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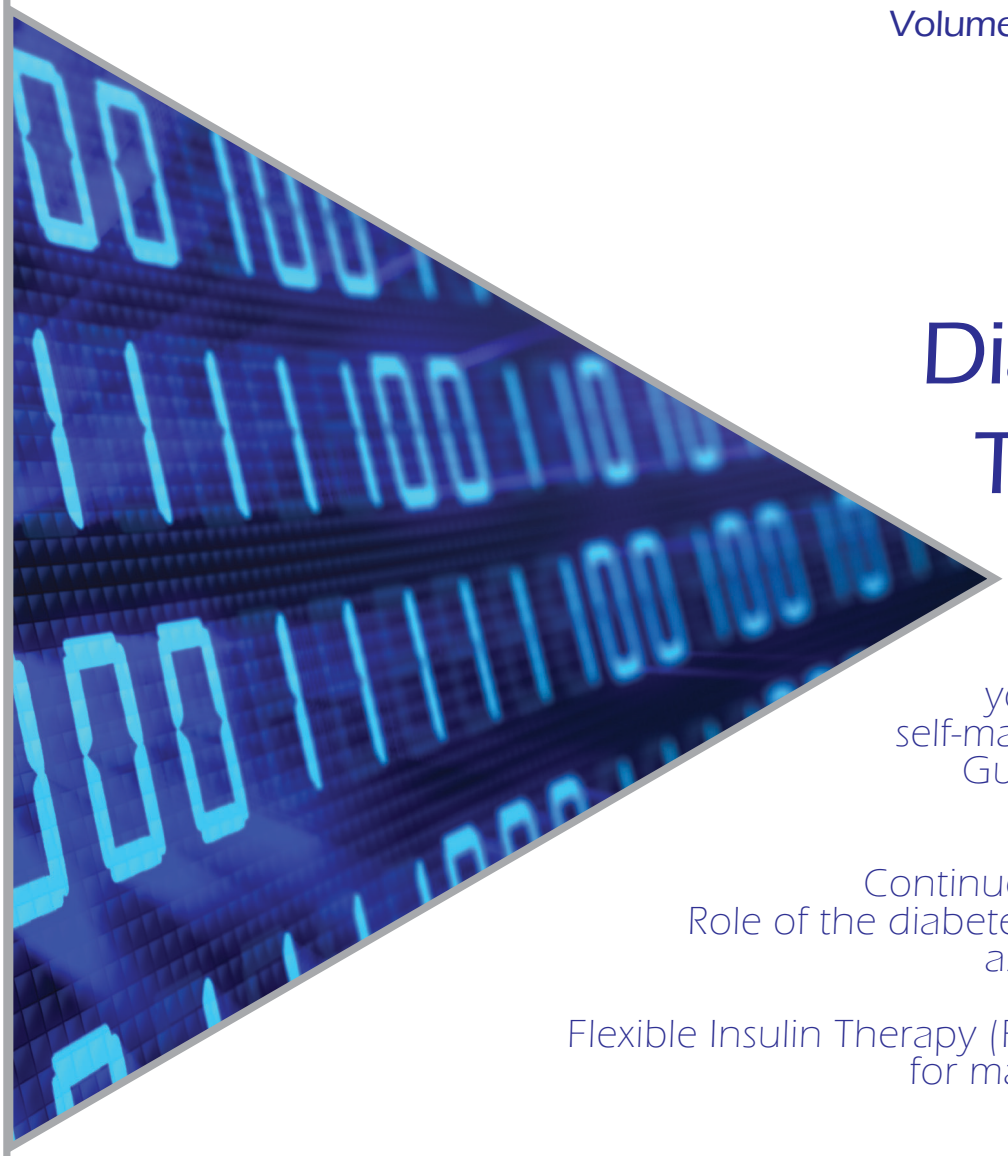

Diabetes and Technology

Feature article

Major changes in a young woman's diabetes self-management by using the Guided Self-Determination online program

Continuous Glucose Monitoring
Role of the diabetes educator in individual assessment and planning

Flexible Insulin Therapy (FlexIT) Training Program for managing type 1 diabetes

Original research

Sensor-augmented pump therapy in the management of type 1 diabetes: lived experiences of children, adolescents and parents

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Our sustaining members make an important contribution to our ongoing growth. Their financial support assists ADEA in pursuing its goal of achieving optimal health and wellbeing for all people affected by, and at risk of, diabetes, through education, advocacy, support and research.

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From the Editor

Dr Kate Marsh, BSc, MNutrDiet, PhD, Grad Cert Diab Edn & Mgt
Advanced Accredited Practising Dietitian & Credentialled Diabetes Educator

We hope you are enjoying the new online edition of the ADE. You can read it on any digital device and can also print, share and comment on articles as well as being able to browse or search for past articles. The PDF version (which you are currently reading) will continue to be available for those who prefer to read without being connected to the internet, but if you haven't already, we still encourage you to take a look at the online platform at https://ade.adea.com.au.

The theme for this edition is **Technology and Diabetes** and we have a great range of articles related to this topic including the use of Continuous Glucose Monitoring (CGM) and Sensor-Augmented Pump Therapy (SAP), and the benefits of the Ambulatory Glucose Profile for interpreting blood glucose data. We present an evaluation of The Baker Heart and Diabetes Institute's FlexIT program health professional training and a case study discussing the use of a Guided Self-Determination online program in a young woman with type 1 diabetes.

Other topics addressed in this edition include diabetes-related knowledge and attitudes of health professionals working in community based multidisciplinary teams, including Social Determinants of Health (SDOH) in the clinical management of diabetes, and diabetes and tuberculosis.

For those in private practice who would like to take advantage of technology for streamlining the administrative side of things in their business, Maida Learning discusses the benefits of Practice Management Software and what to look for if you are thinking of investing in this technology.

Finally, we have the return of our book review section, with this issue's review thanks to Michelle Robins. If you've come across any great books you would recommend to your colleagues or individuals with diabetes, please let us know, so we can add them to our list.

I'd like to take the opportunity to once again thank our hardworking EAG members – Michelle Robins, Penny Barker, Nicole Duggan and Anne Marks, for their help in bringing this edition together

I hope you enjoy reading the June ADE and welcome your feedback on this edition as well as the new online format.

Case study

Major changes in a young woman's diabetes self-management by using the Guided Self-Determination online program

Bodil Rasmussen, Professor, RN, Grad Dip NEdu, MEdSt, PhD
Judy Currey, Professor, RN, BN(Hons), GCertHEd, GCertSc(AppStats), PhD
Trisha Dunning, Professor, AM, RN, CDE, MEd, PhD
Vibeke Zoffmann, Associate Professor, RN, MPH, PhD

Introduction

In the era of technology, there is a dramatic increase in both online approaches to, and programs applied in, healthcare. Most young adults in Australia have access to computers, mobile phones and other electronic devices that allow connection to the internet. It follows that healthcare services for young adults with diabetes should also be available online.

Studies in young adults with type 1 diabetes have identified that psychosocial stress, adaptation and coping capacity can influence a person's self-management potential, and consequently, metabolic control, clinical outcomes and mental health.[1,2,3] Motivation to manage diabetes is substantially affected when people experience life changes such as moving out of home, starting university and entering the workforce.[4,5] Women in particular seem to be more susceptible to psychosocial distress and depression,[6] especially during life changes.[5]

Our study aimed to develop and pilot test an online interactive version of an evidence-based self-management program, Guided Self-Determination (GSD), developed by Zoffmann.[7] The GSD program has been shown to improve the life skills of young adults with diabetes.[2,8] Using mutual reflection, GSD is designed to guide clients with persistently suboptimal management, together with their diabetes educators. Young adults are prompted to reflect on their personal difficulties and experiences with diabetes educators through words and drawings on shared worksheets, which in turn enables the diabetes educator to discuss the issues and discover the individual's potential for change.[9] The worksheets were designed to prepare clients to actively participate in their self-care.[8] Participation in the GSD online program includes seven online conversation sessions between the individual with diabetes and a diabetes educator at mutually agreed convenient times over eight weeks. Some sessions lasted 20-30 minutes while other sessions, particularly those focusing on problem formulation and problem solving, took up to one hour.

The case study being presented describes the experience of one young woman and the changes she made to her diabetes self-management while participating in the GSD online program.

Details of person with diabetes

The person was a 24-year old woman who had had diabetes for 10 years. She attended regular appointments with and received feedback from her GP, endocrinologist, diabetes educator and dietitian. In addition, she intermittently consulted a psychologist for her high level of diabetes-related anxiety. Prior to participating in our study the woman's already high anxiety level increased due to multiple concurrent changes in her life. She had moved out of home to live with her boyfriend and moved from a regional setting to a city setting. In addition, she had just commenced studies at university and was working to support herself. The woman specifically highlighted her fear of overnight hypoglycaemia and sense of lack

of control over her diabetes management, and she no longer seemed to be able to find time to exercise or spend time with friends.

Education or management provided

The woman's feedback about participating in the GSD online program indicated she felt more empowered to make decisions because the GSD method helped her clarify her difficulties and learn to balance the competing commitments in her life. The reflective sheets and the conversations with her diabetes educator, which are central to the GSD program, helped her identify three key underlying issues that made her life stressful and empowered her to make changes.

a. Fear of overnight hypoglycaemia

When working through the reflection sheets and identifying the main stressors in her life, she was able to unpack each stressor and communicate with her diabetes educator to find solutions. Her fear of hypoglycaemia during sleep led her to consider using sensor-augmented pump therapy with low glucose suspend. Working through the GSD worksheets and reflecting on her emotions and actions together with the diabetes educator assisted her decision to try the pump. The diabetes educator encouraged her by providing the necessary evidence-based facts and supported her with short follow-up mobile phone texts. The young woman found that sensor-augmented pump therapy was not as difficult to manage as she anticipated. Importantly, it engendered a sense of safety that enabled her to sleep through the night without fearing hypoglycaemia.

b. Moving out of home to living with her boyfriend, starting university study and working to support herself financially

Moving away from her family and the local community was more difficult than she expected. The difficulties were related to losing her family support and having to learn to manage many life skills such as cooking at the same time she was learning to live with her boyfriend. During some deep reflective conversations with the diabetes educator and by writing notes about her emotions, she felt supported to make decisive changes. One GSD session was particularly dedicated to preparing her to tell her boyfriend about the decision to move back home. She finally decided and moved back home with the support of her boyfriend who understood and supported her decision. The move back to home also improved her financial situation, which enabled her to work fewer hours, and both changes reduced her anxiety level.

c. A strong sense of lacking of control of her diabetes management as well as life balance

The young woman also identified that her life was out of balance because she spent a lot of time travelling to and from her boyfriend's home to the university, as well as spending many hours every day studying. Consequently, she was unable to undertake her normal exercise and socialise with friends, both aspects she enjoyed and that helped her to manage her diabetes and anxiety. The GSD method empowered her to decide to talk to her lecturer at university to develop an individual learning plan that accommodated her various needs and enhanced her self-care and diabetes-life balance.

Key learnings

Evidence of effectiveness of the GSD program is reported in the literature. This article showcases the experience of one research participant, a young adult with diabetes. Her experience shows the GSD online program can help people:

1. Appropriately change their diabetes self-management to feel safe
2. Feel empowered to make decisions
3. Achieve balance in their lives.

Discussion

The woman's experience is representative of other young adults with diabetes who participated in the GSD online program. General outcomes of the study were positive and include the following:

- The GSD online program saved time because the online setting was flexible and available when needed. The convenience of the online 24/7 availability of the program was evident by the fact that many participants, including the woman in the case study, accessed the program numerous times, often overnight. Technology can supplement current care by providing educational and motivational support[9]. A national survey of Australians aged 15 years and older showed 98% of

respondents had internet access and 52% of those with internet access used the internet daily[9].

- The flexibility of the GSD online program meant clients could form a professional relationships with the diabetes educator faster than they would in conventional in-person diabetes consultation because the online conversation went 'straight to the point' and both parties were prepared to discuss relevant issues when they met.
- The GSD online program helped the clients to improve their problem solving skills because the reflections assisted them in identifying their problems which in turn helped them to find solutions to these problems/issues.
- The GSD online program enabled young adults to engage more effectively and efficiently with diabetes educators and vice versa.

Our case study provides evidence that young adults with diabetes were able to engage effectively with the diabetes educator as they worked in partnership, in an agreed way of communicating, to achieve outcomes that the clients had set. The roles shifted away from the diabetes educator being the 'expert' to the client being the expert in their own diabetes, which aligns with person-centred care.

There were no direct negative outcomes found in our study. However, feedback from the participants identified certain technological limitations which has been used to design a new GSD platform.

