

**Contemporary
issues in the practice
of diabetes care,
diabetes education and
self-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. Ms Toni Eatts, Former Editor of Diabetic Living
3. Dr Sue-Lynn Lau, Endocrinologist at Westmead Hospital
4. Dr Kate Marsh, Editor of the Australian Diabetes Educator publication
5. Ms Peta Tauchmann, Chair of the ADEA Clinical Practice Committee

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2. Content in this publication is provided for health professionals only and is not intended to be used by health consumers, people with diabetes and carers.
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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.

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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 2,100 members, there are over 1,200 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, core 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.

2017 Case Study Competition

ADEA facilitated the Case Study Competition, with financial support from Abbott Diabetes Care, for diabetes educators to submit case studies that address contemporary issues in the practice of diabetes care, diabetes education and self-management involving the use of flash glucose monitoring with or without ambulatory glucose profile.

Case studies address the following question(s), including principles of person-centred care:

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. Eight written case studies from the following seven winners are included in this publication:

1. Miss Samantha Bridgland
2. Ms Robyn Hart
3. Mrs Jui-Wen Vivien Hsu^(*)
4. Mrs Rebecca Humphreys^(*)
5. Ms Connie Luo^(*)
6. Mrs Amy Rush
7. Mrs Maxine Schlaeppli

Two video case studies from the following two winners are available on this website: <https://www.adea.com.au/events/abbott-case-study-competition>

1. Ms Robyn Hart^(*)
2. Ms Barbara White

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

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Case one

Flashing a spotlight onto hidden hypos in chronic kidney disease (CKD)

Connie Luo^(*)

Presented at the Case Study Presentation

Introduction

EW is a 60 years-old lady who works as a school secretary (part-time). She is married with 1 child. EW has had type 2 diabetes for 19 years. Her medical history also includes hypertension, dyslipidaemia, renal impairment (CKD stage 4; eGFR 19), obesity (BMI 35.2), glaucoma, bilateral cataract extraction, hypothyroidism, and cholecystectomy.

Her diabetes treatment before the use of flash glucose monitoring was:

- Novomix30: 26units pre-breakfast
- Novorapid: 28units pre-dinner
- Protaphane: 85units pre-bed
- Diamicon MR 60mg pre-breakfast

The Problem

Her glycaemic management was suboptimal. We suspected hypoglycaemia but as she had hypoglycaemia unawareness as demonstrated by Clarke's hypoglycaemia questionnaire,¹ she never complained of hypoglycaemia.

HbA1c fluctuated between 6.8% and 7.3%, but in CKD4 with its associated altered red cell life cycle dynamics and anaemia, HbA1c is a poor index of glycaemic management. The usefulness of serum fructosamine is limited by the short period of glycaemic management it reflects. EW was reluctant to perform blood glucose monitoring (SMBG) more frequently than 1-2 readings. Without knowledge of her 24-h blood glucose level (BGL) profile, it was very challenging to adjust her diabetes treatment without significant risk of hypoglycaemia. EW was already struggling with weight management and any increase in insulin doses would also likely increase weight and insulin resistance.

The rationale to use flash glucose monitoring in EW, with severe renal impairment, was to enable optimisation of glycaemic management while limiting the risk of hypoglycaemia. Importantly, this case study

would contribute to the current literature as there is a lack of published information on the use of flash glucose monitoring in severe CKD.

Education or management provided

The first flash glucose monitoring sensor period revealed frequent asymptomatic hypoglycaemia throughout the day, to EW's shock and surprise. As a result, Diamicon MR 60mg was ceased and pre-bed Protaphane was reduced to 80units.

During the second flash glucose monitoring sensor period there was asymptomatic hypoglycaemia overnight. Pre-bed Protaphane was reduced further to 70units.

A third flash glucose monitoring sensor showed that BGLs were all within target range (5.0-10.0 mmol) without hypoglycaemia. For the first time, EW had become more engaged, proactive and confident with her diabetes and lifestyle management. She monitored glucose levels regularly without finger pricking and adjusted her diet and exercise and lost weight in a safe manner.

Thus, flash glucose monitoring enabled reduction of total daily insulin dose by 15 units and cessation of sulphonylurea. Her overall glucose management improved and hypoglycaemia was eliminated.

Discussion of results

EW remarked, 'flash glucose monitoring has opened my eyes to my changing glucose levels and the importance of frequent monitoring. I feel safe.'

