

THE **sensor** report

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WELCOME TO THE SENSOR REPORT, ISSUE 3

With Issue 3 of *The Sensor Report*, as well as providing recent clinical insights into the impact that the FreeStyle Libre portfolio is bringing to people with diabetes and healthcare professionals (HCPs), we will also dissect the diverse topic of telemedicine and how it has rapidly become established as an effective model of care for people with T1DM or with T2DM. However, we will also take some time to look at the considerable challenges that must be overcome before telehealth will become business-as-usual for HCPs in the management of diabetes. In doing so, we will investigate the logistical, organizational and governmental issues that must be navigated in order to provide consistent and effective care at a distance to large populations of people with diabetes, using robust systems that can be supported by large regional and national healthcare services.

Although the goal of diabetes therapy at a distance, using the evidence-based benefits of sensor-based care for monitoring and managing glycemic control, is not new, the advantages of telemedicine and eHealth have been thoroughly showcased during the restricted access

to diabetes services imposed during the COVID-19 pandemic. These benefits will be further developed in the post-pandemic future and will be founded on lessons learned today, and which we have signposted for you within. Please enjoy Issue 3 of *The Sensor Report* and we look forward to hearing from you.



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featurestory

Meeting the challenge of providing sustainable access to telemedicine for people with diabetes

The move towards telemedicine in diabetes care has accelerated as a consequence of the COVID-19 pandemic. Glucose-sensing technologies, also allowing data sharing and remote access, such as flash glucose monitoring with the FreeStyle Libre system, have enabled effective glucose control for people with diabetes that is at least comparable to standard care pre-COVID-19, including the facility for patients to engage with their HCP via telemonitoring, with therapeutically advantageous sharing of retrospective glucose information¹.

The opportunities of telemedicine in diabetes care will be fully realized only once currently unmet needs for sustainable access to telemedicine technologies and services can be addressed.



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These include: stronger frameworks across regulatory bodies for informed and robust decision-making; increased digital-health literacy amongst healthcare professionals and people with diabetes, as well; policies that clarify data ownership and ensure cybersecurity and data protection, and; incentivization for healthcare providers to engage in telemedicine. These issues have recently been the focus of European-wide call to action amongst expert healthcare professionals and policy makers² (see Box). In this feature article we look at the essential components for sustainable access to telemedicine services.

Health technology assessment

The widespread adoption of telemedicine in diabetes care requires a framework for appropriate reimbursement. Central to this is effective health technology assessment (HTA) by relevant agencies. HTA provides policy makers with evidence-based information that is used to formulate healthcare policy and support reimbursement decisions at a national level. A current unmet need is for HTA bodies to develop flexible and adaptive frameworks to evaluate telemonitoring devices, that encourage innovation and support national healthcare services to make better-informed decisions. Such frameworks will support the approval and reimbursement of telemonitoring devices that enable remote monitoring of glucose and insulin data. Early engagement between HTA bodies and manufacturers is also recommended, in order to accelerate valuable innovation for patients.

eHealth literacy

What does this mean? eHealth refers to the cost-effective and secure use of electronic information and modern communication technologies in support of health and health-related activities. This includes telemedicine and telemonitoring. One of the biggest areas of concern across Europe is the lack of organized training of HCPs in technologies, such as electronic health records (EHR) and telemedicine services. A 2019 survey of 302 medical schools across EU member states found that less than 30% of medical curricula offered eHealth courses and these were mandatory in only 19% of schools³. From a patient perspective, practical trials and studies have generally shown that people with diabetes respond well to telemedicine and eHealth initiatives, which must be supported by addressing the needs of the HCPs.

Patient data, consenting and privacy

Although telemedicine can both save time and reduce anxiety for people with diabetes, a significant barrier is the absolute requirement for patient consenting and privacy that must be preserved within large-scale telemedicine systems. This means enabling HCPs to manage the needs of hundreds of thousands of people with diabetes, rather than the relatively small groups that have participated in



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trials to date. Large-scale management of patient data includes all the dependencies that come with systematic updating of electronic health records (EHRs), delivering effective treatment and ensuring the involvement of multidisciplinary teams. In the real world, HCPs are already facing the need to integrate diabetes data downloads from different devices, as well as transfer data between diabetes devices and EHRs. A further major issue to consider in this context is cybersecurity, data protection and ownership, as data from blood-glucose meters, CGM sensors, insulin pumps and smartpens is increasingly gathered for use by patients, healthcare providers and device developers.