Conclusions

The online version of GSD was highly effective for the young woman in our case study, who found it to be a suitable and convenient way to communicate and engage with her diabetes educator. All participants in our study found the online communication expedient, flexible and particularly suitable for those who had lost motivation. These factors are important for diabetes educators to consider because young people often have many challenging, competing commitments in their lives. Access to psychological services can also be difficult and costly. The GSD program provides diabetes educators with a tool that empowers people to better self-manage diabetes when they are unable to access these services. More traditional education services might consider incorporating online facilities into their services to accommodate the needs of this group of clients. The GSD online method is an example of how online engagement can empower young adults with diabetes to manage their life and diabetes more effectively.

Acknowledgments

The team acknowledges the young adults and diabetes educators who participated in the study and the Centre for Patient Safety and Quality Research (QPS) at Deakin University for funding this study. We thank Dr Van Nguyen who assisted with the preparation of this article.

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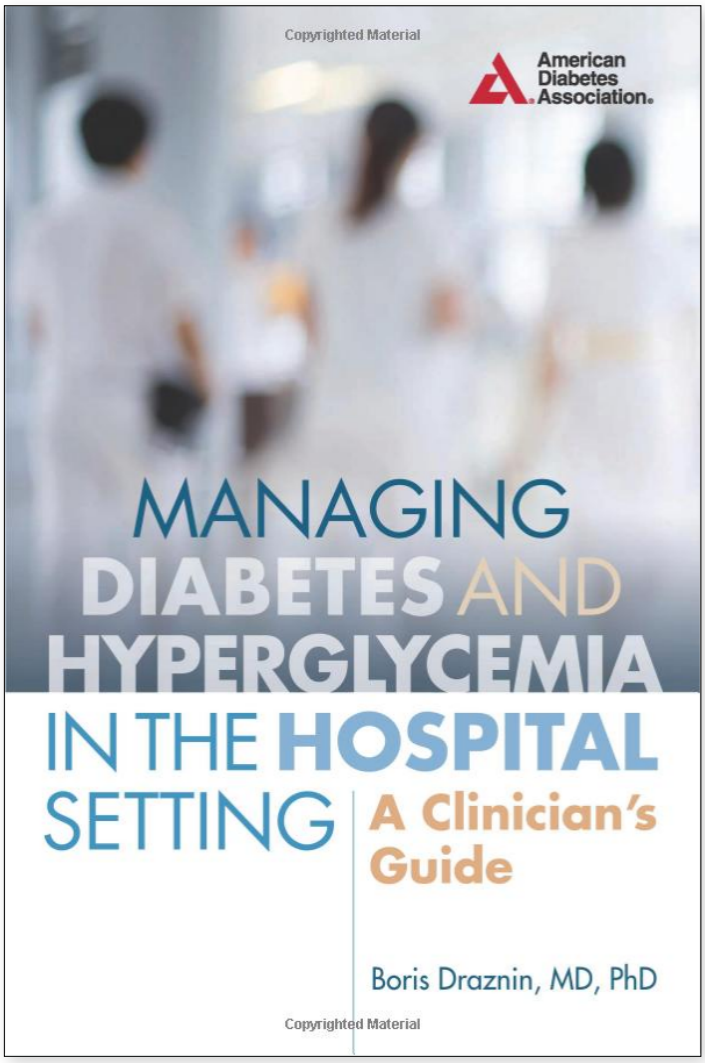
Book Review

Managing Diabetes and Hyperglycemia in the Hospital Setting: A Clinician's Guide

Author: Boris Draznin, MD, PhD
Reviewer: Michelle Robins, Nurse Practitioner Diabetes, CDE
Published by American Diabetes Association, Virginia, 2016.

Don't let the title fool you - this book doesn't simply address hyperglycaemic emergencies and insulin infusions. With nearly sixty contributors (including our own Kellie Rodriguez – CDE previously from Melbourne Health now working in Texas), this publication is a 'go to' reference for many aspects of diabetes inpatient care for all healthcare professionals. Written without the jargon, the authors instead focus on many of the nuances that are not always evident with typical inpatient policies and clinical pathways. For example, an entire chapter is devoted to insulin errors including systemic causes (our culture of safety, education), how we monitor glucose and prescribing/transcribing/dispensing/administration errors, along with three pages of recommendations to reduce such errors.



Topic chapters that you might expect including managing fasting, parenteral and enteral nutrition, steroid-induced hyperglycaemia, transition from intravenous to subcutaneous insulin, and pre and post-operative care. However there are also chapters addressing overlooked and emerging areas of care such as bariatric surgery, gastroparesis, inpatient continuous glucose monitoring, Cystic Fibrosis-related diabetes and post pancreatectomy management.

Concentrated insulins (U-200, U-300 and U-500 formulations) are now available and direction is provided on how to maintain continued use of U-500 insulin and changing an inpatient from U-500 to NPH insulin or basal bolus therapy. The advantages and disadvantages of inpatients using insulin pump therapy is articulated including the roles and responsibilities of the individual with diabetes, diabetes team, non-endocrine inpatient unit, assigned registered nurse and health service. There is also a chapter devoted to insulin management in renal failure including a series of clinical recommendations and an overview of the different issues seen in peritoneal compared to haemodialysis.

Of all the diabetes textbooks currently sitting on my shelf, I can count on one hand the number I have read from cover to cover - this is one of those books.

Feature article

Including social determinants of health in the clinical management of diabetes

Amanda Frier, APD and PhD candidate at James Cook University, BHSc N&D, BAppSc HMS, Grad Cert DE, MPH/MBA, Grad Cert Res Meth.
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Introduction

Diabetes educators improve the lives and futures of people with diabetes by helping them improve their glycaemic management. Along with other approaches, behaviour change around smoking, nutrition, alcohol and physical activity are central to this improvement. However despite passionate educator intent, and desperate client willingness, sometimes changes are not possible because of the environment the client lives, and has grown up in. These influences on diabetes self-management can be described as 'Social Determinants of Health (SDoH)'. Addressing SDoH, even in a clinical setting, may lead to improved glycaemic management, and increased choice and control over life for people with diabetes.[1]

What is already known?

It is known that people with poorer social and economic circumstances have worse health outcomes than their more affluent counterparts. More specifically the development of diabetes and suboptimal management is more likely amongst individuals with poor SDoH.[2] Socio-economic status (SES) is synonymous with SDoH, however SDoH connect the social and economic contributors to SES with health outcomes. Specifically, SDoH include early childhood development, education, employment, food security, housing, transport, economic status, social support and healthcare access. As the quality of people's SDoH decline so does their health status. Unfavourable SDoH and the resultant social inequities lead to premature mortality, higher morbidity, poor quality of life and suboptimal health-related choices.[2] Conversely, if a person is born into an affluent society with quality education, positive life circumstances, opportunity and healthcare access, they are more likely to be in good health.[3,4]

The prevalence of diabetes in Australia has tripled since 1990[5] with 1.7 million Australians now living with diabetes.[6] Of this population, diabetes is far more common among those at socio-economic disadvantage,[5] and people of lower SES are less likely to partake in the self-management behaviours necessary for improved glycaemic management.[7] Logical inference therefore suggests that understanding this health inequity, and working within the SDoH of individuals with diabetes may be a further step in optimising diabetes management and quality of life for this population.

Why include the social determinants of health?

The solution to working within this social disparity is not an easy one. While addressing non-medical issues is not the typical focus in a clinical setting, the relationship between poor SDoH and a person's ability to better manage their diabetes is undeniable. High-level policy changes and upstream approaches to sustainably address the SDoH have gained traction and momentum. Nonetheless, while this essential work is under way, people are still living in circumstances that are not conducive to a healthful life, free of chronic disease.

The 'National Diabetes Strategy'[8] articulates seven goals designed to influence the practice of all health professionals working in diabetes care:

"**Goal 1**: Prevent people developing type 2 diabetes

Goal 2: Promote awareness and earlier detection of type 1 and type 2 diabetes

Goal 3: Reduce the occurrence of diabetes-related complications and improve quality of life among people with diabetes

Goal 4: Reduce the impact of pre-existing and gestational diabetes in pregnancy

Goal 5: Reduce the impact of diabetes among Aboriginal and Torres Strait Islander peoples

Goal 6: Reduce the impact of diabetes among other priority groups

Goal 7: Strengthen prevention and care through research, evidence and data"

Goal one specifically focuses on preventing type 2 diabetes (T2DM). Although it is clearly identified that diabetes awareness, health behaviours and choice are integral for T2DM prevention,[9] the causative link between the higher incidence and prevalence of diabetes in lower SES populations requires further consideration.[5, 10] The convolution of early life experience, income, education, housing, living environments, access to nutritious food and health care influence health-related choices and behaviours.[4] Alarmingly SDoH also have a biological impact on health. For example a child of parents with poor SDoH is more likely to develop chronic conditions as an adult.[11] Consequently, the powerful influence of SDoH is fundamental in the 'Centres for Disease Control and Prevention' (CDC) diabetes prevention programs.[9]

Though not explicit, goals five and six indirectly allude to the impact of SDoH on diabetes. Broadening interpretation to overtly include SDoH, in an Australian context, will add to a worldwide evidence expansion demonstrating the correlation between SDoH and diabetes self-care and management.[10,12-16] Furthermore assimilating SDoH into clinical management will enable SDoH to span the diabetes care continuum. This could then improve health outcomes for people with diabetes.[1]

Goal seven's call for prevention and care through research, evidence and data, combined with the indivisible connection between SDoH and diabetes, innately requests advancement in this area. Currently in Australia, SDoH research and action is necessarily conducted at policy and upstream levels. The additional incorporation of SDoH at a clinical level could further strengthen current approaches to diabetes prevention and care.

The remaining goals of the 'National Diabetes Strategy' also have an association with SDoH. The direct link between people's social and economic circumstances, quality of life and health outcomes (including diabetes)[2] infers plausibility that addressing SDoH, in a clinical setting, may provide a progressive and valuable contribution to all seven goals either directly or indirectly.

How to include the social determinants of health?

Though the connection between SDoH and diabetes has been identified, to date there has been minimal emphasis or resources applied to specifically identifying and addressing SDoH on individual and clinical levels. Targeted integration and collaboration between health professionals, health services and community supports that acknowledge and focus on individual social needs are required to address SDoH on a clinical level.[1, 2] Furthermore, a deeper understanding of how an individual's SDoH affect their ability to self-manage their diabetes is required. Once these are identified and explored, action can then be taken towards improving them. Validated questionnaires to assess the SDoH of clients with T2DM in clinical settings have been trialled by American researchers. Assessments include education level, employment, income, living and housing situations, expenditure capacity, safety, stress, substance use and access to, and use of social support.[1, 17] SDoH assessments were completed in parallel with usual clinical outcome measures. The specific assessment and documentation of clients' social needs allowed meaningful approaches for addressing SDoH to be incorporated into client care.[1,17]

Utilisation of community health workers, and collaboration with social support services within the community were recommended as the basis for assessing and addressing the SDoH of clients.[1, 17, 18] The associated positive health outcomes, enhanced client care and feasibility of this approach have led to the inclusion of SDoH into T2DM quality improvement projects.[1] In addition to social support referral and collaboration, advocacy and partnerships are imperative to comprehensively address SDoH.[19] The inclusion of SDoH into clinical settings contributes to proactive influence at client, practice,

community and population levels.[10, 14, 19] It also implies merit for including SDoH in Australian clinical settings.

Understanding and addressing non-medical barriers to self-management is an important part of a providing holistic, person-centred and team based diabetes care. However, extending this role to include a broader focus on SDoH is fundamental if vulnerable populations are to move towards achieving improved diabetes management and overall health outcomes. Of course the necessary population-based strategies must continue, however an extension of these strategies would value add to the overall approach to addressing the strong relationship between SDoH and diabetes. Furthermore to ensure efficacy in an Australian context, locally based research is required to develop strategies that accommodate the diverse range of populations and communities across the continent, and the equally diverse SDoH they experience.

This approach is not intended to create additional work for diabetes educators and other clinical staff. Instead the emphasis should be on enhancing their effectiveness and quality of care provided to people with diabetes. Consequently research into the most beneficial approach and strategies for incorporating these non-medical aspects into diabetes management, in a clinical setting, and in an Australian context is required. Assessment of an individual's SDoH, documentation, health literacy, staffing requirements and intervention and referral approaches are conceivable themes for initial investigation.[1, 17,19, 20] Following that, evaluation of the effectiveness on both health outcomes and cost is necessary.[8] Finally, flow-on effects that improve quality of life and overall well-being also deserve exploration.[1]

Conclusion

In Australia we are fortunate to have choice and control over our life. This however is not equally true for all of the population. People at greater socio-economic disadvantage suffer the consequences of higher morbidity and mortality from all chronic diseases, including diabetes.[2] Health professionals working within diabetes care are in the advantageous position to contribute to health equity. Broadening the focus of diabetes services, to include SDoH on a clinical level, could augment current contributions towards this. A desire for improved self-management and enriched lives for their clients is a probable motivator for all health professionals working with people who have diabetes. Indirectly this then becomes a plea for action towards incorporating SDoH into diabetes management in clinical settings.