Flash glucose monitoring and ambulatory glucose profile reporting allowed us to examine the trend and 24-h pattern of glycaemic variability. This proved to be very useful in EW, whose HbA1c was not a reliable indicator of glycaemic management. This technology enabled identification of her multiple episodes of asymptomatic hypoglycaemia, reduction in her diabetes treatment and prevention of further hypoglycaemia and its dangerous consequences.

EW found flash glucose monitoring convenient and felt better able to manage her diabetes, being able to check her glucose level at all times. She improved in her self-management.

Conclusion

Currently, no literature exists for flash glucose monitoring in renal patients. This case strongly suggests that flash glucose monitoring is useful in diabetes management.² It would benefit particularly people with diabetes with severe renal impairment, as it detects any asymptomatic hypoglycaemia for which such people with diabetes are at very high risk. Flash glucose monitoring is a safe and effective tool in reducing and preventing severe hypoglycaemia, and we suggest that it can replace SMBG.³ It is simple to use, and greatly enhances safety, motivation, and self-management.

References

1. Clarke WL, Cox DJ, Gonder-Frederick LA, Julian D, Schlundt D, Polonsky W. Reduced awareness of hypoglycemia in adults with IDDM: a prospective study of hypoglycemic frequency and associated symptoms. *Diabetes care*. 1995;18(4):517-22.
2. Distiller LA, Cranston I, Mazze R. First Clinical Experience with Retrospective Flash glucose Monitoring (FGM) Analysis in South Africa: Characterizing Glycemic Control with Ambulatory Glucose Profile. *J Diabetes Sci Technol*. 2016;10(6):1294-302.
3. Haak T, Hanaire H, Ajjan R, Hermanns N, Riveline JP, Rayman G. Flash glucose-Sensing Technology as a Replacement for Blood Glucose Monitoring for the Management of Insulin-Treated Type 2 Diabetes: a Multicenter, Open-Label Randomized Controlled Trial. *Diabetes therapy: research, treatment and education of diabetes and related disorders*. 2017;8(1):55-73.

Case two

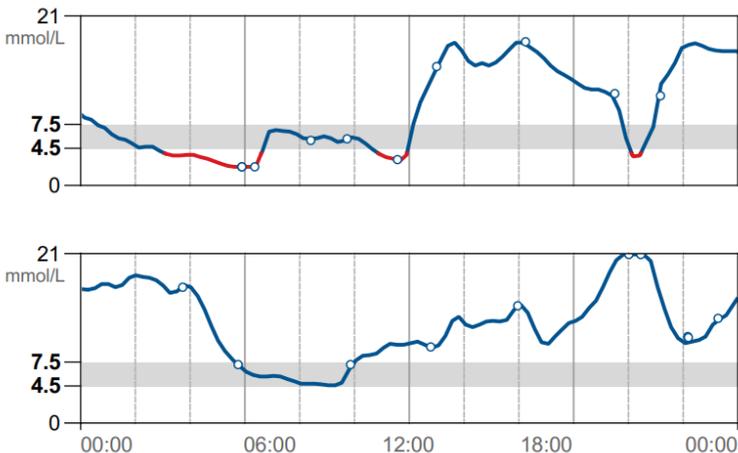
Build your confidence to live well with diabetes

Jui-Wen Vivien Hsu^(*)

Presented at the Case Study Presentation

Ms A is a 24 years old full-time health professional with type 1 diabetes (diagnosed 10 years ago) who has a very busy work schedule so she has irregular meal times at work and sometimes misses the lunch insulin, resulting in mid-afternoon hyperglycaemia. Her HbA1c was reasonable but she's constantly tired. Her job is very stressful and needs good concentration to focus on tasks at hand. It's difficult to monitor her BGLs at work. FreeStyle Libre is discreet and easy with 1 second scan and no finger prick calibration needed for up to 14 day sensor wear so she chose to try it.

