

Contemporary issues in the practice of diabetes care, education and management



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Acknowledgement

ADEA would like to acknowledge the generous contributions from the following members of the Review Panel:

1. Ms Jenny Carmuciano, Person with type 1 diabetes
2. Dr Sue-Lynn Lau, Endocrinologist at Westmead Hospital
3. Dr Kate Marsh, Editor of the Australian Diabetes Educator publication
4. Ms Peta Tauchmann, Chair of the ADEA Clinical Practice Committee

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5. The person with diabetes discussed in these published case studies were all de-identified.
6. The person with diabetes discussed in these published case studies consented that these case studies are published in this print publication.

About ADEA

The Australian Diabetes Educators Association is the peak organisation for diabetes education in Australia and is the only organisation that has the experience and facility to recognise diabetes educators' qualifications and expertise through the ADEA Credentialling Program.

Among over 2,300 members, there are over 1,300 Credentialed Diabetes Educators in Australia, the specialists in diabetes education who are able to support over 1.7 million Australians with diabetes to stay well every day. ADEA also reviews educational programs developed by external organisations and endorses those programs for diabetes educators to complete for professional development purposes.

For over 35 years, ADEA has been at the forefront in diabetes education, setting professional standards and competencies, providing education and leading the way in recognising best practice in diabetes education, diabetes care and diabetes self-management.

About Abbott Diabetes Care

Abbott is committed to helping people living with diabetes live the best possible life through the power of health. For more than 125 years, Abbott has brought new products and technologies to the world—in nutrition, diagnostics, medical devices and branded generic pharmaceuticals—that create more possibilities for more people at all stages of life. Today, 94,000 Abbott employees are working to help people live not just longer, but better, in the more than 150 countries we serve.

Abbott Case Study Competition 2018

The 2018 Abbott Case Study Competition is run to acknowledge and reward case studies that address contemporary issues in the practice of diabetes care, diabetes education and self-management in the use of flash glucose monitoring and ambulatory glucose profile.

Submitted case studies included principles of person-centred care and were encouraged to adhere to the Diabetes Australia Language Position Statement while discussing the use of flash glucose monitoring¹ with or without ambulatory glucose profile² and addressing the following questions:

1. How have the client's outcomes (clinical or non-clinical) improved with this technology?
2. How has the technology been used to make a difference to a client's quality of life?
3. How has the technology changed practice for an individual health professional or the diabetes care team?
4. How has it helped to prevent an adverse event?
5. What are the challenges clients have found with this technology? What has been done as a consequence?

24 case studies, in both written and video formats, were submitted. Each submission was reviewed by two reviewers in a blinded review process, after which, the top ten case studies were selected. Ten written case studies from the following winners are included in this publication:

- | | |
|-------------------------|------------------------|
| 1. Daina Coenen | 6. Margaret Loh (*) |
| 2. Sally Double (*) | 7. Amy Rush (*) |
| 3. Ziping (Helen) Huang | 8. Yvette Owen |
| 4. Julie Lang | 9. Katherine Snars (*) |
| 5. Jayne Lehmann | 10. Bridget Wilkes |

(*) Case studies of these authors will be presented at the Case Study Presentation:

Time: 2pm – 3.30pm, Wednesday 22 August 2018

Room: RB7, Adelaide Convention and Exhibition Centre

1. The flash glucose monitoring system utilises a glucose sensor/transmitter and handheld receiver to measure multiple glucose data points from interstitial fluid. The glucose sensor is worn on the arm continuously for 14 days and includes a transmitter to communicate with the handheld glucose device. The handheld glucose receiver is used to manually transfer the data and displays the current glucose level, trend arrow and history of the past 8 hours without the need for capillary glucose testing. The receiver may also be used with capillary blood as an insulin dose advisor, however, calibration with capillary blood is not required.
2. The ambulatory glucose profile is a software approach to collating and analysing glucose data. It combines glucose readings from multiple days/weeks of glucose monitoring into a single 24 hour period, featuring statistical information such as average, interquartile and interdecile ranges.

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Case one

Flash glucose monitoring for managing diabetes with complex medical conditions

Daina Coenen

A 12 year old female diagnosed with type 1 diabetes mellitus (T1DM) 5 years ago attends our clinic every three months. She has also been diagnosed with hypothyroidism and Complex Cyanotic Congenital Heart Disease. At six months old, she underwent reparative surgery, with another three surgeries since then.

Management of her health includes frequent blood glucose monitoring and regular international normalised ratios (INRs). The multiple health conditions this young person has makes managing her diabetes difficult for her and her mother. Her mean HbA1c is 9.0%.

Her medications include insulin (Novorapid and Lantus), Thyroxine and Warfarin. A consideration for this young person managing T1DM is the risk of bleeding as a side effect of Warfarin.¹ Performing frequent blood glucose checks each day is required to effectively manage T1DM, yet this also poses a risk for her due to her medical conditions.

Upon reviewing her management plan, we considered the option of continuous glucose monitoring systems, now subsidised for children and adolescents under the age of 21. I discussed this with the young person and her mother as an alternative to the frequent blood glucose checks that she was performing. They were unsure whether this was something that they wanted, with the significant increase in data and alarms. She also has a mild allergy to tapes and they were unsure how she would react to the adhesives. They stated that they did not know if they were willing to spend government funds on a device and consumables that they might not use or benefit from. However, they saw some advantages including reducing blood glucose monitoring and glucose trend information to help make insulin dosing decisions. We then discussed the option of utilising the FreeStyle Libre system. Whilst not a continuous glucose monitor subsidised by the government, it still held the benefits that they considered important to her overall wellbeing. The amount of adhesive was less, hopefully minimising the chance of irritation or reaction to the tapes. They were able to consider

the various options, cost, associated risks and benefits and finally decided to try the flash glucose monitoring system.