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Which practice software program is best for me?

Amy Geach, B.App.Sc(OT) MAHTA, MClinSc(Hand & Upper Limb Therapy), Occupational Therapist
Director, Maida Learning, Riverina Hand Therapy, Riverina Kids Therapy

Introduction

Which software program is best for me? This is a common question that I am asked by many allied health professionals, and the honest answer is there is not one that is best for all. We are starting to see the development of great software for allied health professionals and the wonderful thing about this is that software programs are easily accessible, affordable and easy to navigate – many "pluses" for busy people!

Why consider using a software program?

Sometimes people will ask me if they should invest in a software program to manage their client billing, consults and correspondence, or just continue to use paper files, or Word documents. The latter may seem easier than launching a new software program, but there are many benefits to having a program with some intuitive features. One of the biggest benefits to implementing a practice software program that it provides efficiency. This is a must. Times are busy. We are busy. Clients are busy. Creating efficiencies in various places in our practices can save time and ultimately save money. It can also enhance the experience for the client. They want to know the practice they are using is organised, on time, and that their information is secure. One of my favourite things about my practice software is that it allows me the ability to gather statistics very easily and quickly which saves me a large amount of time. I can look up things like how many clients came in during a particular week, how many new clients I see compared to follow-up appointments, where the majority of income occurs (which consults are most profitable), how many people did not attend their appointments, how many people I see each year on a Chronic Disease Management plan (or other funded programs), and which doctors have referred to me lately.

Considerations before you dive in!

Different learning styles and your team

Before you launch into a software program, there are some things that you need to consider. Firstly, everyone learns differently. Some of us are visual learners and like to see things to understand them Others are auditory learners, and find visuals distracting when learning. Some of us like to have a go at tasks ourselves because we learn better that way. This concept applies when we are learning about how to use any new technology in our practice.

If you have a team, make sure that each of your team members learns how to utilise the features of the software program well. It may be too optimistic to show them a written manual and expect there to be instant magic! Training may need to also happen face to face, using images, step by step guides, or checklists. Planning the training needs of your staff is a good starting point.

Your investment of time

Secondly, no matter which platform you intend on using, you will need to dedicate time to setting it up. This does take time. You will need to 'tell' your software what item codes you use to bill your clients, what your provider number is, what the names of your consultations are (e.g. long, short, complex), and you will need to design your letterhead to use on

invoices and letters/reports. This can take longer than you think depending on the software program that you choose. It is worth asking your software provider whether they will help you with your initial set-up. Remember to make sure then it is set up the way you want. Does the letterhead look good from a branding point of view? It is important when we consider introducing any new platform or tool into our practice that it matches the branding we are striving for.

What does your practice need?

Thirdly, you need to consider your practice – what do you need from a software program? Don't just get a particular one because you were talking to another practitioner at an event, or a workshop and that is what they use! What do you want it to do for you? How do you want it to create efficiency in your practice? Does letter writing hold you back currently? If so a program with a great letter writing capacity will be very helpful. Do you write lengthy reports that need particular formatting? In this case a program that allows you to customise a report writing template would be very helpful. Do you have different sites you work from, or are a travelling practitioner on the road a lot? Then a program that has an app for easy log in on the go is most likely helpful. Finding the right software program for your practice takes a little bit of research. Grab your diary, and add in some time for you to research the programs on the market and to find which ones have the features that match your requirements.

How will the great migration occur?

The fourth thing to think about is how you might get your existing client information into the new software program, if that is what you prefer to do. This would mean all your information is in one place going forward. It can help things to be efficient when finding client information. If you are moving from a paper based system to an electronic software program, you need to think about whether you want to just archive the paper files you have created somewhere accessible and secure, so you can access them if you need them. The other option would be to scan the files and add them to your new software program, so they become part of the one system. This second option is a great choice if you think it is likely you will need to access the information from the paper files on a regular basis. If not, and you will most likely rarely need to look at it, it might not be worth the time and effort to scan them all in. When it comes to scanning files into a new program, consider who will do this? Does that person have time to do that task? Trial a couple of files first and see how long it takes. Can this be outsourced to a reputable and trustworthy person who can do this for you? If you are moving from one electronic software program to another, then again you need to decide if you will merge the files from the old program across to the new. Most programs will allow you to do this manually, or you may choose to ask the new program developers if they can transfer the files across. Sounds simple? Yes and no. If will depend on which program you are transferring from. Each program has its own way of storing your consult notes, letters and scanned documents and they might not be compatible with the next program you choose to use. In these cases, the new program developers might need to write additional code to transfer your files across. If you are switching from one electronic software program to another, then it is well worth asking if they have converted files before and what the process and costs are for this.

Top tips

1. **Trial first:** One of the best things you can do is contact the software suppliers that you think are going to match your needs well, and ask them for a trial version of the software. You can then look at it and see how it runs, if you like how it appears, and how easy the functions are to use. The trial versions are often free, and most run for 30 days. They do not have your client information on there, so they are secure. What they offer is an area to 'play' on so you get used to the program.

2. **Gather opinion:** I have already mentioned not launching into a software program just because someone else does. This is important. However, do not ignore the thoughts of others who might have similar practices to you or a similar client base. It is well worth asking other practices which program they use, what do they like about it, and what don't they like about it.

3. **Ask questions!:** Sometimes you don't know what you don't know! I have been there before. I never knew what to ask my first software program supplier as I had never been in that position before. From memory I think I just asked what it cost and was it suitable for occupational therapists! When you are starting to look at different software programs and compare, some questions to be asking yourself or the supplier include the following:

   - Can it be mobile (available on a tablet), if that suits you? Is this an additional cost?

- How is the data backed up and protected? What happens with cloud based data if it gets hacked? What happens with cloud based data if the internet goes down? Will your information still be there?
- Where the data is stored if in the cloud? (under the privacy principles, if outside Australia you need to let your clients know about this). Always check which country so you can notify your clients in their consent forms and record this in your privacy policy.
- Are there access restrictions for different staff members? Do you want your junior staff members having access to the practice statistics, or being able to delete information from your system? Most programs will allow you to set up different access levels for staff. Some programs have this as being highly customisable, and others just have 1-2 options.
- Are you paying for features you don't need? (this can often happen in programs that are not designed with allied health in mind). If you choose a program that is designed for surgeons, you might find that you are paying for features such as theatre booking abilities, script writing functions, and pre-entered Medicare codes for surgeries.
- Can you customise forms and letter templates to suit your practice? Will they be customised in a way that matches your brand?
- Does it send out SMS (text message) reminders to clients? How much do these cost in addition to the software?
- Will it cope with an expanding practice? If you add more practitioners, will the cost increase? Can it manage if you decided to open another practice site?
- Is it compatible with the National Disability Insurance Scheme (NDIS), Medicare, the Department of Veterans' Affairs (DVA), or other funding bodies that are applicable to your practice?
- Does it link with your accounting software program? (for example: Xero, or MYOB). Most practice software programs are designed to store information about your clients, including referral letters, consult notes, billing information, and other correspondence. It allows you to bill clients, or third parties for your services. Most of them do not track
your expenses, for example how much petrol you purchased this month, or room rental, or electricity, or phone bills. These will be recorded in your accounting program. Most practice software programs also do not include functions for payroll. These again, are managed in your accounting software program.
- If you are transferring from another software company, can they upload that data, and what will it cost? How long will it take?
- If you decide to leave one day, how can you take your data with you and what will that cost?
- What is the cost? Is it an annual fee, or is there a monthly fee? How can it be paid (credit card, direct debit or pay on invoice)?
- What support and training is available? Can someone come to your practice and help set up, or is help available on the phone? Can you call all day every day if you run into problems, or do you only get a certain amount of phone calls to the support team that you can make a year. What hours is support available - only during business hours or also evenings and weekends (if you work at these times?).
- Does it have functions to book clients into 'groups' if you run any group programs or classes?

Conclusion

After all this, its important to remember that there is not one perfect software platform! If there was, we would all be on the same one! The thing you need to work out is which one is best for your needs now, and in the future. Try to think about where your practice might be headed and where you see yourself in 3, 5, 10 years' time. This can help you work out which features might be best for you. The great thing about this space is that there are many developers constantly working on updating and improving their platform, so they are getting more efficient, more intuitive, and easier to use.

To help you decide and work through the above list, I have started the process off for you with a comparison table of common allied health practice software programs!

Go to maidalearning.com.au/component/content/article?id=59 to access the comparison table and good luck in your quest for the right program.

Continuous Glucose Monitoring

Role of the diabetes educator in individual assessment and planning

Jennifer Nicholas, CDE NP
Carol Cole, CDE

Continuous glucose monitoring (CGM) systems are advancing rapidly; including the advent of a hybrid automated insulin delivery system approved for use in the United States. There is evidence that CGM has the potential to offer benefits for managing glycaemic excursions and reducing severe hypoglycaemia.[1-6] There also appears to be an association between consistency in use of CGM and level of satisfaction.[7]

Yet for many people with type 1 diabetes (T1DM), the cost of this technology and other barriers exist. Recently, CGM technology has become subsidised through NDSS for people with T1DM up to the age of 21 years, who meet certain eligibility criteria. It is hoped that this will eventually be extended to be equally accessible to all people with T1DM and perhaps other patient populations where the evidence supports this. The American Association of Clinical Endocrinologists has advocated for expanded use of CGM technology to all patient populations with proven benefits.[8]

There are various CGM resources available and still emerging, to guide the use and interpretation of CGM. The literature on diabetes management generally and related to CGM is vast, with the internet and social media further creating a wealth of information and many personal anecdotes.

Diabetes educators have a pivotal role in counselling people to navigate the options available to them in order to meet their individual diabetes management goals and expectations, and then design education in a way that is meaningful and personalised to meet individual requirements and expectations. While many of the fundamental principles of teaching the use of CGM will remain the same, the manner of teaching, level of detail and rate of teaching and clinical follow up, should be individualised. Based on the combined experience of the authors from carrying out clinical trials and within their own clinical practice, the following points are offered for consideration, when assessing the individual with diabetes and planning diabetes education:

- The person with diabetes and their diabetes team should be informed about all of the possible options available for CGM.
- Engage the diabetes multidisciplinary team in order to optimise the experience of the person with diabetes and to cultivate knowledge of how to interpret and act on CGM information, including:
  - » dietitian
  - » exercise physiologist
  - » endocrinologist
  - » social worker
  - » school teacher and assistant
  - » psychologist
  - » general practitioner
- Scaffold knowledge and skills from basic to advanced interpretation and use of glucose trend information, at a pace suitable to the individual or caregivers
- Recognise changing personal circumstances e.g. developmental changes in young people and transitions from child to adolescent, to emerging adult independence
- Knowledge and skills may need revisiting over time.