We've reviewed the graphs, identified when her suboptimal glucose levels occurred and planned with Ms A her diabetes self-management. Her husband also came to the consultation to learn how he can provide additional support, especially during weekdays. The graphs showed the trend of frequent nocturnal hypoglycaemia (up to 27 events fortnightly and lowest is 1.9 mmol/L) and mid-afternoon hyperglycaemia (up to 24.3 mmol/L). These trends have made her tired constantly and contributed to her inability to concentrate. She was extremely worried about severe hypoglycaemia that has been linked to excessive morbidity and mortality in the research.^{1,2,3}



In collaboration with her endocrinologist, we have adjusted the doses of her basal and bolus insulins every 3 days and changed the insulin administration time to suit her work schedules. She also started to bring lunch to work with pre-calculated carbohydrate amounts. The occurrence of nocturnal hypoglycaemia and mid-afternoon hyperglycaemia have reduced significantly. The glycaemic variance also reduced dramatically and she's feeling a lot more energetic and enjoys her work more as she can concentrate better. Her overall quality of life has improved because she has more confidence in self-management and all aspects of her life are better.

As HbA1c results cannot identify diurnal glucose patterns which are important for clinical decision making to adjust the insulin doses in a safe and timely manner,⁴ I believe the graphs have helped us to make appropriate clinical decisions to adjust the doses of insulin to suit her lifestyle safely and effectively. This also reduces the glucose variance which helps her to manage her diabetes rather than being controlled by her diabetes. This can help other people with diabetes who wish to manage their diabetes better and help other clinicians understand their clients' needs more, to actively treat diabetes.

References

1. Zoungas S, Patel A, Chalmers J, de Galan BE, Li Q, Billot L, Woodward M, Ninomiya T, Neal B, MacMahon S, Grobbee DE, Kengne AP, Marre M, Heller S, ADVANCE Collaborative Group Severe hypoglycemia and risks of vascular events and death. *N Engl J Med.* 2010;363(15):1410–8.
2. Seaquist ER, Miller ME, Bonds DE, Feinglos M, Goff DC, Jr, Peterson K, Senior P, ACCORD Investigators The impact of frequent and unrecognized hypoglycemia on mortality in the ACCORD study. *Diabetes Care.* 2012;35(2):409–14.
3. McCoy RG, Van Houten HK, Ziegenfuss JY, Shah ND, Wermers RA, Smith SA. Increased mortality of patients with diabetes reporting severe hypoglycemia. *Diabetes Care.* 2012;35(9):1897–901
4. Bergenstal RM, Ahmann AJ, Bailey T, et al. Recommendations for Standardizing Glucose Reporting and Analysis to Optimize Clinical Decision Making in Diabetes: The Ambulatory Glucose Profile. *Journal of Diabetes Science and Technology.* 2013;7(2):562-578.

Case three

Engaging the un-engaged – ‘taking diabetes care off auto-pilot’

Rebecca Humphreys^(*)

Presented at the Case Study Presentation

Mr B, 22 years old, has had type 1 diabetes since he was 13. He works full-time in an office position but is very active outside work hours. He plays football in winter and cricket in summer. He trains for both and also runs 4-5 afternoons per week. Mr B attends appointments with a physician and more recently a CDE. He is booked every 3 months but has only been attending 1-2 times a year. Appointments were quite brief as it was difficult to get much information regarding glycaemic management or areas requiring further education. His insulin regime is daily Lantus 21units (at night) and Novorapid 10-12units pre-meals at a set dose and not adjusted for carbohydrate.

Issues

- Persistently high HbA1c (Jun 16-8.1%, Dec 16-8.5%)
- No glucose data brought to appointments but Mr B would report he was monitoring and things were ok. ‘Only the occasional hypo’
- High activity levels and no data
- Pump therapy was suggested back in 2013 but he was reluctant due to sport. He has also been referred for DAFNE but never attended.

Education/management

At his last appointment in December his HbA1c was up to 8.5%. We suggested that Mr B get a FreeStyle Libre meter and a sensor just so that we could get some insight to what was happening with his levels. He was reluctant to try this as he thought with sport etc it would get pulled out but as it was summer and there was no football he thought the timing would be ok.

Approximately 5 days into the first sensor I had a phone call from Mr B asking to make an urgent appointment so we could discuss the results. He asked me if it was normal to see 2-6 hours of hypoglycaemia during the night. I think seeing this data really gave him some insight into what had been happening with his levels and finally we had some data and Mr B on board.

After the first sensor, we split the Lantus to 10units mane and 8units nocte. Mr B was concerned about his day time BGLs being too high, but we were able to see this was the case anyway and his bolus insulin really needed addressing. At the next appointment, Mr B brought his wife to the appointment. We could still see some hypos at night but Mr B was doing 10u and 12u Lantus instead of the 10u and 8u we had discussed. We changed him to Levemir 12u mane and 10u nocte. We are seeing him every 4-6 weeks to continue to adjust basal insulin and start to work on bolus insulin. Mr B is now engaged in his insulin therapy and can see that running on auto pilot wasn't really working. Given his frustration with his levels and delayed hypoglycaemia we discussed pump therapy again.