Reimbursement for the practice of telemedicine

Although flash glucose monitoring and other CGM systems have proven effective in lowering HbA1c and reducing hospital admissions for acute diabetes events⁴, the cost-effectiveness of telemonitoring and telemedicine for glucose-sensing technologies is still debated by many reimbursement agencies. This is also reflected in reimbursement models that do not codify the processes for delivery of telemedicine, such that physicians and/or clinics are not properly compensated or incentivized to adopt telemedicine consultations. A pre-COVID-19 analysis by the European Commission found that telemedicine is reported to be cost-effective in 73.3% of the cases covered by the literature⁵. In the post-COVID-19 pandemic landscape, reimbursement frameworks must reflect the provision of telemedicine as standard care. Healthcare systems in Germany, France and Italy have taken steps to encourage HCPs to offer telemedicine consultations and promote this option to patients, including setting tariffs and reimbursement criteria⁶⁻⁸.



The challenges discussed here were highlighted at a recent online roundtable on *Lessons learnt from COVID-19 for health systems: the use case of diabetes remote monitoring*, involving contributors from industry, healthcare economists and diabetes clinical experts. The event was hosted by Sirpa Pietikäinen - Member of the European Parliament (MEP) and Co-Chair of the MEP Interest Group on Diabetes. Who argued that CGM systems can empower patients, and advocated to make these technologies accessible to all people with diabetes. If all European member states just stuck to their own systems for telemonitoring, the EU would fail to learn from each other and work collaboratively to develop best practices. For this reason, pan-European guidance on telemedicine and telemonitoring is clearly needed.

1. Danne T, et al. Telemonitoring, Telemedicine and Time in Range During the Pandemic: Paradigm Change for Diabetes Risk Management in the Post-COVID Future. *Diabetes Ther*. 2021;12:2289-2310
2. Choudhary P, et al. The Challenge of Sustainable Access to Telemonitoring Tools for People with Diabetes in Europe: Lessons from COVID-19 and Beyond. *Diabetes Ther*. 2021;12:2311-2327. doi: 10.1007/s13300-021-01132-9
3. Giunti G, et al. Mapping the Access of Future Doctors to Health Information Technologies Training in the European Union: Cross-Sectional Descriptive Study. *J Med Internet Res*. 2019; 21(8):e14086. doi: 10.2196/14086
4. Roussel R, et al. Important Drop Rate of Acute Diabetes Complications in People With Type 1 or Type 2 Diabetes After Initiation of Flash Glucose Monitoring in France: The RELIEF Study. *Diabetes Care* 2021;44:1368-1376. doi: 10.2337/dc20-1690
5. European Commission. Market study on telemedicine [Internet]. 2018. Available from: https://ec.europa.eu/health/sites/health/files/ehealth/docs/2018_provision_marketstudy_telemedicine_en.pdf
6. Gerke S, et al. Germany's digital health reforms in the COVID-19 era: lessons and opportunities for other countries. *NPJ Digital Medicine*. 2020;3(1):94. doi: 10.1038/s41746-020-0306-7
7. Ohannessian R, et al. France Is the First Country to Reimburse Tele-Expertise at a National Level to All Medical Doctors. *Telemed e-Health*. 2020; 27(4):378-381. doi: 10.1089/tmj.2020.008379
8. Cicchetti A, et al. Analysis of the organizational models of response to Covid-19 in Italy: evidence from 32 Instant Reports. *Italian Journal of Health Technology Assessment & Delivery* 2021 14:Suppl. 1

Survey of younger diabetes doctors suggests that telemedicine was well received during the COVID-19 pandemic

A survey of the International Society for Pediatric and Adolescent Diabetes (ISPAD) JENIOUS group, which comprises their youngest members, collected information on attitudes to telemedicine use during the COVID-19 pandemic¹.

A total of 209 members from 33 countries responded to the survey and reported an increase in the number of telemedicine consultations from <10% prior to the pandemic, to >50% during the pandemic. These results were mirrored in a separate survey of European pediatricians² that reported a similar rise in the use of phone calls, text messages, social media (3–11%) and video calls as a consequence of the COVID-19 requirement for remote consultations. The most commonly used tools for telemedicine practiced by younger diabetes doctors¹ included video call software (34.4%), phone calls (24.4%), digital data platforms (23.9%) and e-mails (10%). The most frequently used platforms for remote data sharing were Medtronic CareLink (79.4% of participants), Abbott LibreView (69.4%), Dexcom Clarity (40.7%), Diasend (28.2%), Glooko (12%), and Tidepool (11.5%).