Tips for planning your CGM education sessions

Timing
» Where is the individual currently, in their experience living with T1DM?
» Is T1DM a recent diagnosis?
» If a child or adolescent, what level of involvement do the parents/caregivers have?
» Is there a change to insulin regimen planned?
» Is the individual using an insulin pump, planning to start, or interested in the options available for sensor augmented pump therapy?
» Is the driving influence the parents or carer of a young child or adolescent and is this influenced by situations such as attending school, camps or travelling?
» Is there parental fear of hypoglycaemia, particularly overnight?
» Is the individual looking to use CGM to optimise glycaemic control for pregnancy or planning pregnancy?
Tailor to the individual as required
» Consider age and developmental stage
» Assess the individual's preferred learning style
» Consider literacy and numeracy skills
» Consider language and culture
» Consider family, caregivers or other supporting people
Resources
» Consider the available supporting evidence for CGM use and indications
» Source teaching tools and expert opinion from members of your team including your medical specialist, dietitian, psychologist and exercise physiologist
Setting expectations
» Determine whether the uptake of CGM is client, care-giver or clinician driven
» Consider the commitment to troubleshooting, adjustment and fine-tuning of settings and review of data and trends
» Consider the benefits and drawbacks of adding in CGM technology to current regimen
» Discuss expectations around personal interaction e.g. fingerstick glucose checks, mealtime insulin, managing sick days, school plans
» Discuss strategies around proactive and reactive responses to CGM information
Discuss potential challenges
» Information overwhelm
» Nuisance' alerts and noises that may result in an individual not fully utilising the potential of the system
» Trusting the CGM or components of the function
» Wearing an external device (may be an extra added one) and site rotations
» Skin sensitivity
» Body image
» Cost if not eligible for subsidies
Individual goal setting
Discuss and prioritise desired outcomes. Discuss scenarios to assist with identifying areas for change or problems that need to be solved:
» Validate adjustments to insulin amount or timing of delivery
» Effects of food on blood glucose (quantity and composition)
» Reduce hypoglycaemia
» Reduce hyperglycaemia
» Exercise or participation in competitive sports
» Managing stressful times e.g. exams, illness
» Driving
» Impaired awareness of hypoglycaemia (IAH)

Formulate a plan of action, document it and identify a timeframe and purpose for clinical and educational follow up
» Consider a basic system setup initially, to allow the individual to become familiar with seeing glucose variability and begin to identify trends and patterns
» Build on knowledge and skills over time, adding in other functions where available
» Provide education around safely and proactively responding to sensor trend information and alerts such as adjusting timing or amount of insulin
» Determine whether reviewing glycaemic trends retrospectively from uploaded data or making management decisions in real-time may be more appropriate to determine some adjustments, such as overnight trends or responses to physical activity (duration, intensity and delayed effects on blood glucose levels)
» Define and prioritise desired outcomes for diabetes management
» Outline responsibilities; individual, parent, teachers and clinical team
Measure outcomes – successes and alterations
» Interpretation of trends, graphs and uploaded information – what to view and how to interpret the best information for the desired outcome
» Quality of life and degree of added or lifted burden
» Worry or fears
» Family, lifestyle and work

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NDSS Updates

national diabetes services scheme

diabetes australia

There have recently been some product changes to the NDSS.

Product Changes		
New Products		
Code	**Name**	**Pack Size**
310	Lifesmart Glucose Test Strips	Pack of 100
312	Lifesmart 2 Twoplus Glucose Test Strips	Pack of 100
900	Dexcom G4 PLATINUM Transmitter	Pack of1
905	Dexcom G5 Mobile Transmitter	Pack of 1
910	Dexcom G4/G5 PLATINUM Sensor	Pack of 4
915	Guardian 2 Link Transmitter	Pack of 1
920	MiniLink Transmitter	Pack of 1
925	Guardian Connect Transmitter	Pack of 1
930	Enlite Sensor	Pack of 5
Deleted Products		
Code	**Name**	**Pack Size**
185	2in1 Smart Glucose Test Strips	Pack of 50

Access to continuous glucose monitoring products through the NDSS

The Australian Government is now providing access to fully subsidised continuous glucose monitoring (CGM) products through the NDSS.

Subsidised access to these products is open to children and young people aged under 21 years, living with type 1 diabetes, who face significant challenges in managing their blood glucose levels.

Providing access to subsidised CGM products may assist families, children and young people to better manage their diabetes, which may reduce stress, anxiety and unscheduled visits to the hospital.

To access CGM sensors and transmitters through the NDSS, the child or young person will need to be assessed by an authorised health professional to determine whether they meet specific criteria and to ensure that the use of CGM will help as part of their diabetes management.

Credentialled Diabetes Educators are authorised to certify CGM eligibility forms for access through the NDSS. For more information on the initiative, and for a copy of the form and eligibility criteria, go to www.ndss.com.au/cgm

Steven Brett

Steven joined the ADEA board in 2012 as an independent director, bringing his commercial knowledge and business skills in sales, marketing and customer service. He is passionate about improving customer outcomes through alignment with strategic business goals and also works with business owners, CEOs and executive leadership teams in their personal leadership development.

In this edition we talk to him about his role and what sparked his interest and involvement in ADEA.

What is your role as the Independent Director?

Predominantly, my contribution to the Board has been improving board effectiveness. ADEA has almost completely changed in the last five years with new management and staff, constitutional change, new board structure and personnel as well as a renewed strategic planning cycle and better governance and risk controls. I have served on many subcommittees over the years and presently serve on the Board Nominations Committee, tasked with attracting and securing new board members; the Board of the ADEA Diabetes Research Foundation (ADRF) and have been instrumental in its establishment; and the Executive Review Taskforce. I am also providing ongoing assistance to the board in strategy skills development.

What is your vision for ADEA during your term as a board member?

In my remaining time on the Board, I am continuing to push for the items that members value the greatest, the most important to me being Health Insurer recognition of CDEs. This will raise the value and profile of the CDE in the health community and provide tangible benefits to our members. I am also passionate about improving the lives of people living with diabetes and for this reason I serve as director of the ADRF. My goal is to make this a sustainable foundation.

What do you do in your professional life outside your role on the board?

I am a Customer Experience Executive, Entrepreneur and Business Management Consultant, blogger on leadership and productivity, fellow, assessor and contributor to the Customer Service Institute of Australia and fellow of the Australian Institute of Management. I have extensive experience in business management gained in property, health, financial services, construction, software and other service businesses, both large and small, over the past 22 years. I offer sales and marketing, operational management and customer experience strategy through my consulting firm, Manage Smart.

What sparked your interest in joining the ADEA board?

My daughter's diagnosis with T1DM at age 6 rocked our family to the core and whilst we struggled to survive in that ocean of pain, loss, and bewilderment, the diabetes educator stood alone as an island of understanding and we clung to that. Making the unbearable achievable, they let us mourn the loss of our normal life and helped us discover a new normal, showing us a way we could not only survive but thrive. Three years later, I was diagnosed with T1DM as well and it was the knowledge we learned from our daughter's CDE that held us on course. My daughter is now at university and we have both been pumping insulin for over a decade. I will never be able to repay the debt I owe CDEs, but perhaps assisting the association will go some way toward it.

What is something new in diabetes education that is taking your interest at the moment?

I am always interested in new technology that is being used to both improve the lifestyle of people with diabetes and also seek a cure. The CGM technology is getting better every year and the closed loop is quickly becoming a reality for people needing insulin. There is so much misinformation about diabetes and its causes so I am interested in anything that cuts through that and paints the real picture for the benefit of all.

Your favourite quote?

We are what we repeatedly do. Excellence, then, is not an act but a habit.
– Aristotle (384-322 BC)

Feature article

Flexible Insulin Therapy (FlexIT) training program for managing type 1 diabetes

Marisa Nastasi, BND, Grad Dip (Human Nut.), BSc., (APD), Accredited Practising Dietitian, The Baker Heart and Diabetes Institute

Introduction

The Baker Heart and Diabetes Institute includes a specialist Education Service which is one of the largest diabetes services in Australia providing individual consultations, client group education and health professional training programs. Type 1 diabetes is a significant focus, representing approximately 25% of clients seen.

The Flexible Insulin Therapy (FlexIT) Program was developed by the education services department for people with type 1 diabetes (T1DM) on a basal-bolus regimen beyond the honeymoon period. Participants who complete this program have been found to have an enhanced:

- Understanding of insulin action
- Awareness of diabetes health targets, complication screening and self-management strategies such as frequent health checks
- Ability to identify carbohydrate in food and beverages and count carbohydrate in grams
- Knowledge of how to manage hypoglycaemia
- Principles of insulin adjustment and corrections
- Knowledge of how to manage sick days and hyperglycaemia
- Understanding of how to manage carbohydrates and insulin for physical activity
- Improved confidence on how to manage the effects of alcohol on blood glucose levels (BGLs)
- Awareness of the new technologies available to help manage T1DM

In 2016, the education service commenced training health professionals on teaching these concepts to their clients in the format of a two to three-day training program.

The rationale for a health professional FlexIT training program

From 2000 to 2013 there were 31,895 new cases of T1DM in Australia, with 2,323 diagnosed in 2013.[1] The rate of T1DM is increasing and currently accounts for ten percent (10%) of all diabetes.[2] This illustrates the growing demand for specialised support for people with T1DM.

In Australia, health professional and client training opportunities for managing T1DM and insulin self-adjustment are limited.[3] The FlexIT program provides a less time intensive training program for those with restrictive schedules. It offers a novel approach to flexible insulin adjustment therapy delivered by experienced facilitators (health professionals) who draw on their knowledge gained from one to one consultations and group FlexIT delivery. Carbohydrates are counted in grams where insulin is matched to the gram, which allows for more flexibility for the client.

The Baker Heart and Diabetes Institute has traditionally facilitated health professional training programs such as carbohydrate counting. The need for more information on managing T1DM was a common theme amongst the feedback from health professionals attending these programs. A preference

for providing a formal model of training, that reflects our current clinical care at the Baker Heart and Diabetes Institute, has led to the launch in 2016 of the FlexIT health professional training program.

The two-day FlexIT program explores a range of topics with the expectation that health professionals build competency before educating their clients on the following:

- The need to know basics such as *what is diabetes?*
- Insulin profiles
- Basal insulin testing and adjustment
- FlexIT insulin ratio calculation and adjustment
- Hypoglycaemia
- Hyperglycaemia and sick day management
- Carbohydrate counting
- Managing physical activity and alcohol

The optional three-day FlexIT program grants permission for health professionals to run the FlexIT client group program in their facility. Upon completion of the three day program, attendees must undergo a mandatory online assessment and must achieve an 80% pass rate to become accredited. Accredited FlexIT providers must undertake an annual ongoing assessment and payment to maintain this status.

Evaluation of the health professional FlexIT training program

Health professionals who attend the health professional FlexIT training program are encouraged to undertake an evaluation of their learning experience after the completion of the two-day program. Of the 52 participants who attended the two-day FlexIT training program in 2016-2017, twenty-eight percent (28%) rated their confidence in teaching insulin adjustment principles as level 4 or 5 pre-program (5= extremely confident).[4] By the end of the program eighty-four percent (84%) of participants rated their confidence as 4 or 5. The majority (93%) of participants rated the quality of their learning experience as a 4 or 5 (5= excellent) and felt their learning goals were achieved during the program (*Figure 1*).[4]

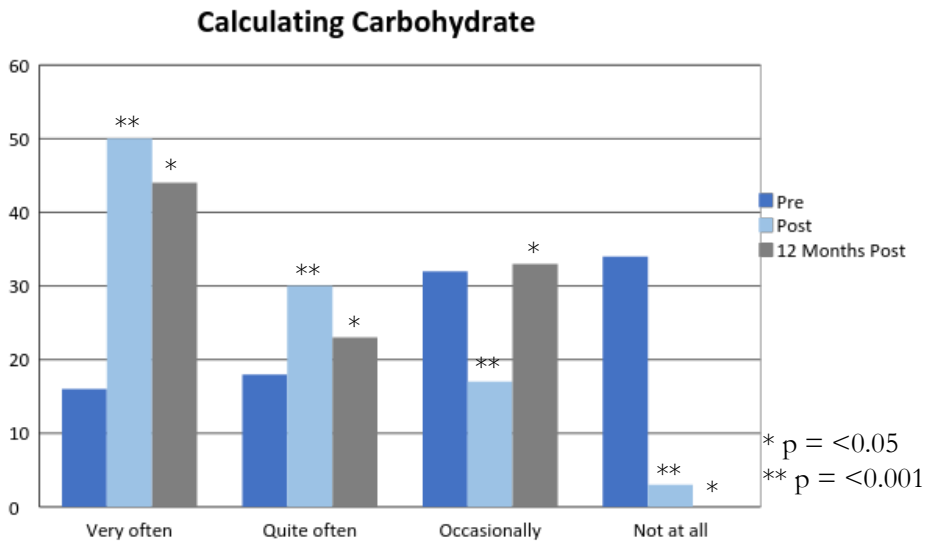
Figure 1: Health professional learning outcomes for confidence rating pre and post FlexIT program: 'How confident did you feel about applying your knowledge of Flexible Insulin Therapy to a practical situation?'[4]

Evaluation of the client FlexIT training program

Clients attending the FlexIT program complete an evaluation survey at four time points; pre and post program, and 3 and 12 months after completion of the program. The survey involves assessing diabetes management knowledge (adapted from the MDRTC Diabetes Knowledge Test), self-management behaviours, a rating of their confidence (Self-Efficacy Scale) and carbohydrate and insulin-dosing knowledge (adapted PedCarbQuiz).[5-6] The following are outcomes which have been achieved through completion of the FlexIT group program:

- Improved carbohydrate counting knowledge (assessing knowledge of which foods contain carbohydrate, calculating grams of carbohydrate for single foods and mixed meals and label reading strategies). Participants in the FlexIT program (n=68) showed improvements in carbohydrate counting pre and post program, increasing their knowledge base from 62% to 82%, although this was not statistically significant.[7]
- Consistency with carbohydrate counting improved post intervention and was maintained at 12 months (n=68) (p=0.000 and 0.008 respectively) as seen in *figure 2*.[8]
- Perceived "freedom to eat" improved 3 months post program increasing from 31% (n=61) to 52% where respondents rated freedom between 8 to 10 out of 10 (unpublished data).
- HbA1c was decreased from baseline post intervention (n=68) (p=0.001), however by 12 months had increased and was not different from baseline.[8]
- Knowledge of BGL management improved post intervention (n=68) and was maintained at 12 months (p=0.000 and 0.015 respectively) as was confidence around management of BGLs if there were outside of ideal target range (p=0.001 and 0.001 respectively).[8]
- Monitoring and managing ketones improved post intervention (n=68) (p=0.001 and 0.007 respectively) but at 12 months returned to baseline (p=0.409 and 0.365 respectively).[8]
- Control over preventing hypoglycaemia improved 12 months post program from 49% to 100% where respondents rated confidence between 6-10 out of 10 (n=5) (unpublished data).
- Perceived control of diabetes improved 3 months post program from 22% (n=60) to 48% where respondents rated perceived control of their overall diabetes management between 8-10 out of 10 (unpublished data).
- The following quality of life measures (using the Self-Efficacy scale)[5] were assessed at the 3 month interval post FlexIT:
  - 33% of participants (n=45) reported not being overwhelmed about diabetes management which improved to 82% (Unpublished data).
  - 31% of participants (n=45) reported that they did not feel burnt out by the constant effort and need to manage diabetes pre-program which improved to 55% (Unpublished data).