We provided education on its use and a plan for her ongoing follow up. After 14 days, we discussed her experience. She was happy that 'it reduces finger pricks and tells me if my glucose is going up or down' and 'it helps whilst studying in school'. Her mum stated 'I can scan at night-time without disturbing her and it helps me judge night-time readings and insulin doses'. When scanning overnight her mother is able to determine if a lower glucose level needs treatment by interpreting the trend arrows, preventing overnight hypoglycaemia.

They are able to upload the device readings, and together we review the ambulatory glucose data and decide on a treatment plan to optimise her glycaemic management. Prior to commencing on this system they were utilising a meter that included an insulin dosage calculator. They found it was a drawback of this system that to utilise the dosage calculator included in the meter a confirmatory blood glucose level needed to be performed. Given that a reduction in blood glucose monitoring was important to them, we helped download and setup an insulin dosage calculator application on their mobile devices, effectively overcoming this barrier.

As a team, we were able to identify a management plan with this young person and her mother that addressed two important aspects of her healthcare:

1. A clinical need to reduce invasive and frequent fingerstick blood glucose checks whilst still optimising glycaemic management
2. Provide a system that allowed ease of glucose checking and greater reassurance overnight for her mother.

References

1. Melbourne Haematology. Melbourne Haematology. [Online].; 2018 [cited 2018 April 7. Available from: <http://www.melbournehaematology.com.au/fact-sheets/warfarin.html>.

Case two

Changing from MDI (multiple daily injections) to CSII (insulin pump therapy) – supporting the transition

Sally Double

Presented at the Case Study Presentation

Mrs A, 45 year old, has had T1DM since she was six. Mrs A has a busy family life with teenage children, works (active job), studies part time and enjoys daily exercise. Exercise varies between walking, personal trainer sessions and gym work. Mrs A is seeing an endocrinologist for ongoing medical support every 3-4 months. Mrs A is very proactive with her management and has developed strategies, including a low carbohydrate diet, that she believes works best to optimise her management and achieve regular HbA1c under 6.5%.

The decision to transition onto insulin pump therapy was due to hypoglycaemia frequency particularly overnight on MDI.¹ Mrs A transitioned onto insulin pump therapy following education through face-to-face appointments along with online learning modules. Mrs A coped well with being attached to the pump 24/7 along with navigating around technology of the pump with confidence. The greatest challenge that Mrs A was facing was to understand her glucose response when she was only using one type of insulin, NovoRapid, along with hypoglycaemia management and adjustments to basal rates for active days.

Snapshot

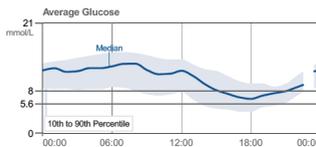
6 April 2018 - 19 April 2018 (14 days)

FreeStyle Libre 

Glucose

Estimated A1c **7.9%** or **63 mmol/mol**

AVERAGE GLUCOSE	10.0 mmol/L
% above target	71 %
% in target	21 %
% below target	8 %

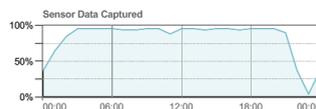


LOW-GLUCOSE EVENTS	4
Average duration	53 Min



Sensor Usage

SENSOR DATA CAPTURED	84 %
Daily scans	6



Logged Carbs

DAILY CARBS grams/day

Logged Insulin

Rapid-Acting Insulin units/day

Long-Acting Insulin units/day

TOTAL DAILY INSULIN units/day

Issues

- Hypoglycaemia episodes daily, including overnight² whilst on MDI
- Increasing occurrence of hypoglycaemia unawareness particularly overnight
- Transitioning onto insulin pump therapy from an insulin regimen that involved Lantus, Actrapid mane and NovoRapid nocte
- Education and management

Mrs A needed greater insight into her glucose trends on the pump to be able to reassess her management and responses to insulin delivery. It was suggested that Mrs A try a flash glucose monitor (FGM) to assist with gaining insight into her glucose trends. The Freestyle Libre FGM system was also suggested due to the ease of use, nil alarms or calibrations which works well when Mrs A was already trying to cope with the changes to insulin delivery through insulin pump therapy technology.

Mrs A was set up on the Freestyle Libre system two weeks after transitioning onto pump therapy. Mrs A really enjoyed being able to scan at any point in her day and get a glucose reading along with directional arrows. This was particularly useful at work and during exercise. Mrs A also gained huge insight into her overnight trends since the sensor can store 8 hour's worth of glucose data. This invaluable information gave Mrs A confidence in titrating overnight basal rates to achieve optimal fasting levels without the fear of undetected overnight hypoglycaemia, (See Snap Shot page 8).

Challenges

Mrs A adjusted to the Freestyle Libre sensor data with few issues. We did discuss the importance of understanding the directional arrows, reducing reactionary behaviours to directional arrows (unless indicating hypoglycaemia) as this can make overall data interpretation challenging when making insulin dose adjustments.

Mrs A did experience accidental removal of the sensor transmitter at day 13 with a handbag strap. This was resolved with site choice along with taping recommendations.