Most respondents felt that the impact of telemedicine was as good or superior to in-person visits on the ability of children with diabetes to reach glycemic targets (83.7%), on their families' quality of life (82.3%) and on the quality of care provided to them (74.2%). Almost all participants agreed (36.4%) or strongly agreed (63.2%) that telemedicine can enhance in-person visits, and 43% agreed or strongly agreed that remote visits might replace in-person contacts. The survey also highlighted strategies that are needed to reduce the additional burdens in the use of telemedicine. These included: single integrated platforms for downloading patient data; tools for more-effective video consultations; automated data uploads without the need for patients to intervene; training and education for HCPs, patients and caregivers; better integration with electronic health records; more resources dedicated to managing data downloads prior to teleconsultations; technical support for the teleconsultation process; adequate coding and reimbursement for telemedicine as a care process.

The data showed that 83.3% of the physicians surveyed reported to be satisfied with the use of telemedicine, but that 45.5% reported that they felt stressed by the need for extra-time required for telemedicine consultations. Overall, this survey painted a positive picture of the use of telemedicine, but the survey outcomes highlight that many challenges remain.

1. Giani E, et al. Telemedicine and COVID-19 pandemic: the perfect storm to mark a change in diabetes care. Results from a world-wide cross-sectional web-based survey. *Pediatr Diabetes*. 2021; doi: 10.1111/peidi.13272

2. Reingold SM, et al. COVID-19 era effect on pandemic and post-pandemic pediatric telemedicine use: A survey of the European Academy of Pediatrics Research in Ambulatory Settings Network. *Front Pediatr*. 2021; 22:9:713930

Telemedicine – what do expert diabetes teams really think?

The attitudes of healthcare professionals who have been tasked with adapting quickly to the rise of telehealth during this period are only now being researched. The two articles on this page focus on the organised feedback of hundreds of pediatric diabetes specialists on the strengths and limitations of telemedicine, as revealed by the COVID-19 pandemic.



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Italian survey highlights the gaps in the use of telemedicine at the start of the COVID-19 pandemic

A comprehensive survey was conducted to investigate the use of telemedicine in all Italian pediatric diabetes centres following the start of the COVID-19 pandemic.

Specifically, the researchers aimed to ascertain the tools used to provide telemedicine services for young people with T1DM, included those using diabetes technologies, such as insulin pumps and CGM, and those not using such devices. The study also sought to understand the administrative recognition for telemedicine activities and any reimbursement of these activities. Sixty percent of the 68 centers belonging to the Italian Society for Pediatric Endocrinology and Diabetology (ISPED) completed the survey over a 3-week period in March and April 2020.

The survey found that the common methods of telemedicine were: use of generic download portals, instant messaging to physicians' mobile phones, working emails, and phone calls to physicians' mobiles. An issue with many of these strategies is the lack of integration with patient records. One of the significant outcomes was that only 25% of the pediatric diabetes centres had an established system for codifying telemedicine support and offering reimbursement. This research further highlights both the opportunity of telemedicine and also the unmet need for an accreditation system for telemedicine and a structured reimbursement scheme that will allow all patients and HCPs to incorporate telemedicine as part of standard diabetes care.

Tornese G et al. Telemedicine in the time of the COVID-19 pandemic: Results from the first survey among Italian pediatric diabetes centers. *Healthcare (Basel)*. 2021; 9(7):815

Case studies from the COVID-19 pandemic demonstrate effectiveness of telemedicine

A series of four case studies is presented that highlights the benefits of CGM use and telemedicine in glycemic control, especially during the COVID-19 pandemic.

The cases presented a diverse set of scenarios: pregnancy in T1DM; T2DM on oral therapies; T2DM infected with COVID-19, and; newly diagnosed T1DM in a 3-year old. In each case, the authors found that remote monitoring of CGM and insulin data enabled the clinicians to make therapy adjustments confidently while clinical access was restricted. Furthermore, they reported that access to CGM data allowed them to discuss glucose management with the patients and carers, so that they could better understand how therapy would impact on their glucose levels. Across these individual cases, the authors conclude that the COVID-19 pandemic has showcased the value of telemedicine in diabetes care which can deliver effective care whilst reducing the need for in-person appointments.

Carlson AL et al. Continuous glucose monitoring integration for remote diabetes management: Virtual diabetes care with case studies. *Diabetes Technol Ther.* 2021; 23(S3): S56–S65

CGM and telemedicine improved glucose control for young people with T1DM during COVID-19 lockdown

An observational study involving 85 children and young people with T1DM (aged 5–18 years) using CGM, looked specifically at the impact of the COVID-19 lockdown on glycemic control in this group.