Figure 2: Client outcomes for knowledge and understanding of carbohydrate counting pre and post the FlexIT program[4]



Discussion

Both the NHMRC and the American Diabetes Association (ADA) guidelines recommend carbohydrate counting and use of insulin to carbohydrate ratios in T1DM in order to optimise glycaemic management.[9-10] The ADA guidelines recommend that 'Individuals with type 1 [or type 2] diabetes taking insulin at mealtimes, should be offered intensive education on the need to couple insulin administration with carbohydrate intake'.[10] Furthermore, randomised control trials implementing DAFNE (Dose Adjustment for Normal Eating) principles have demonstrated improvements in:

- HbA1c[3,11-13]
- Dietary freedom[3,11-13]
- Quality of life[3,11-13]
- General wellbeing and treatment satisfaction[3,11-13]

The FlexIT program has achieved similar outcomes to DAFNE, particularly with respect to increasing dietary freedom and quality of life (QoL). In these evaluations, The Self-Efficacy scale is used to explore quality of life measures and is similar the Diabetes-Specific Quality-of-Life Scale (DSQOLS) used in DAFNE evaluation data. In the FlexIT program, QoL is assessed by exploring coping abilities of living with diabetes day to day, social aspects, fear of hypoglycaemia, dietary restrictions, physical complaints, anxiety about the future, and daily hassles.[14] 3 months after attending the FlexIT programs there were improvements seen in the number of people having a more positive outlook on the management of their diabetes. The significant improvement in perceived control of hypoglycaemia from 49% to 100% of clients, is one outcome that is likely to impact on treatment satisfaction, giving people with T1DM more confidence in managing their disease. Whilst these numbers were small, this does mirror those results seen in a large randomised control trial looking at the outcomes of DAFNE where there was no significant increase in severe hypoglycaemia over the same time period.[12]

Improvements in carbohydrate counting competency, knowledge and skills remain key strengths of the FlexIT program and are reflected in the ADA guidelines.[10] It provides a less rigid method of carbohydrate counting that aims to help preserve a healthy relationship with food.[10] Whilst HbA1c improvements were noted after attendance in the two-day FlexIT program, these improvements were not maintained after 12 months, as seen in OzDAFNE.[13] This could be due to the lack of formal follow up of clients within that 12 month period. This has now been incorporated into the revised group FlexIT program, with strong emphasis on the importance of ongoing support from health professionals, in order to maintain optimal diabetes care.

Conclusion

The FlexIT program is a comprehensive insulin adjustment education program offered to individuals with T1DM to help them improve BGLs and key aspects of diabetes management in addition to increasing dietary freedom and QoL. Due to the growing incidence of T1DM in Australia, there is a demand for high quality training programs such as the FlexIT program to be offered to health professionals to up skill in this specialised area. Health Professionals who have completed the FlexIT program showed significant improvement in their overall knowledge and confidence in teaching FlexIT principles to clients.[4]

It is essential that FlexIT trained health professionals are able to competently teach these principles in order to maintain the success of the program, as seen through client learning outcomes.[4,7-8]

In addition, having this training course available across Australia will ensure people with T1DM have access to a program that not only aims to help them optimise their management but follows best practice guidelines with a sound evidence base. Evaluation data from health professional attendees and clients along with the latest diabetes management guidelines (e.g. ADA Guidelines 2017[10]) will continue to be reviewed and will inform future direction of the program. Further work is needed to help ensure that the improvement seen in evaluation data are maintained in the long term.

The FlexIT health professional training program runs twice per year and is held at the Baker Heart and Diabetes Institute in Melbourne. It is opened to both Accredited Practising Dietitians and Credentialled Diabetes Nurse Educators. Details of the course and registration can be accessed on the website at www.baker.edu.au. For further enquiries please contact flexit@baker.edu.au.

Acknowledgments

- Health Care Professionals within the Education Service at The Baker Heart and Diabetes Institute.
- The Health Professionals who enrolled into the health professional FlexIT training program.

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Workforce in diabetes education 2016

About the survey

The Workforce in diabetes education 2016 survey is ADEA's first comprehensive national compilation of information and statistics related to the employment status of diabetes educators in Australia.

Findings from this survey provide a greater understanding of the diabetes education workforce in Australia and will assist ADEA in developing projects and resources to support members' employment opportunities and career development.

The survey collected detailed information about the diabetes education workforce to identify:

- Employment of diabetes educators by geographical location and profession
- Education level and experience in providing diabetes education
- Emerging workforce trends, including private practice
- Workforce challenges for health professionals in diabetes education, specifically for diabetes educators

Methodology

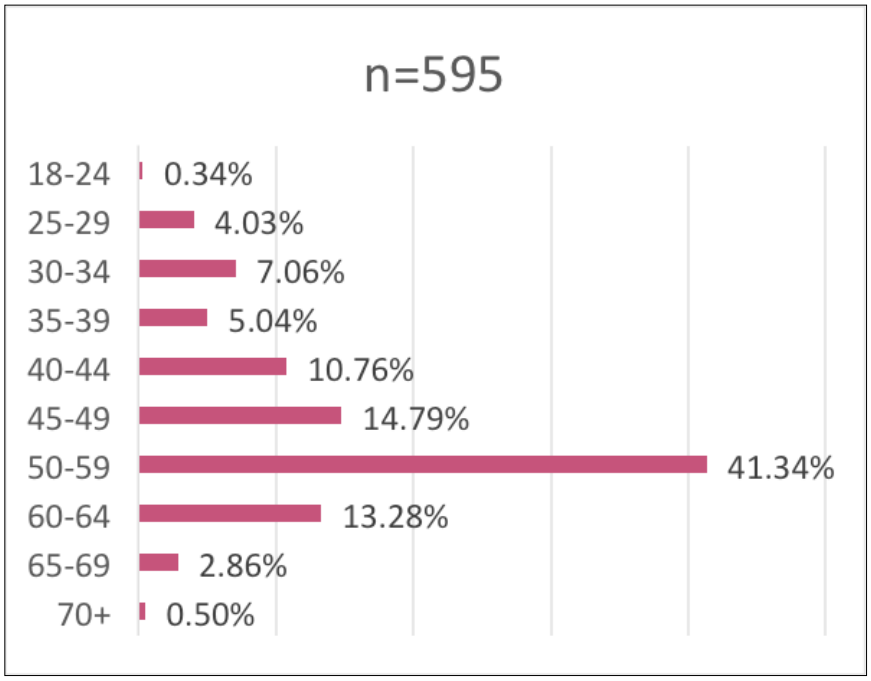
Open from April until June 2016, the survey received 595 completed responses (741 in total) from both members (518 individuals) and non-member professionals who provide diabetes education services. The majority of respondents (74%) were Credentialled Diabetes Educators (CDEs).

Key findings

These are the main findings from the survey:

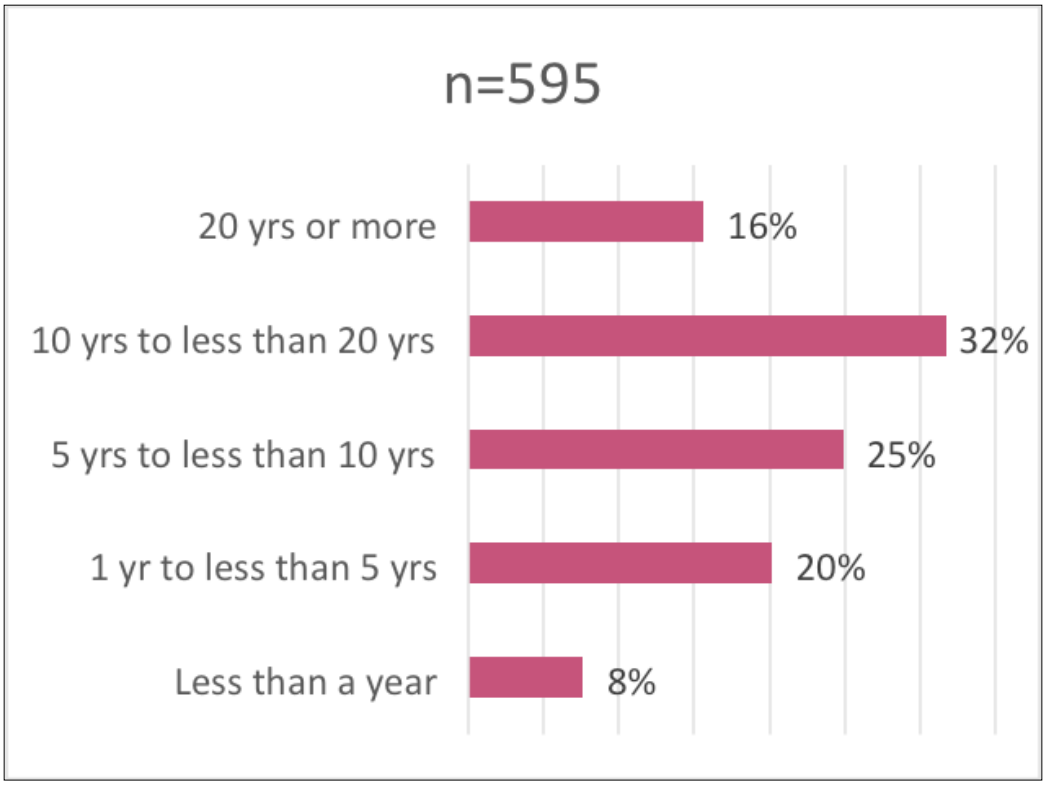
1. We have a mature workforce with 41% of participants aged between 50-59 years. This indicates the potential for skill shortages, as if diabetes continues to rise at the current rate, there will be at least 3.3 million Australian adults with diabetes by 2031[1] while over 41% of the workforce (50-59 years) would have retired. ADEA should continue engaging with the younger groups and keep them in the workforce while at the same time encouraging more health professionals to become diabetes educators.