His HbA1c was down to 7.6%.

Daily Patterns (with Ambulatory Glucose Profile)

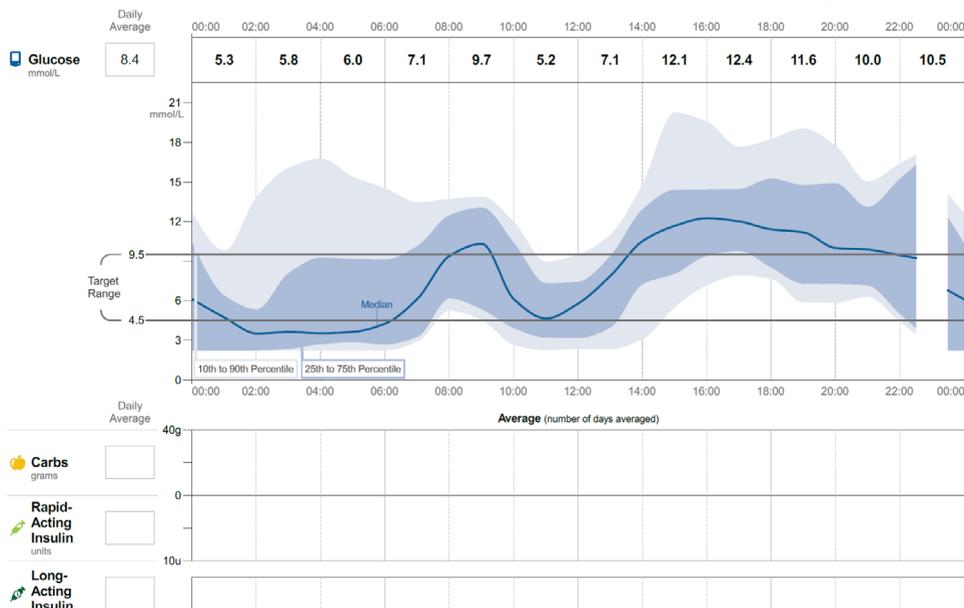


7 January 2017 - 13 January 2017 (7 days)

Estimated A1c 6.9% or 52 mmol/mol

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DATE: 2017/01/13

DATA SOURCE: FreeStyle Libre 2.2.9
FreeStyle Libre 1.0



Summary

This technology has given the health care team some valuable information regarding Mr B's glycaemic management and started to fill in the gaps. It also gave Mr B the opportunity to 'buy in' to his diabetes and how it was being managed.

Significant nocturnal hypoglycaemia was identified with the use of this technology and then the ensuing rebound hyperglycaemia during the day. We were also able to identify that Mr B was often giving his morning Novorapid after breakfast and not before.

Appointments are now more valuable for Mr B as we are now able to offer much more in terms of self-management education and insulin adjustment to ensure his safety and avoid an adverse event.

Mr B continues to have reservations about wearing the FreeStyle Libre during the football season but I now know he can see the value in using it. We have discussed taping and the fact that AFL players are using the same technology. His physician and I value the FreeStyle Libre as a quick and easy to use tool to re-engage.

Case four

Improving T1DM management while maintaining an energetic lifestyle – challenge accepted!

Samantha Bridgland

Introduction

This case study follows a 43 year old female with type 1 diabetes seen in private practice.

Diagnosis: Type 1 Diabetes Mellitus diagnosed age 17. Commenced on Continuous Subcutaneous Insulin Infusion (CSII) at the age of 31 years.

Medical history: Hashimoto's hypothyroidism. No diabetes related complications.

Social history/work: Husband, 2 young children. Works as a part-time dance teacher for primary aged children. Busy lifestyle that comprises of all aspects of family life, part-time work and exercise.

Weekly exercise routine:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Boot camp	08:15-09:15	08:15-09:15	08:15-09:15	08:15-09:15	08:15-09:15		
Dance lessons	16:00-20:30	11:00-14:30	16:00-21:30		10:30-13:30		
Bike ride							09:00-10:30
Walk						08:30-09:30	

Initial assessment

My initial meeting with this person consisted of noting the above medical and social history. Questions and discussion regarding her current diabetes management on CSII:

- Do you make your own CSII adjustments?
- Are temporary basal rates used?
- How many BGLs per day? Are they all entered into the pump?
- Is there post exercise hypoglycaemia? If so how long after? Is it dependent on which activity?