Data were assessed from pre-lockdown, during lockdown and post-lockdown. There was an improvement in time in range from 62.7% to 66.6% and time above range from 33.5% to 29.6%, as well a reduction in GMI from 7.1% to 7.0% ($p < 0.001$ in all cases). This improvement continued into the post-lockdown phase for the younger children, aged 5–9 years, but not in adolescent patients. This interesting finding suggests that adolescents with T1DM may be reluctant to persist in a positive approach to their diabetes once the lockdown period ended. Overall, CGM technology and data-sharing capability was useful during the extreme period of social restrictions and outcomes were maintained afterwards in younger patients aged 5–9 years.

Lombardo F, et al. Has COVID-19 lockdown improved glycaemic control in pediatric patients with type 1 diabetes? An analysis of continuous glucose monitoring metrics. *Diabetes Res Clin Pract.* 2021 Aug;178:108988



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COVID-19 infection worsens glycemic control

Outside of the hospital setting, this study evaluated changes in glycemic metrics in people with T1DM, home-isolating with COVID-19 infection and using a CGM system.

A total of 32 people with diabetes who had tested positive for SARS-CoV-2 were compared with 30 age-matched people with diabetes without COVID-19. The effects of COVID-19 on glycemic control were assessed from CGM data at 2 weeks before confirmed COVID-19 infection (Time 1), at 2 weeks during-COVID-19 infection (Time 2) and 2 weeks after COVID-19 recovery (Time 3). The study found that while the control showed no change in glycemic measures amongst the non (i.e. non-COVID)-COVID control group, those with COVID-19 had a significant decrease in % time in range (TIR) (60.1% versus 55.4%, $p = 0.03$). There was also an increase in time above range (TAR), glucose management indicator (GMI), coefficient of variation (CV), mean glucose values and standard deviation. The study indicates the negative impact of COVID-19 infection on glycemic control for those who do not require admission to hospital.

Longo M et al. Glucose control in home-isolated adults with type 1 diabetes affected by COVID-19 using continuous glucose monitoring. *J Endocrinol Invest.* 2021; 5: 1–8



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Remote flash glucose monitoring is a useful tool for HbA1c reduction during the COVID-19 pandemic

This study assessed the feasibility and efficacy of monitoring people with diabetes using the FreeStyle Libre system during lockdown as a consequence of the COVID-19 pandemic.

A total of 40 people using flash glucose monitoring were included in the study (36 with T2DM, 4 with T1DM), with 26 non-users of the FreeStyle Libre system in a control group. As part of the study, HCPs phoned or emailed patients who were able to download their own glucose data. The study found a 0.4% reduction in HbA1c at 3 months ($p = 0.047$) amongst those using the FreeStyle Libre system, compared to a 0.4% increase in the control group. These results support the remote use of glucose-sensing systems during periods when routine in-clinic care is restricted.

Luzi L et al. Telemedicine and urban diabetes during COVID-19 pandemic in Milano, Italy during lock-down: epidemiological and sociodemographic picture. *Acta Diabetol.* 2021; 58(7):919–27

Telemedicine proves effective for women with gestational diabetes

This systematic meta-review validates the clinical effectiveness of telemedical interventions in the management of gestational diabetes.

A total of 11 studies (563 patients and 2779 patient cases) were included in the analysis, including four systematic reviews or meta-analyses, six randomized controlled trials and one low-quality non-randomized controlled trial. The meta-analysis concluded that telemedicine interventions are effective in reducing HbA1c in gestational diabetes, by as much as -1.14%. Just as important, the studies also showed that telemetry reduced the need for clinic visits and that satisfaction amongst pregnant women was high. These findings further support the use of telemedicine in diabetes care by highlighting the benefits in a patient group who may prefer this care strategy.

Eberle C, Stichling S. Effects of telemetric interventions on maternal and fetal or neonatal outcomes in gestational diabetes: Systematic meta-review. *JMIR Diabetes*. 2021; 6(3):e24284



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Assessing the evidence for virtual care for improving diabetes control

This literature review was developed to ascertain whether virtual care provides different clinical experience or quality outcomes to face-to-face care.

The researchers also aimed to identify best practices when introducing virtual visits for specific populations. The review, which identified 59 articles, including 7 systematic reviews, concluded that virtual care, in particular telemonitoring, provided improvement in HbA1c that was similar or superior to usual care. This was particularly evident in T2DM. Generally, satisfaction was high among people with diabetes and healthcare professionals. The key concerns from HCPs are focused on technical support, effective workflows and reimbursement.

