a control algorithm that determines insulin delivery by the pump on the basis of sensor data (1).

These systems are currently considered the treatment of choice for people with type 1 diabetes and should be offered to everyone who wishes to use them and is able to do so (2).

This recommendation for widespread use is based on the extensive scientific evidence showing that AID systems improve glycemic control, reduce the frequency of hypoglycemia, and improve quality of life for people with diabetes and their families (3, 4, 5). Consequently, AID systems are increasingly used by people with type 1 diabetes, and different systems with different components and characteristics are available on the market.

Nevertheless, AID systems are not yet fully automated and still require user intervention, both to enter carbohydrate information and to keep each component of the system functioning continuously. The technological burden associated with using these systems therefore remains considerable.

The number of older people with type 1 diabetes is growing, thanks to improvements in diabetes care. Older adults face a dichotomy regarding the use of diabetes technology in general and AID systems in particular.

On the one hand, older people may find it more difficult to acquire new knowledge and may be less familiar with technology in general. Furthermore, visual, hearing, or mobility problems, which are more frequent among older adults, may constitute obstacles to adequately learning to use and manage technological devices.

On the other hand, advanced age can make people with type 1 diabetes more vulnerable to hypoglycemia because they are less able to recognize and treat it. Indeed, less stringent glycemic targets have been proposed for older people with type 1 diabetes, precisely to minimize the risk of hypoglycemia (6). However, the long duration of the disease in many cases may also have led to the development of chronic complications, which can be exacerbated by poorer glycemic control. More recently, the possibility has been raised of establishing treatment targets tailored to each individual on the basis of periodic assessments of cognitive status and frailty (7).

There is growing interest in the literature in assessing whether older adults may benefit from AID systems or whether, conversely, the technological burden of managing them and the risks arising from inappropriate use might outweigh the benefits of improved glycemic control. A widespread prejudice, sometimes also held by healthcare professionals, is that complex technology is unsuitable for advanced age. It is assumed that an older person will have difficulty with screens, app menus, changing the catheter every few days, or interpreting alarms. If mild cognitive impairment, vision problems, tremor, or limited family support are also present, the intuitive conclusion is that treatment should be simplified rather than made more sophisticated.

To resolve this dilemma, the first premise is that age is not merely a number. Older adults are generally defined as people over 65 years of age, but people are increasingly reaching this age in better condition, and frailty can vary greatly among people of the same age.

In this context, several studies have been published in recent years assessing the use of technology generally, and AID systems specifically, among older people with type 1 diabetes (8, 9).

In Spain, a study entitled "Automated insulin delivery system initiation safely improves glycemic control in older adults with type 1 diabetes," led by Dr. Carmen Quirós, was recently published 10. It is a multicenter study conducted at 19 Spanish hospitals, with the participation of 21 investigators.

This study, undertaken within the Diabetes Technology Working Group of the Spanish Society of Diabetes, aimed to assess glycemic control, safety, and treatment satisfaction in older adults using AID systems.

The study included 200 people with type 1 diabetes aged 65 years or older, with a mean age of 71 years: 100 were receiving multiple daily insulin injections, and the other 100 were using AID systems. Notable features of the study included a specific assessment of frailty and cognitive status using questionnaires validated for these purposes.

The findings indicate that AID systems are safe, even in people with substantial cognitive vulnerability, and that their use is associated with better glycemic control, an »

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» increase in time in range from 65% to 78%, and a reduction in the frequency of severe hypoglycemic episodes. These results were better than those found among users of multiple daily insulin injections.

After initiation of AID systems, time in range increased from 65.3% to 78.6%, and HbA1c decreased from 7.56% to 7.01%, with parallel improvements in hypoglycemia, hyperglycemia, variability, and GMI. Compared with the multiple daily insulin injection group, the final difference in time in range was 15.6 percentage points (78.6% vs 63.0%). Severe hypoglycemic episodes decreased from 28 to 1.6 episodes per 100 patient-years.

The most novel aspect of this study was the genuinely geriatric profile of the sample: 60% had mild-to-moderate cognitive impairment, and 45% were prefrail or frail. Within the AID group, final time in range was similar across cognitive strata (80% vs 77%) and frailty strata, whereas the gap was much greater in the injection group (67% vs 56%). Good adherence (96–98% in automated mode) and greater satisfaction were also observed. **D**

CONCLUSIONS

The use of technology in people with type 1 diabetes must be individualized, weighing the benefits and drawbacks, as well as each person's specific glycemic targets according to their cognitive status and frailty. Under no circumstances would it be ethically acceptable to limit access solely on the basis of age to technology that may radically change the quality of life of older people who, in most cases, have spent much of their lives dealing with the difficulties of diabetes management. The work of Dr. Quirós and colleagues shows that automation is especially valuable precisely where clinical intuition suggested otherwise: among those with fewer cognitive and functional reserves to sustain a treatment that requires making the right decisions several times a day.

Important questions remain unanswered. We do not yet know what happens over the longer term, how many people eventually discontinue the system and why, how the situation changes when a caregiver takes partial responsibility for its management, or whether these benefits are maintained in people with established dementia or high levels of dependency. Likewise, simpler AID systems with greater personalization are needed so that their use can be adapted to the needs of each person with diabetes.

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