Other questions are answered upon a CSII download – such as how often the line changes are completed and is the pump being overridden at all. The person's HbA1c at this time is 9.3%.

Concerns raised

After discussing the above, it is obvious that this person has an extremely busy lifestyle of work and activity. The inability to do BGL testing during dance class became evident as the pump download showed few blood glucose levels entered during this time and there was often a delay in doing BGLs post dance due to the social aspect of the class at the completion and the need to 'hang about' and converse with parents etc. Furthermore she expressed concern over how best to manage BGLs during and post dance as well as post exercise in the morning when hypoglycaemia was often experienced.

Education and management discussed

After discussing potential setting changes and providing education on this, we discussed the use of temporary basal rates pre, during and post exercise. The main issue however still appears to be that she is finding it increasingly difficult to do BGLs in her busy periods of the day. Incorporating this and not wanting to compromise her current busy lifestyle, it seemed that she was desiring something that may assist in making her life with T1DM slightly easier. The FreeStyle Libre was then discussed as an option. Education was given on what the device does and the potential advantages of using flash glucose monitoring. It was also discussed with her the need to still do BGLs to gain a definitive blood glucose level in the case of hyperglycaemia or hypoglycaemia when symptoms are experienced or as suggested by the interstitial glucose reading or trend arrow on the FreeStyle Libre. She purchased the FreeStyle Libre and commenced wearing this.

Results and outcomes

Ongoing follow up consisted of providing this person with care and education regarding the main concerning issues she was having with overall diabetes management and variability in BGLs, specifically around exercise. This consisted of weekly to fortnightly pump uploads to myself for suggested changes and also ongoing face-to-face appointments whereby we dissected the FreeStyle Libre and CSII download together to assess her relative glucose management. This resulted in more intense management on her behalf – whereby more BGLs were entered. She found that by using the FreeStyle Libre, most specifically for a trend arrow, she could more accurately and more frequently use temporary basal rates for activity and exercise. The use of the FreeStyle Libre during the day when activity was not a factor also led to more BGLs being entered into the pump. She found that by ‘swiping’ the FreeStyle Libre and achieving a reading of interstitial glucose she would then be more likely to do a blood glucose level and enter this into the pump as she knew that she most likely needed a correction. Hence insulin was increased as needed. Her current HbA1c is 8.0% (3 months post commencing FreeStyle Libre).

Challenges

Initial wear of the device proved challenging. This person did experience accidental removal of the transmitter within the first week of its use. This was soon resolved with specific placement in an area that was less likely to be knocked.

Conclusion

Flash glucose monitoring provided a way for this person to achieve improved glycaemic management by indirectly facilitating increased blood glucose monitoring and hence more proactive pump interaction. The trend arrow also assisted with actively manipulating insulin doses pre, during and post exercise.

Case five

Combatting major hypoglycaemic unawareness

Maxine Schlaeppi

Background

A 45 year old lady was diagnosed with type 1 diabetes 30 years ago at the age of 15. She has multiple comorbidities including peripheral neuropathy, right charcot foot, left below knee amputation, frequent bouts of osteomyelitis, retinopathy – macular oedema, nephropathy, hypertension and major hypoglycaemia unawareness causing depression.

Assessment

Current treatment is Lantus™ 5units twice daily and Novorapid™ 5–10 units with each meal. Her current weight is 104kg, blood pressure 140/93 and HbA1c of 8.7% (72mmols/mol). This has always varied usually much higher due to her fear of hypoglycaemia. She has a history of 3 to 5 major hypoglycaemic episodes requiring third party intervention per week. She also has a right foot ulcer, looks slightly acromegalic which requires IGF-1 pathology testing.

Action plan

- Waitlisted for a pancreas kidney transplant
- Clinical psychology input for her depression
- Daily foot dressings by domiciliary nurses
- Installation of a personal alarm system
- Frequent blood glucose monitoring and better hypoglycaemic treatment

Interventions

1. The introduction and education on usage of the FreeStyle Libre reader and sensors supplied by the diabetes service to prevent unnecessary hospitalisations due to further major hypoglycaemic episodes
2. Review and change from the use of sucrose to glucose as a hypoglycaemic treatment using glucose tablets and complex carbohydrates at the correct amounts of 15 to 20grams per episode

As this person lives alone, a decision was made to put into place a personal alarm system in her home to reduce the risk of her being unconscious for prolonged periods of time.