Chan CB et al. Use of virtual care for glycemic management in people with types 1 and 2 diabetes and diabetes in pregnancy: A rapid review. *Can J Diabetes*. 2021; 45(7):677-688.e2



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Clinic-based telehealth model is a useful model for treating people with diabetes living in rural areas

This retrospective cohort study from the USA evaluated glycemic outcomes in people with T1DM who received care in telehealth clinics from 2013-2019.

The study populations lived in rural areas of Nebraska and Iowa and attended telehealth clinics involving travel to a local healthcare centre where they would participate in a video conference call with their physician who was located in one of the large diabetes centres. This method of telemedicine was then compared to home-based telehealth, which relies on the patient having home-access to the necessary technology. The analysis found a significant reduction each year in HbA1c (-0.13%) in people using the telehealth model and patients with uncontrolled diabetes (defined as HbA1c >9%) benefited more from the telehealth intervention compared to those with lower initial HbA1c values. The reductions in HbA1c were independent of the use of diabetes technologies and appear to be founded in the telehealth model of care itself, due to the convenience of attendance and reduced need to travel. The authors also suggested that the clinic-based telehealth model offers advantages that home-based models cannot provide. For example, it does not require the patient to have access to a particular technology.

Eiland LA, Drincic A. Rural telehealth visits in the management of type 1 diabetes. *J Diabetes Sci Technol*. 2021; doi: 10.1177/19322968211037990. Epub ahead of print

Telemedicine can be best used alongside face-to-face care

Two separate French studies assessed real-life use of telemedicine in adults with T1DM using CGM and flash glucose monitoring in conjunction with in-person consultations.

In the first study¹, a total of 72 adults with T1DM and using either CGM or flash glucose monitoring, used a remote-monitoring telehealth platform, DIABNEXT™ over a 6-month period, with a face-to-face meeting at the beginning and end of the study period. At 6 months, mean HbA1c levels were reduced by 0.5% (p<0.001), time in range increased significantly by a mean 6.75% at 3 months and 4.98% at 6 months (p<0.0001). The second study² reported that the same method was used in a sample of 64 people with T1DM or T2DM, on this occasion using the FreeStyle Libre system and LibreView. At 3 months, mean HbA1c had decreased from 10.2% to 8.3% (p<0.0001) and then remained stable to 6 months. In both studies, although telemedicine was shown to improve glycemic control, the face-to-face consultations were seen as meeting other non-clinical needs of patients such as diabetes education, so should be used alongside telemedicine.

1. Gaudillière M et al. Effects of remote care of patients with poorly controlled type 1 diabetes included in an experimental telemonitoring programme. *Diabetes Metab*. 2021; 47(6):101251.

2. Sekkat K, et al. Comment on Gaudillière et al. Effects of remote care of patients with poorly controlled type 1 diabetes included in an experimental telemonitoring programme. *Diabetes Metab*. 2021;47(5):101264. doi: 10.1016/j.diabet.2021.101264

Training can optimize CGM-focused telehealth for adults with T1DM

Barriers to consistent use of CGM and telemedicine include information overload, alarm fatigue, and physical discomfort. The ONBOARD study examined a behavioural intervention to support adults with T1DM in optimizing their CGM use.

Twenty two adults with T1DM participated in the ONBOARD (Overcoming Barriers to Adopting Diabetes Devices) program, which consisted of four 60-minute video sessions with a diabetes psychologist, delivered over a 3-month period, focusing on key themes for optimizing CGM use: physical; data; social and; trust. Content included education, cognitive and behavioural strategies, problem solving. From baseline, time in range (TIR) 70–140 mg/dL (3.9–7.8 mmol/L) increased from 50.9% to 57.7% ($p=0.013$) and TIR 70–180 mg/dL (3.9–10 mmol/L) increased from 72.6% to 77.5% ($p=0.02$). There was also a decrease in type 1 diabetes distress score from 2.27 to 2.02 ($p=0.013$), which is a clinically important difference. Overall, the ONBOARD program validated the use of education and motivational support when starting to use CGM devices in T1DM.

Tanenbaum ML, et al. ONBOARD: A Feasibility Study of a Telehealth-Based Continuous Glucose Monitoring Adoption Intervention for Adults with Type 1 Diabetes. *Diabetes Technol Ther*. 2021; 23(12):818-827

Telehealth visits may be most beneficial for young people between in-clinic visits

This observational multicentre real-life study looked at the efficacy of a single telehealth visit for young people with T1DM during the COVID-19 pandemic when routine clinical visits were less accessible.