The ongoing cost of the sensors without any subsidy is restricting Mrs A's continual use of the product.

Case three

Overcoming barriers to glucose monitoring in a multidisciplinary approach with a flash glucose monitoring system

Ziping (Helen) Huang

John (pseudonym) is a 53 year old man who has type 2 diabetes (T2DM) for over 30 years. He did not take his medications regularly and his glycaemic management was out of target most of the time. He used to work as a builder, but he became unemployed due to illness. He became legally blind due to retinopathy. In addition, he was diagnosed with depression and neuropathy.

He did not perform routine capillary blood glucose monitoring. He found it difficult to manage the lancing device and inserting test strips into the glucose meter due to his impaired vision and neuropathy in his hands. He was prescribed insulin therapy (multiple daily injections), however, without accurate glucose results, insulin titration was difficult.

In 2016, he was introduced by a diabetes educator at our health service to the Freestyle Libre flash glucose monitoring system. He was motivated to improve his glycaemic management. He found it easy to scan and record his recent glucose data anytime and anywhere without the burden of traditional blood glucose monitoring. The screen of the reader was big and bright enough for him to read the glucose results and its trends. He also found the rich glucose profile helped him evaluate the effects of food, activity levels, stress and medications on his glucose levels.

After he started to use the Freestyle Libre flash glucose monitoring system, his requirement of insulin continued to reduce. He increased his physical activity by walking more frequently, making healthier food choices and improving his stress coping skills. In 2017, he went off insulin therapy after review by an endocrinologist and his diabetes was managed by lifestyle as well as oral glucose lowering agents. His HbA_{1c} levels had dropped from 14% to 7%. He looked brighter and he said he felt happier.

During his period using the flash glucose monitoring system, he attended his appointments regularly with the endocrinologist, the diabetes educator, the dietitian, the podiatrist and the psychologist in our health service. The diabetes educator downloaded John's ambulatory glucose profile during

Case four

A journey: Finding the missing link between self-monitoring and pro-active self-management

Julie Lang

A 63 year old retired female diagnosed with T1DM by her General Practitioner in 1983 living with her husband in rural Victoria undertook a course in DAFNE self-management of her diabetes some years ago and has been practicing these principles since.

No significant long-term complications of diabetes are present at this time; however, one of her goals is to maintain tight monitoring to reduce risk of complications associated with ineffective diabetes self-management. The second goal is to have good management of her diabetes to enable safe overseas travel with minimal disruption that may include hypoglycaemia or sick day events.

This person reconnected with the diabetes education team at a rural health service in mid-2017, requesting further education on sick day management and travel. In December 2017, the person reported that she had a Freestyle Libre monitoring system but was reluctant to commence sensor monitoring. An appointment was scheduled in February 2018 to provide her with education on insertion, interpreting flash glucose monitoring (FGM) and ambulatory glucose profile (AGP) analysis. Rodbard (2016) states that people with diabetes 'need to be trained so that they become confident in their ability to translate information derived from continuous glucose monitoring.'¹

A follow-up appointment was arranged with her husband attending, to provide education on uploading and interpreting AGP data. Following the next two sensor insertions, follow-up appointments were attended by the couple to discuss data results.

The outcomes were:

- Initial support was provided by the diabetes educator to establish self-confidence in using the Freestyle Libre system, including glucose trend arrow interpretation, the use of advanced settings in the receiver, including insulin dosage and carbohydrate records.

- The couple became involved in analysing uploaded AGP data and making choices together in daily self-management, including insulin titration.
- Minimal hypoglycaemia activity recorded when the person monitored blood glucose levels (BGLs) via finger prick samples. When AGP was analysed, significant hypoglycaemia was noted in the initial 14-day period, resulting in a decrease in evening basal insulin dose.
- The second 14 days of AGP revealed persistent hyperglycaemia post breakfast and regular episodes of hypoglycaemia pre dinner and before bed. A review of insulin to carbohydrate ratio was undertaken, using the FlexIT for Type 1 resource from Baker IDI.² A marked reduction in the duration and severity of overnight hypoglycaemia was noted with the person reporting feeling better within herself and having more energy during the day.
- Her husband supports her wearing the sensors continuously and provides support in AGP analysis. Bergenstal et al (2013) states ‘the current iteration of the AGP dashboard (the first row of glucose statistics) provides a basic starting point that allows clinicians and patients to begin to more effectively visualise and utilise glucose data as a key component in addition to the HbA1c to drive lifestyle and therapy decisions in the management of diabetes.’³

Seeing the growth of confidence in this person and the support of her family in the daily management of diabetes has been an inspiration to the healthcare team and strengthens the team’s commitment to ensure the client and family remain at the centre of the team’s focus, and are empowered to make informed choices with access to personalised data in real time through the Freestyle Libre system.

As confidence grows in this system, enquires have increased within the diabetes and broader community. However, the cost and lack of consistent patient and clinician education restricts many people from accessing the Freestyle Libre system. Research is continuing worldwide in the new field of AGP and its role in daily self-management of diabetes. The Freestyle Libre system provides real time FGM monitoring and with AGP provides a body of data, allowing for confidence in timely diabetes self-management.

Case five

Flash glucose monitoring – The missing key to improved self-management

Jayne Lehmann

Introduction

Sally was 21 years old, single and enrolled full-time at university when we met in June 2013. Her mum arranged the appointment due to concerns about her daughter's T1DM self-care since being diagnosed in 2012. Sally lived at home with her parents, older sister and twin brother.

