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The Promise of Diabetes Technologies

Clinical Innovation has continued to transform diabetes care since the discovery of insulin over one hundred years ago. In the last three years of the COVID-19 Pandemic, the device industry and regulators have amplified the scale of diabetes technology innovations [1].

Devices like continuous glucose monitors (CGM), Sensor Augmented Insulin Pumps and automated insulin delivery (AID) systems improve glycemic outcomes, quality of life and reduce complications [2, 3]. Diabetes professional associations and medical societies such as American Diabetes Association European Association for the Study of Diabetes (EASD) and International Consensus have recommended use of CGM and AID systems for all people with type 1 diabetes (T1D) and insulin treated type 2 diabetes (T2D), specially from early diseases onset in T1D to improve glycemic outcomes and potentially reduce future diabetes complications [4–6].

In this issue, Kagan Ege Karakuş describes the effect of devices on decision making [7]. This paper describes how different diabetes technologies have reduced the burden of decisions made by people with diabetes. Persons with diabetes (PwD) makes a greater number of decisions per day. Factors like stress, hormones, and sleep increase the complexity of these decisions. Advanced diabetes devices like AID significantly reduce the burden of decision making on.

In another paper in this issue, Mutlu et al. report significant improvement in time in range (TIR) and Glucose Management Indicator (GMI) following initiation of Medtronic 780 G AID system for children at a single center in Turkey [8]. The authors completed two analyses; the first cohort (n = 25) included children with type 1 diabetes previously using a sensor augmented insulin pump which was upgraded to the AID system. In this cohort TIR increased from 75.5% at baseline to 80% after three months. The second cohort (n = 33) included children onboarded on AHCL regardless their previous treatment options. Three months upon initiation of AID in the cohort, over 80% of the children achieved recommended TIR of over 70%.

Mutlu et al. findings are mirror results from AHCL clinical trials and real-world cross-sectional data [9, 10].

Findings from these two studies highlighted in this issue emphasize the importance of supporting patients in adopting the devices and medical insurers to provide coverage. Several research studies have shown a strong association between blood glucose monitoring and glycemic outcomes [3]. More recent evidence suggests that patient reviewing data from devices is associated with improved glycemic outcomes [11]. These devices can reduce diabetes burn out [12] and improve satisfaction [13]. The benefits of these devices are too significant to ignore. It is a welcome development that diabetes centers have taken a system improvement approach to increasing access to them [14, 15].

We can categorize diabetes devices into four tiers based on their impact on glycemic management and the burden of decision-making (Fig. 1). The first tier is a Fully Close Loop system (FCL) with functional algorithms that provide the lowest burden of decision making and the biggest impact on glycemic outcomes for PwD. FCL device does not require adjustments based on food, exercise and functions like a functional artificial pancreas [16]. The second-tier devices are hybrid closed-loop systems which have a minimal burden

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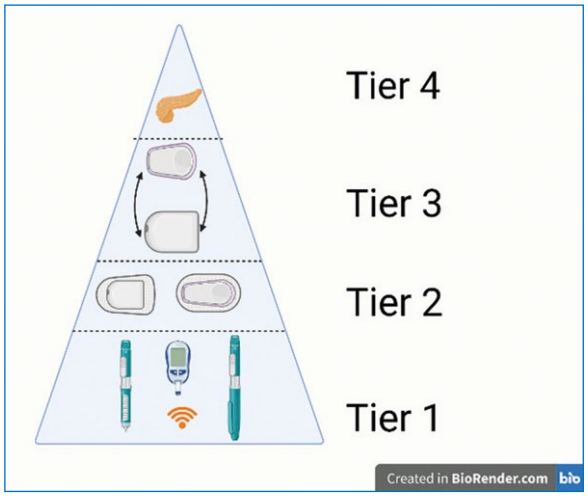

Figure 1. Four Tiers of Diabetes Devices

of decision making. PwD needs to make change for food, exercise, and other external stimuli. The third-tier devices include sensor augmented insulin pumps and continuous glucose monitors. These devices are associated with improved glycemic outcomes and generate helpful data insights. PwD still needs to make modest decisions based on the data input as compared to the second-tier devices. The fourth tier of devices includes 'connected insulin pens' (CIP) and smart glucose meters. PwD on these devices make the most decisions as compared to any of the other tiers.

It is important to consider patient preferences, cost, and equity considerations for these devices. Inequities in access to are preventable, alarming, and widespread [17]. These inequities include many contributors, including diabetes provides bias in prescribing these technologies [18, 19].

Diabetes technologies are now standards of care in managing insulin-treated diabetes in developed countries, with improved diabetes care and increasing use of newer therapeutics and diabetes technologies there is an increased longevity in people with diabetes [20]. However, there is a wide discrepancy in the diabetes care, availability of diabetes technologies and diabetes outcomes among developed and developing countries.

Use of these technologies is limited in developing countries due to cost and lack of availability. There is a need for the diabetes industry to make these innovations cost-effective and making them available in the developing countries. The study from Mutlu et al. clearly demonstrates that use of AID systems/Diabetes technologies improves outcomes regardless of geographical area and population. We hope to see all people with diabetes across the world to have access to diabetes technologies.

Conflict of interest

Dr. Ebekozien reports being a member of the Medtronic Diabetes Health Equity Advisory Board. His organization T1D Exchange has received research support on his behalf from Dexcom, Medtronic Diabetes, Eli Lilly, Abbott, Vertex. He has received honoraria from Vertex and Medtronic Diabetes.

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