Continued support from the local diabetes service is a must to ensure that she remains healthy enough to have a transplant when it is available for her. Referral, continued appointments, necessary treatment and follow up with the diabetes clinical psychologist are important to help with her mental health.

Discussion

The FreeStyle Libre system delivers interstitial readings at a simple swipe of the sensor permitting people with diabetes to view their levels without the need to use capillary finger lancing. This system also shows a graph of the last 8 hours of levels and trend arrows.¹

The diabetes team proactively outlined the care options and health benefits, risks, access and costs of the use of the FreeStyle Libre and checked that she had understood, agreed and can action self-management of her care.² She agreed to trial the use of the FreeStyle Libre reader and sensor system. The FreeStyle Libre system facilitated frequent monitoring and earlier detection of hypoglycaemic levels, viewing of the trending arrows assisted timelier treatment of the falling glucose levels appropriately preventing further major hypoglycaemic episodes. The clinical data downloads showed evidence of frequent undetected hypoglycaemic episodes. Discussion of the data with the person permitted the diabetes team to identify some issues around insulin delivery times and the lack of adequate carbohydrates thus developing some better strategies.

Conclusion

This person and the diabetes team frequently download and analyse the data from her FreeStyle Libre reader, enabling better self-titration of her insulin regimen, earlier treatment of falling blood glucose levels and ultimately prevention of further major hypoglycaemic episodes and hospital presentations.

She now feels confident to pick up the trends of her glucose levels and self-manage her treatment more appropriately. Embracing this system has contributed to her ability to have a better quality of life and reduce her fear of hypoglycaemic episodes. For the first time in many years, she arrived at her last appointment with a smile.

The diabetes team have also gained experience through this case and are now better prepared to help clients with the use of their FreeStyle Libre systems.

References

1. Rebrin K, Sheppard NF Jr, Steil GM. Use of subcutaneous interstitial fluid glucose to estimate blood glucose: revisiting delay and sensor offset. *J Diabetes Sci Technol.* 2010;4(5):1087-1098.
2. Australian Commission on Safety and Quality in Healthcare 2014, Australian Safety and Quality Framework for Health Care, Patient and Consumer Centred Care. Available at: <http://www.safetyandquality.gov.au/our-work/patient-and-consumer-centred-care/> Accessed 12 October 2015

Case six

Severe hypoglycaemia and driving

Robyn Hart

Lyn (not her real name) is a 47 year-old woman diagnosed with type 1 diabetes when she was six years old. She was referred to me for diabetes education after being involved in a motor vehicle accident caused by her diabetes. Lyn had been using a subcutaneous insulin pump for 15 years, but admits as a single mother of four school-age children, she often would guess her carbohydrate serves and required insulin doses. Although Lyn frequently tested her blood glucose levels (BGL) with finger pricks, she would often overcompensate for both high and low BGLs, not always using the pump settings for giving a correction dose.

On the day of the accident, she had taken two of her children, two friend's children and the family to the beach. Once there, Lyn checked her BGL which was 15 mmol/L and administered an insulin correction via her pump and played with the children. Lyn did not check her BGL again when she got into the car to drive home approximately one hour later.

Then Lyn crashed her car into an embankment and slipped into unconsciousness. The panicked children scrambled out of the car and rang Lyn's mother yelling 'mum is having a hypo!' They flagged down a passer-by who immediately rang the ambulance and police.

To this day Lyn does not know how low her BGL had fallen. She was admitted to hospital and stayed overnight for observation and for hypothermia, a condition caused by her earlier swimming combined with her dangerously low BGL.

Hypoglycaemia can adversely affect the ability to drive and hypoglycaemia has at times been implicated as a precipitating cause of road traffic accidents and, in occasional cases, fatalities.¹

As per the Assessing Fitness to Drive guidelines, a person who experiences a severe hypoglycaemic episode while behind the wheel requires a medical clearance to resume driving.² This driving ban made it difficult for Lyn to

transport her children to school and herself to work and doctor's appointments. Lyn clearly needed to more effectively monitor her BGLs, so when she came for her appointment, I explained to her how the FreeStyle Libre flash glucose monitoring system works, including the glucose trend arrow and painless one-second scans of the sensor. She said she was keen to give this new device a trial.