For the purpose of this study, a telehealth visit could include: video, telephone or e-mail modalities and could include all the diabetes team members, according to clinical care needs. Data were collected for 121 patients who completed the telehealth visit and results showed that % time in range (TIR) was significantly higher for the two weeks after the telehealth visit compared with the two weeks prior to the visit (62.9 ± 16.0 , versus 59.0 ± 17.2 ; $p<0.001$). The individuals who benefitted most from the telehealth visit were those with a lower baseline %TIR and those from single-parent households, possibly because single parents were able to better support their child during the stay-at-home period. Although face-to-face clinic appointments are necessary for most young people with T1DM, this study suggests telehealth can be beneficial between in-clinic visits.

Rachmiel M et al. Glycaemic control in the paediatric and young adult population with type 1 diabetes following a single telehealth visit - what have we learned from the COVID-19 lockdown? *Acta Diabetol*. 2021; 58(6):697-705

Telemedicine during COVID-19 is shown to be more cost-effective in poorly controlled T2DM compared with traditional care

The cost-impact of using telemedicine during the COVID-19 pandemic in Saudi Arabia study was examined in a cohort of people with poorly controlled T2DM.

A retrospective chart review was undertaken of 100 people with poorly controlled T2DM ($>9\%$ HbA1c) using telemedicine and compared to 100 matched subjects receiving standard care during the COVID-19 pandemic, with a cost analysis. The study found that HbA1c reduction was greater in the telemedicine group (1.82; 95% CI=1.56-2.09, $P<0.001$), compared with standard care (1.54 (95% CI=1.23-1.85, $P<0.001$). Although the telemedicine group incurred greater costs, the associated cost reductions were greater. The incremental cost-effectiveness ratio was estimated to be SAR 2372.52 (USD 632.67) per 1% reduction in the level of HbA1c. Based on this analysis, telemedicine is an effective method of HbA1c control in T2DM and the study authors suggest that it should be incorporated into routine care.

AlMutairi MF, et al. Cost-effectiveness of telemedicine care for patients with uncontrolled type 2 diabetes mellitus during the COVID-19 pandemic in Saudi Arabia. *Ther Adv Chronic Dis*. 2021; doi: 10.1177/20406223211042542

Home-based digital diabetes program leads to improvements in HbA1c, diabetes distress and hypoglycemia, compared with usual care in T2DM

A home-based digital diabetes program was compared to usual care for measures of glycemic control, HbA1c levels and engagement with annual screening for microvascular disease.

This study enrolled 763 people with T2DM to a home-based digital diabetes program involving diabetes education, advice on nutrition and physical activity, and medication management. Participants were evaluated at baseline and at one year. Compared to a matched usual care group, those in the digital medicine group showed improvements in mean HbA1c, from 7.3% to 6.9% ($p<0.001$), with a reduction in number of patients with an HbA1c $\geq 9.0\%$, from 14% at baseline to 6% at 12 months ($p<0.001$). There was also a 71% reduction in hypoglycemic episodes and a 38% reduction in diabetes distress ($p<0.001$ in both cases). The digital diabetes group were also significantly more likely to undertake annual screening checks for retinopathy or kidney disease. Importantly, the digital diabetes health programme was accepted across a range of ethnic groups, ages and levels of health literacy.

Milani R et al. Improving management of type 2 diabetes using home-based telemonitoring: Cohort study. *JMIR Diabetes*. 2021; 6(2):e24687

The impact of flash glucose monitoring and telemedicine for older people with T2DM

This study reports on the perspectives and outcomes of a model of care incorporating flash glucose monitoring and telemedicine for 41 adult participants ≥ 65 years old with T2DM managed by a specialised community team.

The prevalence of T2DM in older people is prompting the investigation of newer methods to support their diabetes management, including the application of telemedicine and flash glucose monitoring. The OPTIMISE program (Older People with Type 2 diabetes Individualising Management with a Specialised Community Team) involved a 20-week program of diabetes management with two-week periods of flash glucose monitoring at the start and end of the process, with at least two telemedicine consultations, supported by home visits by a credentialed diabetes educator. The participants improved their time in range over the study period (69% at follow-up vs 67% at baseline) and reduced time above range (26% at follow-up vs 29% at baseline). Use of flash glucose monitoring was seen as a positive part of the program, providing timely and understandable feedback on glucose levels, and participants found the experience of telemedicine both accessible and supportive. The OPTIMISE study showed this model of diabetes care to be safe, effective and acceptable to older people with T2DM, with benefits for patients and their healthcare teams.