Sally's self-care was chaotic with missed/late insulin doses (Lantus 16 units pre-bed; NovoRapid pre-meals 0 – 8 units), over-corrected basal and bolus dosing, missed meals, limited blood glucose levels (BGLs) 2 – 21mmol/L, and misleading HbA1c (6.8%).

Issues

- Non-acceptance of diagnosis: 2009 + positive anti-GAD, insulin/islet cell antibodies. Diagnosed in 2012
- No diabetes team/consistent health professionals
- Knowledge and skill gaps:
 - Blood glucose monitoring (BGM)
 - Insulin action
 - Rotation of injection sites
 - Dosing for carbohydrate
 - Sick day management – no ketone strips
- Painful finger-pricking/injections
- High anxiety when BGLs elevated/fear of long term health problems
- Psychosocial issues
- Reluctance to self-care

Education/management provided

Sally felt her past health professionals had not listened to her. Establishing a respectful, meaningful and effective relationship using the principles of person centred-care¹ has been essential. Appointments are in my home office or local cafe, with email and text messaging in-between. We have focussed on her experience of diabetes with:

- Counselling/de-briefing
- Different meters and bolus calculation features
- Experiential learning
- Introduction to social media
- Medication review
- Motivational interviewing, goal setting
- Re-education
- Setting alarms to wake Sally up/give insulin

In 2016 Sally trialed continuous glucose monitoring (CGM) with missed and over-corrected insulin dosing causing unstable BGLs. Cost precluded purchase of the equipment by Sally.

Discussion

Fast forward ... August 2017

Sally messaged me at the 2017 ADS/ADEA Annual Scientific Meeting, asking if she should try the Libre Interstitial Flash Monitoring system. I was wearing and trialling the system and also gathered feedback from the bloggers with T1DM using the new technology during the conference. I shared these insights with her for a realistic understanding of the technology. She decided to purchase the Libre monitoring system.

Sally enjoyed:

- Being more in control of her life/happier/empowered to act on levels
- Discretely scanning at work
- Increased data analysis using the ambulatory glucose profile
- Not needing to wash/prick her fingers
- Identifying patterns especially overnight
- Seeing a difference in insulin action when injected into lipohypertrophy vs. non-affected areas
- Sensor in her arm rather than abdomen (CGM)

In April 2018, an infected in-grown toenail triggered hospitalisation with diabetic ketoacidosis. Due to cost, Sally wasn't wearing a sensor, so frequent glucose and ketone monitoring was required, causing sore fingers. When she left hospital, she inserted a sensor and was able to gain an

understanding of her levels and dosing requirements with improved BGLs over the ensuing days due to an ability to read, understand and respond to the data generated (see image bellow). However, when Sally returned to BGM with a meter post sensor, she recorded no readings the first day, one reading on Monday (27.8mmol/L) and four readings on Wednesday before my appointment with her on Friday.



Conclusion

A person-centred approach underpins the development of a healthy relationship between people with diabetes and their Credentialed Diabetes Educator. The Libre monitoring system proved to be the key to unlocking Sally's ability to use the knowledge, skills and strategies developed over the past five years to monitor and correct her levels. Sensor cost has prevented Sally from using the system full-time. Even intermittent use has enabled Sally to respond more maturely to her data for improved diabetes self-management. Addition of the Libre sensors to the NDSS in the future would further support Sally's diabetes self-management.

References

1. ADEA, March 2015, Person Centred Care for People with Diabetes, Accessed 5.18pm on 14/4/2018, https://personcentredcare.com.au/wp-content/uploads/2017/07/ADEA_Person-Centred-Care-for-people-with-diabetes-Information-Sheet.pdf

Case six

Regaining motivation + wellbeing through technology

Margaret Loh

Presented at the Case Study Presentation

Introduction

Hypoglycaemic unawareness is the occurrence of neuroglycopenia without any preceding warning signs from the autonomic nervous system.¹ It occurs in approximately 40% of people with T1DM and is a major limitation to achieving optimal glucose management. Education is key to developing strategies to reduce the risks associated with this serious complication of diabetes.