Chart 1 - Age group distribution



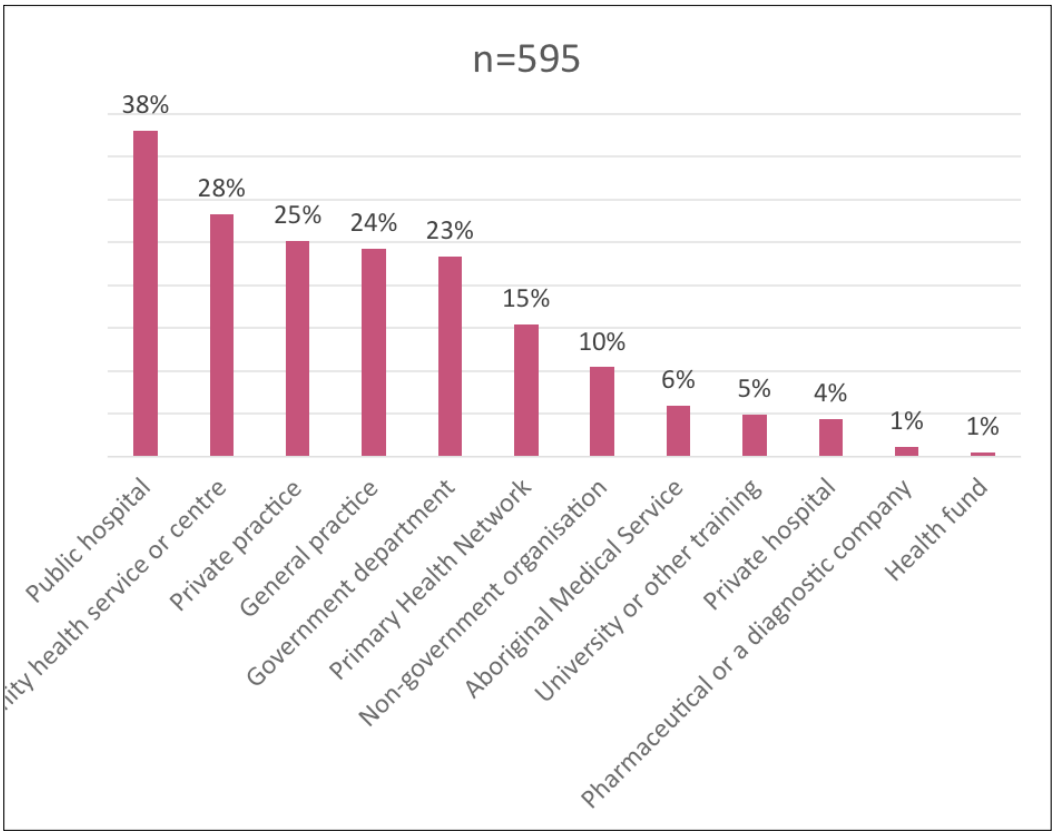
2. Our workforce is very experienced, with 32% of participants having 10-20 years experience. Only 8% of respondents had less than 1 year experience.

Chart 2 - Years of experience



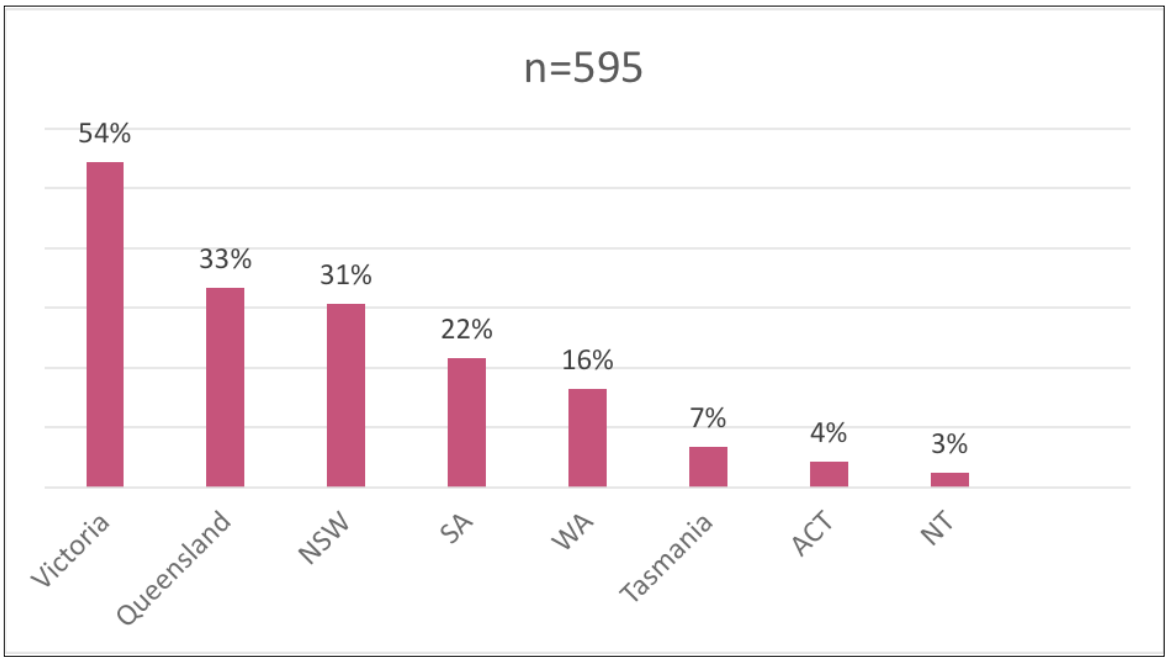
3. The majority (94%) of respondents were female, similar to the gender distribution of ADEA's membership.
4. Public hospitals are the most common work setting where 38% of participants are currently employed. This is followed by 28% of participants working in community health services or centres and 25% in private practices.

Chart 3 - Work setting distribution



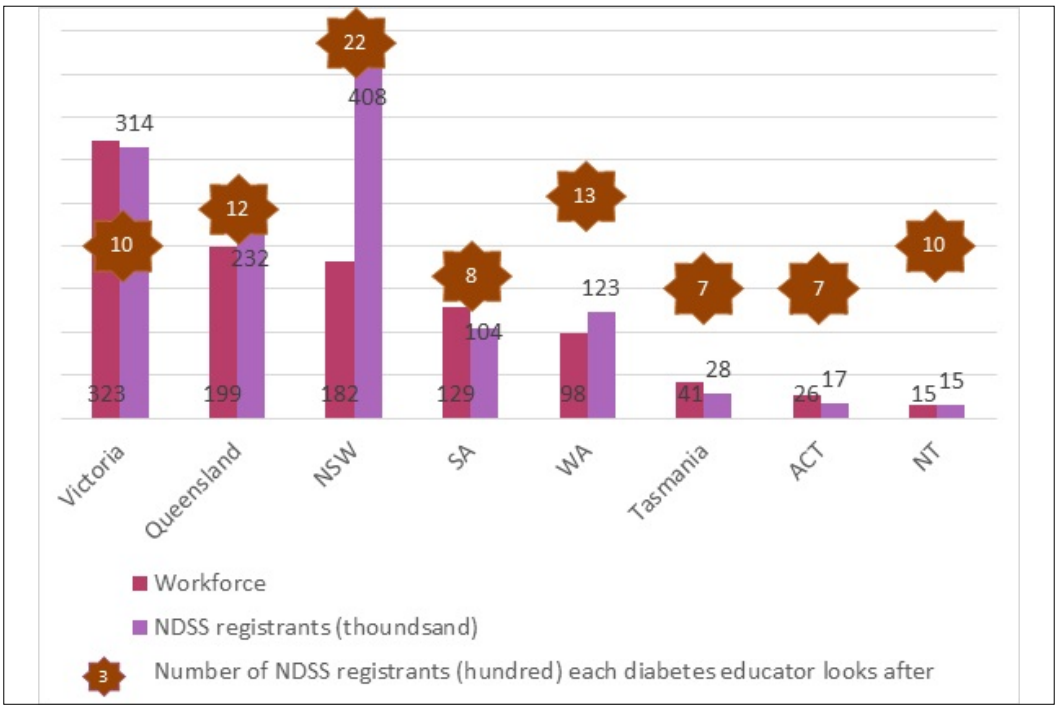
5. 54% of participants work in Victoria, followed by those in Queensland (33%) and NSW (31%) whereas NSW has the highest number of people with diabetes. This distribution of diabetes educators is similar to of the current ADEA membership.

Chart 4 - Workforce distribution in states and territories



If these statistics reflect the actual workforce distribution, considering the number of people with diabetes (who have registered with NDSS) in each state from the Diabetes Map, there would be a gap in workforce distribution compared to distribution of people with diabetes (supply vs. demand). The supply vs. demand modelling in chart 5 below reflects this gap. Assuming that all diabetes educators are currently participating in the workforce, in Victoria, each diabetes educator would have to look after 1,000 NDSS registrants, while in NSW each diabetes educator would have to look after 2,200 NDSS registrants on average.

Chart 5 - Supply vs. demand modelling: workforce distribution compared to number of people with diabetes (hundred)



6. Most respondents (85%) work in major cities (RA1), followed by inner regional areas (RA2).
7. More than 1 in six respondents (16%) are able to speak a language other than English, enabling them to engage with people with diabetes from CALD backgrounds.
8. The majority (78%) of respondents held a graduate certificate in diabetes education/care.
9. Most respondents (82%) were registered nurses.
10. Most respondents (81%) were employed as clinicians and 7% as non-clinicians.
11. 18% were not actively working in diabetes education, including:
    - 9% who were employed elsewhere (not in diabetes education but held diabetes education qualification)
    - 6% who were employed elsewhere and looking for work in diabetes education
12. Respondents perceived the main roles of the ADEA in supporting the diabetes education workforce to be:
    - Advocating for the role of diabetes educators
    - Increasing the value and awareness of the CDE and diabetes education
    - Providing CPD opportunities

Key areas of focus for ADEA

It is suggested that ADEA focus on the following areas:

1. For current members:
    - » Supporting those from the eligible primary disciplines and encouraging them to become CDEs through the ADEA mentoring program, CPD activities and events
    - » Supporting new CDEs and upskilling them through CPD activities and events
    - » Encouraging experienced CDEs to support new and younger members through the ADEA mentoring program
2. For non-members: health professionals from different primary disciplines, such as dietitians, pharmacists, podiatrists, etc.
    - » Communicating and increasing their awareness on the value of CDE and diabetes education
    - » Engaging and encouraging them to consider becoming CDEs

New CDEs

Congratulations to the following ADEA members who have recently achieved CDE status, up to 15 June 2017

Coralie Taylor
Beng Lee Foo
Kiwi Shirley Anne Ruka
Myles Clarkson-Fletcher
Melissa Bingham
Alison McIntosh
Amanda Mason-Jones
Adnan Gauhar
Rebecca Flavel
Kerenina Baxter (Ferry)
Katherine Wilson
Terri Oliver
Annita Joseph
Terrianne Preston
Bree Broomfield
Claire Timms
Katherine Snars
Daisy Do
Christopher Messina
Emma Jeffery
Christina Charalambous
Donna Previti
Gillian Wright
Michelle Kriss
Michelle Bushell
Julian Hanssens
Dawn Gould
Vickie Owens
Elizabeth Kruger
Susan Charlesworth
Diane Gargya
Amanda Lee
Liam Collins
Laura Zimmerman
Tara Whelan
Sandra Abbott
Jaleesa Whitford
Hannah Reeve
Nicole-Maree Farrell-Litwin
Jayne Frost
Saba Tedla
Vibashini Heyn

Original research

Sensor-augmented pump therapy in the management of type 1 diabetes: lived experiences of children, adolescents and parents

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Abstract

Purpose

The purpose of this study was to explore possible barriers to the uninterrupted use of sensor-augmented pump therapy in children and adolescents with type 1 diabetes and their parents.

Methods

Eleven participants (two children, four teenagers and five parents) completed an open-ended questionnaire, with data analysed using thematic analysis. Respondents participated in a multi-site randomised control trial using the Medtronic MiniMed® 640G insulin pump with real –time continuous glucose monitoring. They received two education sessions on the use of this system and attended the midway study visit (between 3.5 and 6 months).

Results

Overall, positive experiences were reported from all respondents. Three themes emerged - practical considerations for optimal use of the sensor, added insight and flexibility, and behavioural responses to real-time and retrospective sensor information. Parents described reduced fear of hypoglycaemia overnight and during sport. Children and adolescents reported feeling greater control in managing glucose levels. Timing of each new sensor start, tolerance of sensor related alerts and skin irritation emerged as potential barriers.

Conclusion

Participants reported more positive than negative experiences using sensor-augmented pump. Despite known glycaemic benefits, barriers to uptake and consistent use of pump and sensor technologies may exist.

Introduction

In the management of type 1 diabetes (T1DM), the positive benefit of near normal glycaemic control for reducing the risk of long term complications is well established.[1] The use of insulin pump therapy is shown to improve glycaemic outcomes,[2,3] quality of life[4] and importantly, intensive glycaemic control with insulin pump therapy may be achieved without increasing the risk of hypoglycaemia.[5] Successful use of insulin pump has been associated with younger age, lower glycated haemoglobin (HbA1c) and more frequent meter blood glucose checks.[6] Compared to insulin injections, insulin pump uptake and sustained use may require significantly higher parental input into children's and adolescents' diabetes management.[7]

Various continuous glucose monitoring system options are available offering the ability for parents or other care providers to remotely monitor glycaemic trends, and insulin pump algorithms that suspend and resume basal insulin based on changing glucose levels. The use of sensor augmented pump (SAP) is associated with reduced fear of hypoglycaemia, improved glycaemic control and a reduction in severe hypoglycaemia.[8,9,10] Sensor-augmented pump therapy with low glucose suspend function (Medtronic MiniMed® Veo System, Northridge CA) appears to reduce the duration and severity of hypoglycaemia without significant ketosis or hyperglycaemia.[11-16] Now an added predictive low glucose suspend and auto resume algorithm (Medtronic MiniMed® 640G System, Northridge CA), can reduce hypoglycaemia with less user interaction required. Hybrid automated insulin delivery systems are clearly on the horizon and clinical teams will continue to face the challenge of translating research findings into their own clinical practice and teaching.