Ogrin R, et al. Older People With Type 2 Diabetes—Individualising Management With a Specialised Community Team (OPTIMISE): Perspectives of Participants on Care. *Clinical Diabetes* 2021; 39(4):397-410. doi: 10.2337/cd20-0129

Primary care telehealth interventions improve self-care behaviours and HbA1c in T2DM

Physicians are increasingly offering telemedicine in primary care as a way to save costs and time but are seeing additional benefits of telehealth for patients with T2DM, such as improved self-management behaviours.

A narrative synthesis and meta-analysis of RCT studies was undertaken for 29 studies that evaluated the outcomes of one or more types of telehealth interventions on HbA1c, compared to usual care alone. Results from the random effects meta-analysis demonstrated that telehealth interventions had a stronger influence on HbA1c compared to usual care with a mean difference in HbA1c of -0.18% ($p=0.04$). A subgroup meta-analysis demonstrated that all telehealth interventions using smartphone technologies (SMS texts, apps), as well as telephone communication have a stronger effect on lowering HbA1c levels. Many of these interventions focused on self-care behaviours in T2DM and also had higher levels of health care provider engagement.

Robson N, et al. Impact of Telehealth Care among Adults Living with Type 2 Diabetes in Primary Care: A Systematic Review and Meta-Analysis of Randomised Controlled Trials. *Int J Environ Res Public Health*. 2021; 18(22). doi: 10.3390/ijerph182212171



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FLARE NL-6 improves HbA1c and quality of life after two years of continued FreeStyle Libre use in the Netherlands

This study is a follow-up to the FLARE NL-4 study in the Netherlands that reported improvements in glycemic control, quality of life and reduced burden of disease during the first year of FreeStyle Libre system use.

A total of 342 participants were followed up for a second year and data were collected using the 12-Item Short Form Health Survey version 2, the EuroQol 5-Dimension 3-Level for quality of life and self-reported HbA1c. Over the 2-year period, there was a significant decrease in HbA1c among those who continued to use the FreeStyle Libre system (-3.5 mmol/mol, 95% CI -6.4 to -0.7), while HbA1c was unchanged in those who stopped using it. Self-reported quality of life was also higher in those who continued the use of the FreeStyle Libre system. At the end of the 2-year follow-up period 76% of users were persistent with the FreeStyle Libre system and 24% had discontinued use. The main reason for stopping was financial constraints. Overall, the FLARE NL-6 study shows that people with diabetes who continue to use the FreeStyle Libre system for 2 years can experience sustained improvement in glycemic control and quality of life.

Lameijer A et al. Two-year use of flash glucose monitoring is associated with sustained improvement of glycemic control and quality of life (FLARE-NL-6). *BMJ Open Diabetes Res Care*. 2021; 9(1):e002124.

FreeStyle Libre 2 system improves diabetes glycemic control in young people with T1DM using insulin pumps

This prospective, single-centre study in Saudi Arabia investigated using the FreeStyle Libre 2 system for 12 weeks in 47 young people (aged 13–21 years) with T1DM on insulin pump therapy previously using finger-prick testing for glucose monitoring.

The study participants were all experienced insulin pump users and were started on the FreeStyle Libre 2 system, with education on how to use the system. Baseline HbA1c was recorded and glucometric data were collected, including mean glucose, time in range (TIR), time above range (TAR) and time below range (TBR). Data were also collected regarding the number of daily glucose scans. Participants completed the Diabetes Self-Management Questionnaire (DSMQ) at baseline and at 12 weeks. The authors reported that the mean HbA1c dropped from 8.3% at baseline to 7.9% at 12 weeks ($p=0.064$). Furthermore, frequency of glucose monitoring increased from a mean 2.4 times a day using finger-prick testing to a mean 8.2 times a day with the FreeStyle Libre 2 system ($p<0.001$). Higher scan rates were associated with higher TIR at 12 weeks. The authors concluded that the FreeStyle Libre 2 system improved diabetes self-management and glycemic control for children and young people.

Al Hayek AA et al. Effectiveness of the freestyle libre 2 flash glucose monitoring system on diabetes self-management practices and glycemic parameters among patients with type 1 diabetes using insulin pump. *Diabetes Metab Syndr*. 2021; 15(5):102265

FreeStyle LibreLink app users experience better glycemic outcomes compared with those who use a reader

This US-based analysis, looked at whether there was a difference in glycemic outcomes among FreeStyle Libre users who used the FreeStyle LibreLink app, compared to those who used the FreeStyle Libre reader.