Details of the person with diabetes

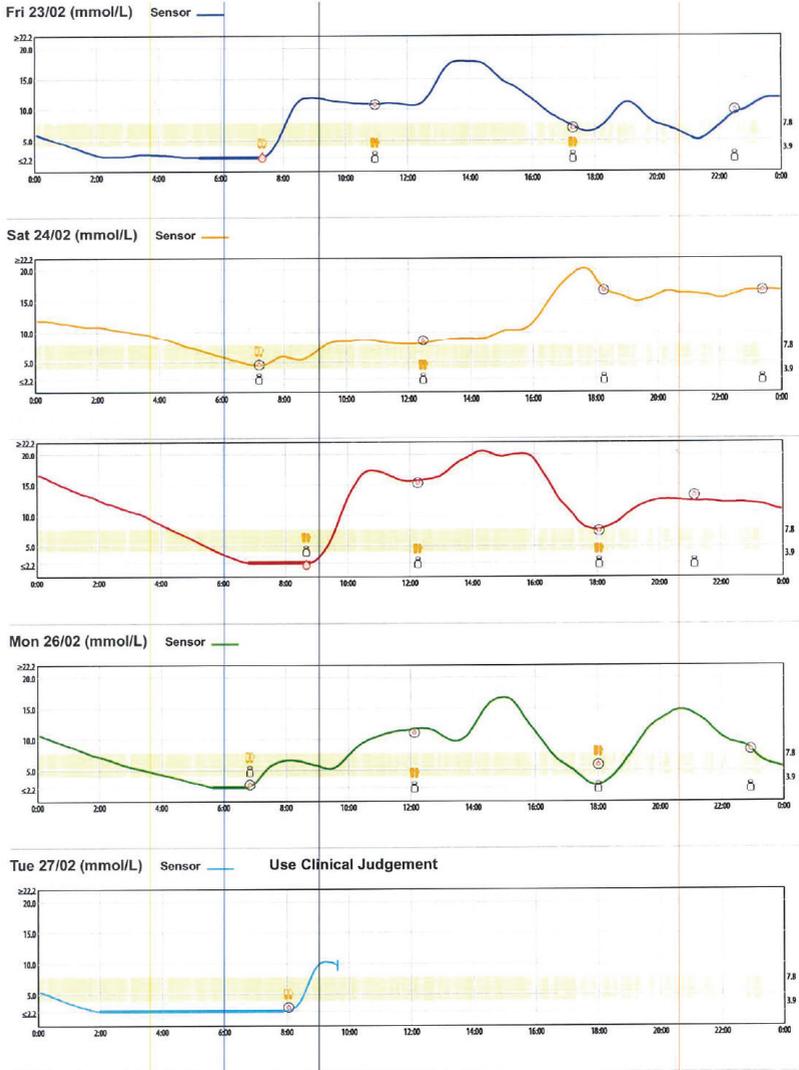
AJ is a 43 year old male with T1DM of 32 years duration. He has a medical history of depression, hyperlipidaemia and elevated albumin creatinine ratio. Medications include Lantus 44 units nocte, Novorapid 12 units pre meals, mirtazapine 15mg nocte, rosuvastatin 10mg nocte and perindopril 5mg mane. He is married with school age children and works as a public servant. He self-presented to the emergency department of a tertiary hospital, reporting three hypoglycaemic episodes in the previous 24 hours. These episodes were detected by his wife who noticed 'words weren't coming out right'. AJ reported taking regular insulin but performed no blood glucose (BG) monitoring and had sought no medical follow up for nine years.

He was emotional throughout consultation with the credentialled diabetes educator and voiced several concerns impacting his life. These included fear of hypoglycaemia and deteriorating ability to detect such episodes, diabetes complications, job security and financial security. He described diabetes as a 'horrible, painful, mentally draining' condition.

Assessment, education and management

It is well recognised that living with diabetes has a negative impact on physical and emotional wellbeing.² AJ's difficulty in maintaining motivation to self-manage diabetes was demonstrated by long term lack of BG monitoring and engagement with healthcare professionals. A person-centred approach to education and management was crucial to successful re-engagement.

Initial education and management focussed on improving AJ's knowledge of detection, management and prevention of hypoglycaemia and rationale for insulin dose adjustments. A six-day glucose profile was obtained. This uncovered undetected nocturnal hypoglycaemia lasting up to six hours. Intermittent daytime hypoglycaemia was also a prominent feature (see image below).



Whilst appropriate adjustments to insulin doses were made, this did not address AJ's fear of undetected hypoglycaemia and unpredictable changes in glucose levels. A real-time glucose monitoring system was trialled. However, due to difficulties with sensor insertion and glucose sensor failure, AJ rapidly lost confidence in this technology. He was introduced to the Freestyle Libre flash glucose monitoring system. He reported numerous advantages including:

- Ease of use – 'painless sensor insertion and no need for finger pricks'
- Improved wellness and relationships – 'I'm getting a better night sleep making me a more pleasurable person with T1'
- Improved safety – 'I feel comfortable going to sleep'
- Improved decision-making with meal-time insulin due to directional arrow

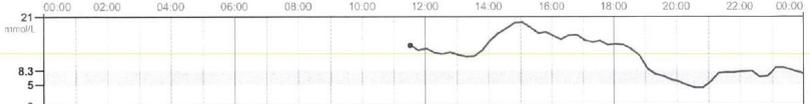
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Daily Log

27 March 2018 - 10 April 2018 (15 days)

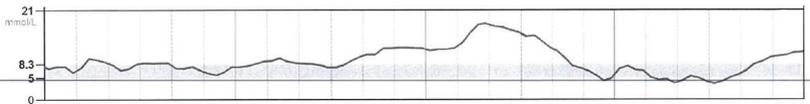
FreeStyle Libre 

Tue 27 Mar



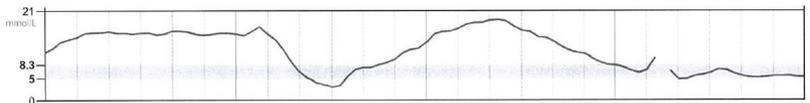
 Glucose
mmol/L

Wed 28 Mar



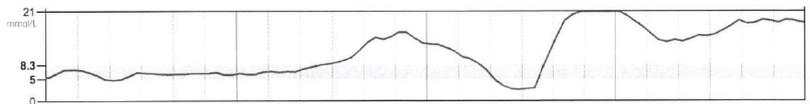
 Glucose
mmol/L

Thu 29 Mar



 Glucose
mmol/L

Fri 30 Mar



 Glucose
mmol/L

DATA SOURCE: FreeStyle Libre 22.13
FreeStyle Libre (s)

Legend  High Glucose (>13.3)  Low Glucose (<3.9)  Strip Test  Sensor Scan  Logged  Post-Meal Peak  New Sensor  Time Change

Additionally, nocturnal hypoglycaemia resolved and AJ is now planning to see a dietitian for carbohydrate counting education to further improve daytime glucose management.