That was six months ago. Below are Lyn's responses to how the device improved not only her diabetes management but also her quality of life.

1. HbA1c is 6.6%, down from 7.2% previously.
2. Lyn feels much safer whilst exercising as she can frequently check which way her blood glucose level is trending. Although Lyn had been educated frequently about setting a temporary basal for exercise, she felt so rushed she would just often forget.
3. Lyn finds it easier to monitor rises in her BGLs, so she has experienced less hyperglycaemia from over-treatment of a hypoglycaemic event.
4. Lyn reports she enjoys the ease of checking overnight BGLs with a quick scan, and the consequent lower risk of overnight hypoglycaemia.
5. Lyn works as a checkout clerk at a grocery store, and previously found that her BGL would often go low whilst serving customers. This resulted in her grabbing lollies at the counter and overeating in front of customers. Now, she frequently swipes and has not had any such incidents at work since commencing on the FreeStyle Libre.
6. Finally, Lyn was able to resume driving again six weeks after the accident by downloading the device readings, enabling her to show evidence of her improved glycaemic management.

References

1. Frier Brian M, Heller Simon R, McCrimmon Rory J. Hypoglycaemia in Clinical Diabetes 3rd Edition 2014. Chapter 18. 354 p.
2. Assessing Fitness to Drive for Commercial and Private Drivers 2016. Chapter 3. Diabetes Mellitus. 59 -62.

Case seven

When a four-legged friend isn't enough

Robyn Hart

Debbie (not her real name) was 46 years old when she developed type 1 diabetes after an episode of pancreatitis caused by a motor vehicle accident in 2000. Debbie has a history of frequent severe hypoglycaemic episodes, and is presently on the islet cell transplant list.

She started having hypoglycaemic episodes soon after diagnosis and in 2009 was changed from multiple daily injections to continuous subcutaneous insulin infusion. Over time, as technology improved, Debbie added a continuous glucose monitoring system.¹

Due to Debbie's hypo unawareness she was forced to stop driving in 2011.² That same year, Debbie suffered a seizure after a profound overnight hypoglycaemic episode, which required intensive care admission. Following this episode Debbie developed cognitive function difficulties which, along with other complications, forced her to leave the family business. She grew stressed as she watched the business decline. Around this time, Debbie acquired Sunny, her diabetes assistant dog, from the organisation Paws. Sunny helps warn Debbie of impending hypoglycaemia and even senses when she is unwell from other ailments like high blood pressure.

Despite her new companion, Debbie eventually lapsed into a major depression as she believed she was becoming a burden to her family. She took an overdose of insulin, but survived.

During an extended period in a mental health clinic, Debbie was administered a new antidepressant medication, with side effects that made it almost impossible to manage her insulin pump. Prior to this admission, I introduced her to the FreeStyle Libre as a tool to monitor her blood glucose levels (BGL) without always needing to lance her fingers.

Debbie called it a 'life changer'. She felt able to prevent hypoglycaemia episodes by watching the directions of the arrows on the meter. She learned that when the arrow pointed down, her BGL was falling quickly, and if the trend arrow was rising, she could stop eating to avoid over-treating

her hypoglycaemia. Debbie has remained in close contact with her mental health team and is doing well.

When Debbie couldn't use the insulin pump in the mental health clinic, she could still maintain reasonable blood glucose management using the FreeStyle Libre Rapid Acting Insulin Calculator. Debbie was on a prescribed insulin dose with each meal. These doses, along with a target glucose range and correction factor, were programmed into the meter which would suggest an insulin adjustment depending on her pre-meal BGL (remembering, that the calculator can only be used with finger stick glucose readings, and not with a sensor result).

Debbie sums up her feelings of the advantages and disadvantages of using the FreeStyle Libre meter:

- 'My family and I feel it has relieved a lot of anxiety. They can check my blood glucose levels without disturbing my sleep.'
- 'I love the trending arrow too as it alerts me that my blood glucose is going low or rising rapidly.'
- 'I calculated that I have done 50 thousand finger pricks over the years, pricking my fingers eight to ten times a day. Now I only prick before meals.'
- 'The only downside is the cost. Otherwise I love it!'