Overall, time in range (TIR) for FreeStyle LibreLink app users was 65.3% compared with 60.5% for FreeStyle Libre reader users. Furthermore, app users also had lower time above range (TAR), lower average glucose and lower glucose variability. The authors suggest that these differences may be due to the ability to share data on the FreeStyle LibreLink app; by sharing data with their healthcare professionals, FreeStyle LibreLink app users may be more comfortable making informed treatment decisions. The authors acknowledged that the differences in metrics may also be influenced by unknown demographic differences between the two groups.

Kao K et al. Comparison of glucose metrics between users of CGM readers and CGM-connected Apps. *J Diabetes Sci Technol*. 2021; doi: 10.1177/19322968211044141. Epub ahead of print.

Tele-education works in diabetes and beyond

The efficacy of EDUC@DOM, a telemonitoring program not restricted to glucose metrics, was assessed in improving glycemic control compared with usual care.

EDUC@DOM is a device that gathers data on weight, physical activity and food intake, as well as assessing blood glucose. It also is a platform for delivering lifestyle education. This study assigned 282 people with T2DM with baseline mean HbA1c 7.8% (63 mmol/mol), on insulin or non-insulin therapy, to either a telemonitoring group (TMG) or a control group for 1-year. The primary endpoint was difference in HbA1c levels. Other clinical parameters such as body weight, BMI and waist circumference were also measured. In the TMG, the mean number of connections to the device corresponds to a frequency of about twice a week. On average, TMG patients sent about one message per month to the investigators. The study found that there was no significant decrease in HbA1c in the TMG group, compared with control. There was, however, a slight improvement in glycemic control in the frequent user subgroup and significant weight loss in women. The investigators did conclude that this strategy could contribute to new models of care for diabetes management as an alternative to face-to-face clinic visits.

Turnin MC et al. Impact of a remote monitoring programme including lifestyle education software in type 2 diabetes: Results of the Educ@dom randomised multicentre study. *Diabetes Ther*. 2021; 12(7):2059–2075

Flash glucose monitoring reduces acute diabetes events and all-cause hospitalizations in T2DM

Adults with T2DM treated with basal insulin or non-insulin therapy had a reduction in acute diabetes events (ADEs) and all-cause inpatient hospitalizations (ACHs) 6 months after starting the FreeStyle Libre system.

A retrospective analysis of the IBM MarketScan Commercial Claims and Medicare Supplemental databases between October 2017 and March 2019 revealed that, amongst 10,282 adults with T2DM using the FreeStyle Libre system, ADE rates decreased from 0.076 to 0.052 events per patient-year ($p < 0.001$) and ACH rates decreased from 0.177 to 0.151 events per patient-year ($p = 0.002$). After starting flash glucose monitoring, reductions were seen across multiple admission criteria, including cardiovascular disease, endocrine disease, neurological and digestive diseases. These results are noteworthy since they show a reduction in ADEs in patients on basal or non-insulin therapies who tend to have lower rates of microvascular and macrovascular complications than patients on intensive insulin therapy. These findings indicate that use of flash glucose monitoring in patients with T2DM treated with basal insulin or non-insulin therapy improves clinical outcomes and potentially reduces costs.

Miller E, et al. Flash CGM associated with event reduction in nonintensive diabetes therapy. *Am J Manag Care*. 2021;27:e372-e377 doi: 10.37765/ajmc.2021.88780.

Assessing improvements in daily family life for children with T1DM using the FreeStyle Libre system

This study from the Republic of Georgia investigated the family-centred experience of parents when a child with T1DM begins using the FreeStyle Libre system.

Twenty parents of children (aged 2–16 years) with T1DM and at least 7 months use of the FreeStyle Libre system* took part in a qualitative survey and follow-up dialogue, that met the requirements of the Standards for Reporting Qualitative Research (SRQR). Parents felt the device was critical for the management of their child's diabetes and gave them a better understanding of the disease. All parents reported the device made it easier to adjust insulin doses and that their child's glucose levels were more stable. A greater sense of safety and security was a key theme, particularly during the night. Drawbacks were reported for participation in sports, notably rugby, although these could be overcome using protective coverings. This SRQR-compliant study highlights the value of the FreeStyle Libre system on family life for children with T1DM.

Kheladze N, et al. Experiences of Using a Continuous Glucose Monitoring System in Children—A Descriptive Study with Parents in the Republic of Georgia. *Healthcare* 2021; 9: 1556 doi.org/10.3390/healthcare9111556

* FreeStyle Libre system is indicated for use for people with diabetes aged 4 and older. In European countries a caregiver at least 18 years old is responsible for supervising, managing, and assisting children aged 4–12, in using the FreeStyle Libre system and interpreting its readings.