In clinical practice, this technology allows me to offer different management choices to patients, which underpins the principle of person-centred care. The FGM system is durable, reliable and the simplicity of device download and reporting systems reduces the time burden when assessing patient results.

Unfortunately, current costs associated with glucose sensing make use of this technology unsustainable for many adults. Hopefully, the NDSS subsidy will soon be extended to this patient cohort.

Conclusion

The addition of this tool to routine practice improves opportunities for patients to achieve improved quality of life. Ease of use and immediate feedback of glucose trends seen with FGM has impacted AJ's life in a very positive way. 'The rewards are I have much better blood glucose management'. As a healthcare practitioner, it is gratifying to see the empowerment this glucose monitoring system has brought to his day-to-day life.

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Case seven

Free to be a kid – without lancets

Amy Rush

Presented at the Case Study Presentation

Details of the person with diabetes

Miss S is an eight year old who loves the water. She was diagnosed with T1DM at age 3. Her diabetes is well managed by her parents, but management is challenging when out of routine, such as on a recent trip to Bali. Having experienced difficulties managing diabetes on previous trips, the family was aware of the restrictions necessary for Miss S to stay safe around the pool.

The problem

Miss S cannot swim freely without a care in the world. Instead, she must leave the water regularly to monitor her blood glucose. Cold, wet fingers are not easy to check, so she is forced to sit on the sidelines until her fingers dry and warm.

Miss S's diabetes regimen on holidays is restrictive and frustrating, but necessary to avoid hypoglycaemia. Risk of hypoglycaemia increases during exercise due to increased uptake of glucose from the blood,¹ especially during strenuous activities such as swimming. Risk increases with prolonged activity. Anecdotal evidence from people living with type 1 suggests immersion in cold water can further reduce blood glucose levels, linked to changes in metabolism with decreased body temperature.² Miss S's parents are terrified she will slip under the water from an undetected hypo.

Constant fingerpricking and hovering parents – this is not 'freedom to be a kid'.

The solution

Miss S's parents were anxious about their upcoming holiday. Being able to monitor Miss S's blood glucose at all times was paramount, but they wanted her to enjoy the holiday the way she wanted, in the pool. As their clinician, the Libre was the answer to their monitoring issue.

During their Libre set up, Miss S's parents were delighted the sensor felt secure on her skin. I highlighted the importance of the trend arrow and how this could be integral to decision making.

Miss S's parents sourced a waterproof case with a lanyard for the reader. She would feel confident and safe, knowing she could check any time with a simple scan. She would have the freedom to be like every other child.

The results

Having the Libre gave Miss S the chance to enjoy her holiday without restrictions. Miss S had told her mum that she loved scanning instead of fingerpricking, and her parents enjoyed the trends and history they could access using the Libre. The time Miss S spent away from her insulin pump whilst swimming was rectified by frequent scans, looking for the tell-tale trend arrow of rising blood glucose and reattaching the pump to deliver micro boluses. The fear of hypoglycaemia was alleviated with frequent scans, and Miss S was not forced to leave the pool for fingerstick checking.

The impact of the Libre extended beyond the pool. By the second day, the family noticed the breakfast buffet was causing a dramatic rise in blood glucose, followed by a rapid fall requiring hypo treatment - right before she hit the pool. The foods were generally high GI, so armed with the information about her history, her parents agreed to try a pre-breakfast bolus. By the time they were at breakfast, the pre-bolus was already in action. The post-prandial high followed by the low ceased, as insulin action better matched carbohydrate absorption. Miss S could eat what she liked and jump in the pool afterwards. Miss S's parents would have struggled to notice this trend with fingerpricks. With the Libre, they could act on the information they had gained within a day, making Miss S's morning considerably more stable.

With the Libre, Miss S was truly 'free to be a kid' – swimming in the pool, eating holiday food, and enjoying time with her family.

References

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3. Smart CE, Annan F, Bruno LPC, Higgins LA, Acerini CL. Nutritional management in children and adolescents with diabetes. Pediatric Diabetes 2014; 15 (Suppl. 20): 135–153.

Case eight

How the flash glucose monitoring system optimised glycaemic management and avoided hypoglycaemia for a metropolitan train driver

Yvette Owen

The use of the Freestyle Libre Pro in the general practice setting for a person with T2DM has been invaluable. This case study will focus on a 57 year old gentleman who works full time as a state metropolitan train driver.

This person was diagnosed with T2DM in 2004, has a BMI of 23.4 kg/m² and has been struggling to attain a target HbA1c less than 7%. He had also at times experienced episodes of hypoglycaemia. His medications include Metformin XR 2g, Daonil 7.5mg and Jardiance 25mg per day. The rationale for selecting the Freestyle monitor as an intervention was to examine the impact of certain foods on blood glucose levels. Another important consideration was the monitor's potential to improve ease of BG monitoring and to ultimately avoid hypoglycaemia.

Addressing the issues of raised HbA1c and hypoglycaemia were important to our 57 year old man. As part of his job, he is required to provide evidence that his diabetes is 'managed' and that he 'wasn't having hypos'. The application of the sensor and reviewing the download along with a food diary was most valuable. I was able to educate the gentleman about how to interpret the data along with identifying foods that were contributing to significant post-prandial blood glucose excursions. Whilst this man's intake at most times was healthy, we were able to identify foods with a high glycaemic load. For example, on the days that he had corn flakes for breakfast, his blood glucose rose significantly. On days where he had eggs for breakfast, we saw little to no rise in his blood glucose levels.