As a health professional, the FreeStyle Libre has increased my confidence when giving advice to Debbie and other people with diabetes. I can sit with them and download their BGL records onto my computer. These readings are more comprehensive, thanks to the FreeStyle Libre continuous BGL monitoring function. Together, my clients and I can look at daily patterns and log books, identify hypoglycaemia or hyperglycaemia, and discuss how to avoid or manage such episodes in the future. I particularly feel more assured in the insulin dose adjustments I recommend.

References

1. LangendamM, Luijf YM, Hoofst L, DeVries JH, Mudde AH, Scholten RJPM. Continuous glucose monitoring systems for type 1 diabetes mellitus. Cochrane Database of Systematic Reviews 2012, Issue 1. Art. No.: CD008101.DOI: 10.1002/14651858.CD008101.pub2.
2. Austroads, National Transport Commission. Assessing Fitness to Drive for Commercial and Private Drivers. 5th Edition. Sydney: Austroads Ltd; 2016. 59-62 pp.

Case eight

Conquering the solo Rottneest Channel Swim

Amy Rush

Miss J was diagnosed with type 1 at age 17 and since her early 20s has successfully self-managed her diabetes with a reduced carbohydrate dietary approach, frequent glucose monitoring and physical activity. Miss J is a healthy and physically fit individual with a HbA1c of 5.1%.

A lover of the ocean and one to never back down from a challenge, Miss J made the decision to compete in the 19.7km open ocean Rottneest Channel Swim as a solo entry. Type 1 diabetes posed profound challenges and as Miss J's Credentialed Diabetes Educator, I had doubts about how her diabetes would be managed. But Miss J's determination and drive sent us both into the proverbial deep end, on a quest to find ways to support a person with type 1 to swim unaided across the ocean, and do it with blood glucose levels conducive to optimum athletic performance.

The challenge of testing blood glucose regularly over 10 hours in extreme conditions stopped us immediately in our tracks. Without a solution to this problem, the swim was over before it began. Regular blood glucose monitoring was not an option due to the cold restricting Miss J's blood flow and the inability to dry her hands. Another tool, continuous glucose monitoring will not transmit through water so was also not an option. Enter flash glucose monitoring which uses radio frequency that can transmit through water: the FreeStyle Libre. The FreeStyle Libre was the game changer.

Miss J began her gruelling swim training regimen using the FreeStyle Libre. With the reader in a waterproof bag she was entirely self-sufficient; able to monitor her glucose levels even on long open water swims, keeping the reader tucked inside her bathers or poolside during squad sessions. With over 15 hours in the water per week, keeping the sensor in place was a concern. A layer of Opsite Flexfit tape was sufficient to ensure 14-day wear from the sensor.

The ambulatory glucose profile from training was used to improve pre-and post-swim diabetes management strategies and aid our nutrition decisions for the big day.

During the 19.7km swim, Miss J was not allowed hands-on assistance from her support kayaker. Drinks, food and equipment needed to be thrown to her in the water and she was required to administer everything herself. Early detection and confirmation of trending lows was vital, as she needed to tread water while self-treating. Miss J has difficulty recognising hypoglycaemia in the water because her first symptom is usually perspiration. Using the FreeStyle Libre she was able to scan to detect early, and intervene before the hypoglycaemia progressed. With the FreeStyle Libre, we were also able to test ketones immediately post-race to ensure Miss J was within a safe range.

Miss J's Rottneast Swim was a success, largely due to her ability to constantly monitor her glucose using the FreeStyle Libre. Upon completion we had a complete ambulatory blood glucose profile of a 19.7km solo swim, upon which we could reflect on and learn from. The FreeStyle Libre made challenges that previously seemed insurmountable feasible, due to the ease at which my clients could check glucose levels and with the value of the trend data. As Miss J's CDE, this experience has allowed me to see that anything is possible with type 1 and has given me the confidence to tackle the big things head on with my type 1 clients.

Case Study Presentation

The top four case studies of this competition will be presented at the Case Study Presentation during the 2017 ADS-ADEA Annual Scientific Meeting:

Time: 11am – 1pm (Perth time)

Date: Thursday 31 August 2017

Room: Riverview room 4&5,

Perth Convention and Exhibition Centre

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

Complete the voting slip and return to us at the end of the presentation.

Recipient of People's Choice Award will be announced at the ADEA Award Ceremony after the Annual General Meeting on Friday 1 September 2017.