For the parents of children with T1DM, hypoglycaemia is a significant cause of fear and has been associated with a reduced quality of life for the child, as perceived by the child and parent.[17] The unpredictability of physical and sporting activities on glycaemic control may further impact on this concern, with parents of children with T1DM reporting the need for vigilance to manage blood glucose levels, with fears around the physical and emotional impact of hypoglycaemia.[18] Whilst the use of SAP is shown to result in a reduction in HbA1c in the absence of hypoglycaemia in both adults and children, reasons for the non sustained use of SAP remain to be fully explored. There is some correlation between social factors, body image and quality of life in the uptake of insulin pump therapy by adults,[19] yet further research is needed to understand how such barriers may impede the uptake of emerging pump and sensor technologies, such as automated insulin delivery systems, especially in children and adolescents. In an earlier SAP system, correlations were found between consistency in sensor use and level of satisfaction.[20] Furthermore, while consistency in SAP use is correlated with the degree of reduction in HbA1c,[10,21,22,23] the use of glucose sensors appears to decline over time, particularly amongst child and adolescent groups.[24,25] It appears that for adolescents, the barriers related to the use of these systems outweigh their understanding of the benefits of glycaemic control, contributing to declines in sensor use over time.[20] Greater parental input especially with younger children compared to adolescents, as they transition to more independent diabetes self-care, may account for some of the adolescent decline in sensor use. Individuals with optimal HbA1c at baseline and greater adherence in terms of frequency of blood glucose monitoring may still benefit from the use of continuous glucose sensors through a reduction in hypoglycaemia.[24]

Insulin pump use requires commitment to wearing an external device and developing an operational knowledge of the various functions built into the device that may optimise glycaemic control. The use of SAP requires the user to wear an additional external device. These systems are becoming progressively multifaceted, so increasingly the user must acquire knowledge of how to navigate, troubleshoot and optimise the use of this technology. The benefits of using SAP are many, including validating glycaemic variability associated with food, activity and hormonal influences, as well as reassurance through notification of actual or impending hypoglycaemia and hyperglycaemia across the day and night. The successful use of SAP requires technical problem solving skills and knowledge of factors that enhance the accuracy of the sensor, such as timely calibrations of the sensor with a meter blood glucose level.[26] It is also necessary for individuals with diabetes or their carers and the clinical team to develop the knowledge and skills to be able to effectively translate the information derived from SAP reports to benefit individual diabetes management. Viewing real-time SAP information such as trend arrows may be favoured over uploading and retrospectively reviewing the information via computer software programs.[21] However, for individuals to safely and effectively respond to real-time sensor glucose trend information they require knowledge of insulin pharmacokinetics and some initial direction from their health care provider as to the degree of adjustments to make in altering the rate and amount of insulin delivered.

Parental adjustment when children are changed from multiple daily injections to insulin pump therapy

has been described as a broad transitional process including re-education of parents, an adjustment in thinking about how to manage glucose levels and an increased flexibility in the daily living with T1DM.[27] Ideally, with the advent of more sophisticated SAP technologies, the use of this technology must be in the absence of any perceived increase in burden for the individual and carers. Although human factors such as quality of life measures, burden and fear of hypoglycaemia continue to be explored, the individual experiences of young people and their parents utilising this innovative technology day to day remains largely unreported. Hence, this study explored the day-to-day lived experiences of a cohort of children, adolescents and their parents utilising SAP technology.

Research Design

Design and setting

This study used qualitative methods to collect, explore and report personal experiences and opinions.[28,29] Thematic analyses were used to identify and analyse themes within the data,[30] which were then summarised and presented using thematic networks.[31] Children, adolescents and their parents provided written comments via a questionnaire about their experiences using the SAP as they participated in the trial. The study setting was a tertiary children's hospital in Western Australia. This research was part of a larger multi-centre RCT; the Predictive Low Glucose Management Study (PLGM). Participants in the RCT had T1DM for at least one year and had used an insulin pump for at least 6 months. The hospital human research ethics committee approved the trial and it was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12614000510640). The pumps and glucose sensors (Enlite™ sensor) were provided free for the duration of the RCT. Informed consent was received.

Subjects and procedure

To maximise the representativeness of the sample, a purposive sampling strategy using maximum variation sampling was employed.[32] This sampling strategy ensured a wide range of respondents by age, gender, study arm and parental input. The sample included children and adolescents (aged 11 to 18 years) and their parents, who had completed their midway study visit in the RCT, having used the SAP for between 3.5 and 6 months. Respondents were asked to complete an open ended paper based questionnaire either at the time of, or after their midway study visit for the RCT. Each participant in the RCT had initially received two individual teaching sessions with the diabetes educator to commence using the Medtronic MiniMed® 640G insulin pump with Enlite™ sensor and Guardian™ 2 Link transmitter. At least one parent attended both the insulin pump and continuous glucose sensor training sessions with their child or adolescent.

Questionnaire development and data collection

The questionnaire was developed by the Children's Diabetes Centre team, at the children's hospital in Western Australia. Its face and content validity was guided by the known practical and educational considerations necessary for the successful use of SAP and the combined expertise of the research team and their experience in large home-based clinical trials utilising SAP. Nine open-ended questions enabled respondents to share their thoughts, feelings and behaviours associated with the use of the SAP system. The first four completed questionnaires were reviewed and the open-ended questions were modified to add two further questions to allow respondents to more broadly report their experiences and feedback about the SAP. The questions sought to explore the experiences, thoughts and behaviours related to the use of the SAP technology, including questions such as the following:

- How do you feel that you use the sensor glucose trend arrows information?
- Are there times when you do not wear the sensor and if so can you list all of the reasons you can think of for this?

Data analysis

The thematic analysis involved the following six step process; initial coding of material, identification of themes, development of visual thematic networks, description and summary of networks and final interpretation of patterns.[31] The codes were primarily data-driven, which is considered appropriate given the paucity of published studies investigating this topic.[33] Data were transcribed and independently coded by two researchers. After initially transcribing the text, the two researchers independently formed a coding framework guided by the research questions as well as recurrent issues identified within the text. The coding frameworks were reviewed and revised until consensus was achieved. The identified codes were examined using a constant comparison process where each code is compared with the remainder of the data to determine the basic themes. The two coders then performed cross (inter-rater) comparisons on three separate occasions, comparing their interpretations and context on emerging themes and findings. There were several revisions to the organisation of the themes and development of sub themes imputed from the codes.[30] Consensus was also achieved to

identify the quotations used to represent the themes and subthemes.

Results

In total, five parents participated together with six children and adolescents between the ages of 11 and 18 years (Table 1). Three main organising themes were identified within the transcript. The thematic network (Figure 1) illustrates the organising themes together with clusters of basic themes and how they interlink. In summary, the themes were practicalities (practical considerations for the optimal use of the system), perceptions (individuals' reported thoughts, feelings and expectations for its use) and responding to sensor information (behavioural responses to both real-time and retrospective sensor information). Parent comments are denoted by (#.P).

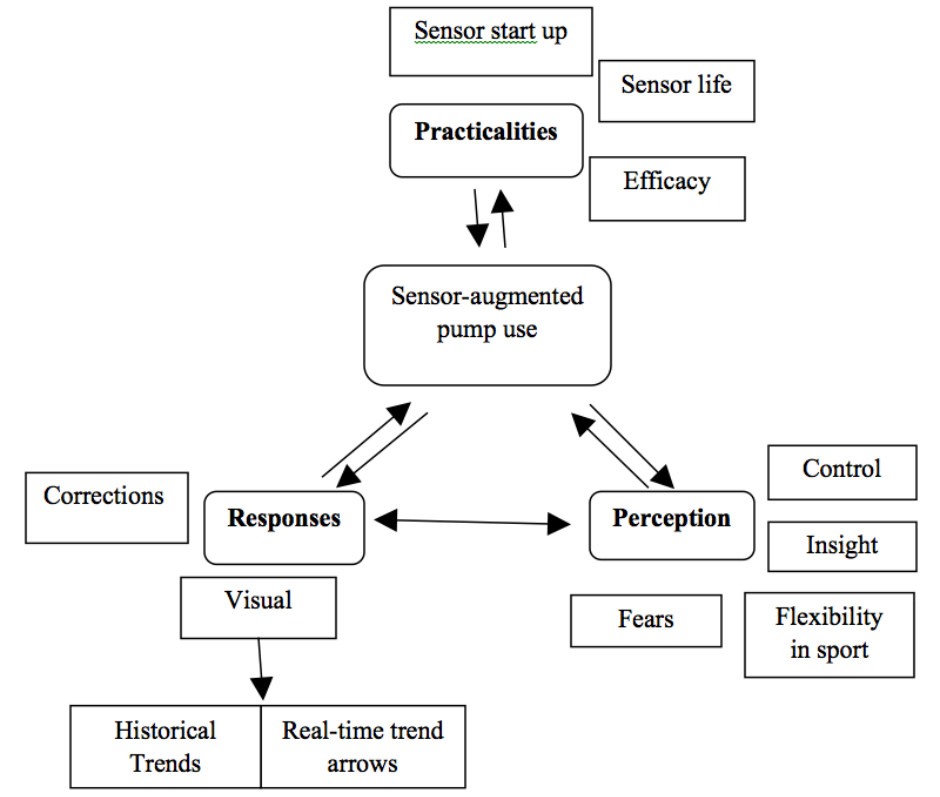
1. Practicalities

Practical issues centred on the feasibility of consistent use of the SAP; placement, activation, duration and efficacy of the sensor. Most respondents reported locating the sensor on the buttocks or hips, followed by the abdomen as the preferred site. One rationale was *"we used to use tummy but had weak signals at night"* (5.P). There was uniformity in responses regarding the start-up and efficacy in the lifespan of the sensors. Most respondents reported the timing of a new sensor start was a key consideration, including planning the time of day for initiating the new sensor and also needing to consider the predicted stability of blood glucose levels for calibration. Most favoured the morning or avoided a sensor start in the evening *"it takes 2 hrs to calibrate/warm up so I don't do it before bed"* (11) and from a teenager *"I don't want to be woken up to calibrate"* (10).

Table 1- Baseline characteristics of the six child and adolescent participants

Age in years (SD)	14.9 (±2.7); range 11.1 – 17.5
Gender (%)	Female (57 %)
Diabetes duration at baseline in years (SD)	8.8 (±4.3); range 3.0 – 14.4
Duration on pump in years (SD)	6.7 (± 3.5); range 1.4 – 10.1
A1C baseline % (SD) mmol/mol	7.9 (±1.1); 63 (±12.2) mmol/mol; range 6.1 – 9.4; 43-79 mmol/mol

Figure 1. Thematic network for the sensor-augmented pump



1.1 Sensor start up

Starting a new sensor requires that sufficient time is allowed to insert and tape the sensor, charge and connect the transmitter, followed by the first calibration after two hours and then a subsequent calibration (ideally performed) within 6 hours. From the perspective of the parent of an 11 year old boy, *"after tea is not the ideal time as the second calibration is often 4am"* (5.P). They also reported calibrating to guarantee the sensor was working before school. From the parent of a young teenage girl *"I find inserting and setting up sensor is very problematic time-wise"* (2.P). Most reported that sensors generally lasted for the full manufacturer recommended lifespan of 6 days *"if the dressing doesn't get washed off in the shower"* (4.P); three reported a sensor lifespan of 4-6 days *"when it falls out and we have to wait till morning before breakfast"* (1). One parent indicated alarm fatigue and skin reactions were reasons for interrupting the consistent use of the SAP *"I know that .... finds the alarms quite wearing and she enjoys a short time period without them. She also is relieved to have the sensor removed after six days as it can get itchy"* (4.P).