The sensor was also very valuable for the gentleman in blood glucose monitoring and identifying blood glucose trends. This gentleman was extremely happy to now be able to avoid finger stick checking and being able to easily use the system especially whilst at work. The ability to instantly know whether his blood glucose levels were on the way up or down was very reassuring and enabled him to respond appropriately even whilst driving the train. Most importantly, it provided him with peace of mind that he and his passengers were safe.

The outcomes for this gentleman after using the Libre monitor have been amazing. He has felt more informed and empowered about managing his diabetes. He is feeling more confident about selecting foods that have minimal impact on his blood glucose levels and thus has been able to achieve an HbA1c of 6.7%. He has also managed to avoid hypoglycaemic episodes which has decreased his fear of hypoglycaemia considerably. The ease of using the sensor has been instrumental in fulfilling the gentleman's health requirement to work, as well as his own motivation to improve his diabetes self-management skills.

The ability to use the Freestyle monitor has certainly had an amazing benefit for this gentleman with T2DM. As a CDE, I have been able to enhance this individual's diabetes self-management skills. This man has enjoyed the ease of use of this blood glucose monitoring system as well as being able to download and interpret the data that this system provides. The use of this system has applicability to many people with both type 1 and type 2 diabetes. As a CDE working in the general practice setting, I have had great pleasure recommending and providing education to people with diabetes with the ultimate goal of empowering and improving individual diabetes self-care and management skills.

Notes

Case nine

Pre-conception planning and management using flash glucose monitoring and CSII (insulin pump therapy)

Katherine Snars

Presented at the Case Study Presentation

Introduction

Miss C is a 31 year old female who has had type 1 diabetes since she was 10 years old and currently works full-time. She started using an insulin pump in December 2015 to assist with managing her diabetes and also takes metformin. She has no other medical conditions.

Issues

When speaking with Miss C in mid-2017, she expressed concerns that when she had asked the specialist about pre-conception planning and management of her diabetes, she had just been told to let us know when she was pregnant. After a discussion about her concerns and providing some education on the topic, I was able to facilitate her seeing a different specialist who would provide more support.

Education and management provided

Miss C identified concerns with blood glucose levels and hypoglycaemia when exercising and about overnight hypoglycaemia. As she was wanting to become pregnant, she was also trying to reduce her HbA1c and improve her overall management. After discussing options, she decided that due to cost, she could not afford to use the CGM system with the pump but would try using flash glucose monitoring (Libre) as it was less expensive to set up and could be used periodically by purchasing sensors when she could afford it. Our service was able to provide a Libre with two sensors for her to trial initially. Education was provided about use of the Libre, particularly how to respond to readings and arrows, as well as further information about pre-conception planning.

By using the Libre sensors and uploading her results along with her pump uploads, more effective changes could be made to Miss C's insulin pump settings. She was also able to manage her blood glucose levels more effectively when exercising by having seen what is actually happening in that time using the Libre.

Results

Comparing sensor data from July 2017 (Figure 1) and February 2018 (Figure 2), the median line is much more even. In July 2017, the median ranged from 5.4 to 10.0 mmol/L with an average daily glucose of 7.9 mmol/L. In February 2018, the median ranged from 6.7 to 7.9 mmol/L with an average daily glucose of 7.4 mmol/L. The variability around the median was also reduced. However, while these values have decreased, the number of low glucose events has increased from 15 to 23 events with average duration also increasing from 113 minutes to 132 minutes. This is something that we need to continue to work with Miss C to reduce.

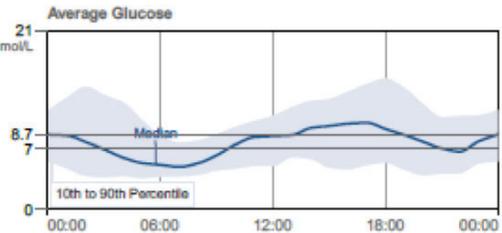
Snapshot

29 June 2017 - 12 July 2017 (14 days)

Glucose

Estimated A1c **6.6% or 49 mmol/mol**

AVERAGE GLUCOSE	7.9 mmol/L
% above target	36 %
% in target	21 %
% below target	43 %

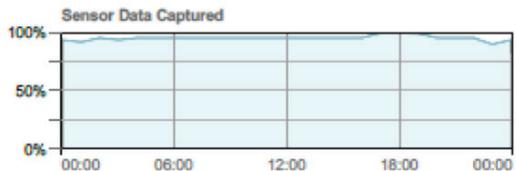


LOW-GLUCOSE EVENTS	15
Average duration	113 Min



Sensor Usage

SENSOR DATA CAPTURED	96 %
Daily scans	11



DATE: 2017/07/12

FreeStyle Libre 1.0

Figure 1. Snapshot of Miss C's July 2017 Libre results

Snapshot

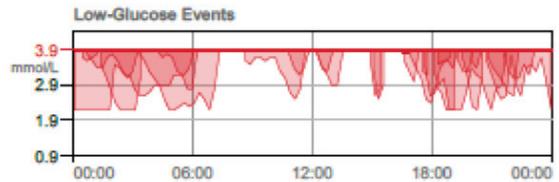
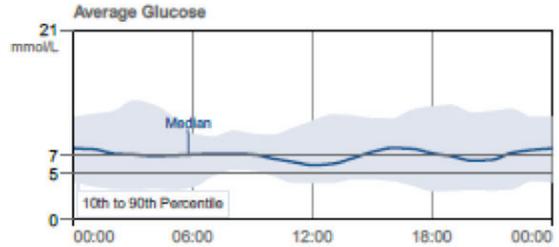
6 February 2018 - 9 March 2018 (32 days)

Glucose

Estimated A1c **6.3% or 45 mmol/mol**

AVERAGE GLUCOSE	7.4 mmol/L
% above target	50 %
% in target	27 %
% below target	23 %

LOW-GLUCOSE EVENTS	23
Average duration	132 Min



Sensor Usage

SENSOR DATA CAPTURED	52 %
Daily scans	9

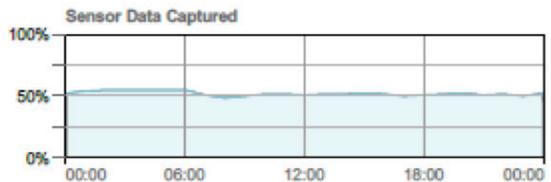


Figure 2. Snapshot of Miss C's February 2018 Libre results

By using the Libre results in conjunction with basal rates, bolus doses and carbohydrate inputs from the pump, more effective changes could be made to the insulin pump settings. When discussing suggested changes, it was easier for Miss C and her diabetes team to recognise what changes were needed by seeing the full story of what was happening with her blood glucose levels. Miss C's HbA1c was reduced from 7.8% in July 2017 to 6.3% in January 2018 and Miss C is now pregnant.

Case ten

Supporting lifestyle changes with flash glucose monitoring

Bridget Wilkes

Introduction

CS is a 56 year old man employed as a full time dispatch administrator. At the time of his diagnosis of T2DM, CS was admitted to intensive care due his markedly elevated lipid and glucose levels. CS was discharged home after 10 days on a premixed insulin and lipid lowering agent.

The diagnosis of both his T2DM and his elevated cholesterol was completely unexpected, but on subsequent reflection of his lifestyle CS admits that his diet was not particularly healthy. CS has been attending the diabetes educator and GP in general practice as well as regular appointments with his endocrinologist since his initial diagnosis. CS is particularly motivated by the health risks associated with his diabetes. His diabetes management has been particularly effective over several years, managed with a combination of oral and injectable medications and through adopting collaborative goal setting.

In October 2017, CS came to his appointment, expressing complete frustration and disappointment with both his recent pathology results and feedback. CS's unhealthy weight and suboptimal blood glucose levels were contributing factors, despite efforts to maintain a healthy lifestyle. 'For people with diabetes, feelings of failure and frustration and self-blame are common. Consequences of unrealistic expectations'.¹

Intervention

Fortunately at this time, there was an opportunity to trial the Freestyle Libre device and CS was particularly motivated to make positive changes to improve both his quality of life in the short and long term. CS also expressed the desire to trial a calorie restricted diet, requiring close supervision of both his blood glucose levels and insulin doses. CS's wellbeing and overall goal was to lose weight, improve his energy levels and hopefully achieve optimal blood glucose levels. CS embarked on strict calorie restriction, increased exercise regimen and weekly insulin adjustments. Facilitated by the additional information provided by the Freestyle Libre, CS successfully reduced both his weight and waist

circumference over the following three months. In addition, his insulin doses were gradually titrated down to a daily dose. After persistent post prandial hypos indicated by both the Freestyle Libre and confirmed with fingerstick glucose levels, CS's insulin was ceased.

Discussion of results

The additional information provided by his Freestyle Libre has enabled CS to keep a more comprehensive profile of his glucose fluctuations and inform his lifestyle choices. We're all different, and there is no one-size-fits all approach when it comes to eating. While intermittent fasting may suit some people, it's not a magic bullet to improved health.² CS has remained off his insulin for the following three months and his HbA1C has decreased from 8.0% to 6.2%. Similarly, his lipid profile also improved (Table 1). CS is particularly realistic about the propensity to regain his weight and subsequently increase his insulin requirements. However, he remains extremely positive and motivated and maintains regular contact with and values a team-based approach.

Table 1.

	November 2017	February 2018
HbA1c	8.0%	6.2%
Total Cholesterol	5.4mmol/L	4.2mmol/L
Triglycerides	2.6mmol/L	2.4mmol/L
HDL	1.3mmol/L	1.2mmol/L
LDL	2.9mmol/L	1.9mmol/L
Waist	113.5cm	105cm
Weight	104.6kg	92.6kg
Treatment	Diabex, Byetta, Novomix 30 BD	Diabex and Byetta

Conclusion

This case study has demonstrated that with improved glucose monitoring techniques, options to trial different lifestyle treatments can be undertaken. In particular, the ability to safely trial different dietary regimens whilst on insulin therapy and maintaining regular contact with his diabetes care team. The insight gained by using the Freestyle Libre enabled CS to experiment with his diabetes management to make positive lifestyle changes.

Case Study Presentation

The top four case studies of this competition will be presented at the Case Study Presentation during the 2018 Australasian Diabetes Congress:

Time: 2pm – 3.30pm (Adelaide time)

Date: Wednesday 22 August 2018

Room: RB 7, Adelaide Convention and Exhibition Centre

You are invited to participate in this presentation and vote for your favourite case study to find one recipient for the People's Choice Award.

Recipient of People's Choice Award will be announced at the ADEA Award Ceremony after the Annual General Meeting on Friday 24 August 2018.