1.2 Sensor efficacy

Eight of the eleven respondents reported that between days 2 to 5 of the sensor life provided the least discrepancy between sensor and meter blood glucose values. They reported calibrating the sensor 2 to 4 times per day. Respondents demonstrated they understood the factors known to potentially cause variability between sensor values and their meter blood glucose levels, such as differences between more structured school days compared to weekends in terms of food, bolusing habits and activity levels: *"at school I have a set routine and it makes the sensor easier to manage"* (3). Consequently, respondents indicated efforts were made to manage this variability, such as calibrating while blood glucose was stable (overnight and pre-prandial). It was noted that activity level may have influenced how the sensor worked either in a practical sense *"can [affect it] if it is displaced"* (11) or in terms of glycaemic variability *"more rapid change"* (2.P). Where the predictive low glucose suspend function was used one teenager commented that *"It can take too long to come out of auto suspend"*; *"the alerts for a rise in BSL [blood sugar level] can be repeated too much like the alert before high and alert on high and alert BSL rising rapidly can all go at once or within 5-10 minutes"* (11). Similarly, a parent reported occasionally overriding the predictive low glucose suspend feature overnight *"if trends and BG checks suggest her level is steady according to graph"* (2.P). However, their child reported not doing this during the daytime unless it was necessary *"tend not to override [suspend before low], except when about to eat and give a bolus"* (1).

2. Perception

The theme of 'perception' reflected an overarching sense of the considered benefits and constraints in respondents' experiences of the everyday use of the SAP. Information from the sensor could fill in the gaps between meter blood glucose checks *"less finger pricks, look at reading on pump regularly, make more decisions during the day based on the trend of the line"* (5.P).

2.1 Control and insight

All respondents indicated a variety of ways in which they considered the SAP helped them to more easily manage glucose levels. Primarily, this included looking at the real-time sensor glucose trend arrows which indicated the direction and speed of change. Two teenage respondents explained *"[It] makes it easier to manage, more control"* (10) and *"it enables me to be able to keep a tight control over my blood sugar levels, preventing lows and highs"* (7). Respondents described how they could make decisions to avoid hypoglycaemia, for example during sport *"It is not possible to make a decision about my BGL before I start playing and without the trend arrows a BGL of for example 8 might look great but with ↓↓↓ I would have to have glucose to catch a low before it happens. With the trend arrows info I have not needed to sit out of any activity"* (8). Some respondents indicated using the trend arrows to monitor the effectiveness of their bolus insulin for food *"If there is just one or two [trend arrows] I'd think that the carbs [carbohydrates] were just wearing off or taking effect"* (3) and *"I think it helps me with checking how effective my dose is"* (11).

2.2 Flexibility in sport

Respondents reported the practical management of the pump during various sporting activities remained largely unchanged, most disconnecting the pump for contact sports and swimming. They did indicate that while the pump was disconnected for sport, information from the sensor could still be utilised at different times, by viewing the sensor trend information at the start and checking it during and after the activity which could result in the use of a temporary basal rate or action to prevent impending hypoglycaemia, as described by an 11 year old *"at for example swimming and netball games my bag with my pump is close enough that the transmitter is still picked up and my mum does check my pump after each netball quarter and gives me the info – I do have jelly beans if my reading is below 6 with arrows showing that my reading is going down"* (8).

2.3 Fears

Relief from concerns about hypoglycaemia or fluctuating glucose levels overnight were reflected in parents' responses. A parent of an eleven year old girl referring to the sensor glucose trend arrows

responded *"to put your mind at peace when she is going onto the netball court/out for a horse ride"* (9.P) and *"She does not have to be unsure about what action to take"* (9.P). Regardless of whether or not the suspend before low function was used, parents indicated that they were still getting up overnight to check their child's blood glucose level. However, one parent indicated that overnight blood glucose checks may happen less frequently *"The sensor is wonderful as we can look at the graph before doing a finger prick and it helps us make decisions about whether we need to check her again a few hours later"* (4.P).

3. Responding to sensor information

Actively responding to real-time and retrospective sensor glucose information emerged as a theme conveyed by all of the respondents.

3.1 Visual – real-time and historical trends

Using this real-time and historical trend information provided by the SAP, respondents could make a decision to act at the time or adopt a 'watch and wait' approach. *"down arrows – how much insulin on board, how long since eaten, what activity has taken place – make a decision for a small amount of carb [carbohydrate]or watch and wait"* (5.P). In this instance, when a child ate a small amount of food in response to downward arrows, the parent referred to this action as "micro-carbing".

Respondents reported that if they identified patterns using the SAP then appropriate changes were made to the pump settings. *"To make adjustments to the insulin settings or food intake or delay exercise for a while. The ↑↑trend arrows are used as a warning to act"* (9.P).

3.2 Corrections

All respondents indicated the SAP enhanced their ability to adjust their insulin delivery to correct a high or rising glucose level, or to reduce the insulin delivery in the case of a low or impending low glucose. An upward trending arrow often alerted them to a meal related glucose rise that some chose to correct with extra insulin at the time. An adolescent commented *"sometimes I find my insulin is not as effective so I give more"* (11). The decision to act was often made based on the number of glucose trend arrows *"If just 1 or 2 [arrows] I'd think the CHO [carbohydrate] was wearing off or taking effect, but if 3 I would respond by correcting"* (3). A more pre-emptive use of the glucose trend line was also described by the respondents *"...look at pump reading regularly; make daytime decisions based on trends. Bolus at BF [breakfast] and wait for line to 'turn down' before eating (if time). Would like to do for rest of day but can only really do if line (trend) is straight or slightly curving up"* (5.P).

Conclusion

The purpose of this study was to give a voice to the individual experiences of children, adolescents and their parents, using a new SAP system in the management of T1DM. Overall, reported experiences were positive and provided insight into factors that may facilitate and impede consistency in the use of SAP. Three primary themes emerged related to the practical use of the sensors, the insights and assurance respondents gained with use and the resultant day to day action taken to manage blood glucose levels through the utilisation of both real-time and retrospective sensor information. Practical issues concerning the ongoing use of the SAP may account for periods of time when the sensor was not used. Inserting and starting a new sensor was most likely to be planned, with certain times of the day considered inconvenient. Thought was also given to the stability of glucose levels for the first two calibrations. The additional time costs associated with the use of sensors have been reported elsewhere,[34] as has the users' awareness of optimal times to calibrate the sensor crucial to its effectiveness.[26] Knowledge of the discrepancy that can occur due to the physiological lag between interstitial and capillary glucose levels is important when interpreting sensor information. Given the respondents in this study were experienced with insulin pump use, motivated and committed to participating in a clinical trial, they were able to identify variables that may impact on the accuracy of the sensor, such as calibration timing and activities likely to cause rapid glucose fluctuations. Ongoing consideration must be given to the degree of education and support required to optimise personal use of these systems, beyond the clinical trial setting. A study strength is the length of time respondents used the system, a prospective account from 3.5 to 6 months of use of this system. A further strength of the study is the way the views of children, adolescents and parents were collected to reveal the different perspectives, uptake and personal experiences of the daily use of SAP. Several factors may limit the validity of this study including the small group of participants, with generally good glycaemic control at baseline, which potentially predicts the uptake and more consistent use of glucose sensors. [24, 26] The recruitment of respondents already participating in a clinical trial may have resulted in a group with a high level of motivation to manage T1DM. This study was a secondary aim from a larger clinical trial, and used a convenience sample with no attempt to achieve data saturation.

Until recently, the cost of sensor technology is likely to have been the biggest barrier to widespread uptake and continuous use. Now for many young people with T1DM, this barrier has been removed through government funding. This report is timely in highlighting the positive and negative experiences of young people and their parents, given that acceptance and perceived added value in the use of any sensor technology will likely be balanced against added burden. More consistent use of SAP can lead to improvements in HbA1c, a lowered incidence of severe hypoglycaemic events and greater satisfaction in sensor use,[10,21,22] yet the fundamental influencing factor will be individual tolerability of wearing a sensor continuously. Clinical teams face a challenge in remaining upskilled and translating research findings into their own clinical practice and teaching.

Implications/ relevance for diabetes educators

The key themes generated may help to inform the clinical application, education and further research in this field of rapidly changing technology, in the management of T1DM. These findings also invite further exploration using qualitative techniques to investigate experiences related to sustained use and adaptation over time.

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Contribution

All authors were involved in the conception and design of the study. JN, LG and FG analysed and interpreted the data. All authors critically revised and approved the final article.

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Feature article

Diabetes and tuberculosis: what we know, why we care and what can be done

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Introduction

Tuberculosis (TB) is a bacterial disease which continues to be a major public health problem. In 2015, globally, there were an estimated 10.4 million cases of TB, with 1.8 million deaths (400,000 among people living with HIV infection).[1] Males are predominantly affected and outnumber females by 70%.[1] In addition to the 10.4 million people who are affected by active TB (i.e. TB disease), it is estimated that approximately one third of the world's population is infected with the TB bacterium. This is termed latent TB infection and is a dormant form of TB; the bacteria are viable but are walled off in the lungs by the body's immune system and there is no evidence of clinically active TB.[4]

*While TB is caused by a bacterium (**Mycobacterium tuberculosis**), a number of socioeconomic and biological risks factors perpetuate its spread.[2] TB is strongly linked to poverty (both within and across countries), poor living and working conditions and other biological risk factors such as HIV infection, silicosis and diabetes mellitus.[2, 3]*

The association between tuberculosis and diabetes

The association between TB and diabetes has long been established, dating back to Roman times.[5, 6] In the 1940s the Philadelphia TB and diabetes survey found that among 3,061 people with diabetes, 8.4% had TB, about double that of a control group.[8] The study authors concluded that the control of diabetes would be "a very important factor for TB prevalence."[8] In Birmingham in the early 1950s, dedicated services for people with TB and diabetes were established to provide co-ordinated care for people with these two co-morbidities.[7] Details of the Birmingham TB-diabetes service and the Philadelphia TB and diabetes survey were published at a time when rates of TB were high in high income countries such as the United Kingdom and the United States. Therefore, co-morbidities associated with TB were of major concern. Since this time, TB has been on the decline (particularly in high income countries) and United Kingdom and the United States are now considered to have a low incidence of TB.[1] However, as the prevalence of diabetes has been rising globally, there has been renewed interest in the association between TB and diabetes. In addition, and more importantly, the association between TB and diabetes has once again gained prominence as rates of diabetes are rising in many countries where the TB burden is also high, and the care and management of individuals with these co-morbidities has been a concern for those involved in TB and diabetes care.[5, 9]

A systematic review published in 2008 concluded that people with diabetes are three times likely to develop TB, compared to people without diabetes.[10] This increased risk was evident regardless of the study design or population group.[10] The authors concluded that people with diabetes were important targets for public health and clinical interventions such as efforts to actively detect people with TB, and the treatment of latent TB infection.[10] They also suggested that efforts to diagnose and treat diabetes may have a beneficial effect on TB control.[10]

In 2010 a systematic review assessing the effect of bi-directional screening (i.e. screening people with TB for diabetes and vice versa) found that the prevalence of TB in people with diabetes was 2-36% (among 12 studies) and the prevalence of diabetes in people with TB was 2-35% (among 18 studies).[12] The authors suggest that people with diabetes may be a group in which active TB case screening activities could take place and that "efforts to diagnose, detect and treat diabetes may have a beneficial impact on TB control."[12]

Another systematic review, published in 2011, found that diabetes adversely affects these TB treatment outcomes.[11] Following adjustment for age and other potential confounding factors, the risk of death during TB treatment was 5 times higher for people with diabetes compared to those without.[11] When the authors combined the treatment outcomes of failure and death, people with diabetes had a 1.7-fold increased risk.[11] Failure is a TB treatment outcome that indicates that the person has not had a bacteriological response to treatment.[16] Individuals with TB and diabetes were also found to be more likely to relapse when compared to those with TB without diabetes.[11] This has profound consequences for these individuals, as those who relapse may require re-treatment and may be at higher risk of developing drug resistant TB.[16]

Studies have also demonstrated that the risk of developing TB is higher for people with diabetes and elevated blood glucose or HbA1c levels, that TB may present differently among this group (i.e. more infectious TB) and that TB treatment outcomes may be worse for people with elevated blood glucose or HbA1c levels, when compared to those with optimal blood glucose or HbA1c levels. [17-19] In one study from Taiwan, an estimated 7.5% of individuals in the study population (which consisted of 123,546 individuals who participated in a community-based health screening service in northern Taiwan) had TB, which was attributed to an elevated fasting blood glucose.[19] Another study, from Denmark (another low TB incidence country with an estimated TB case notification rate of 6 per 100,000 population[20], similar to Australia), found a higher risk of TB with increasing HbA1c; people with an HbA1c of ≥ 8.0% had a 20% increase in TB (although this was not a statistically significant finding).[17] In the same study, immigrants with diabetes were more at risk of TB compared to people born in Denmark.[17]

Finally, there is evidence that a significant proportion of TB globally is attributable to diabetes. Studies in Pacific Island nations, where TB and diabetes are highly prevalent, have determined that between 37 and 42% of TB in those countries is attributable to diabetes.[21, 22] It is estimated that approximately 15% of the global adult TB burden is attributable to diabetes (based on 2013 figures) which equates to approximately 1 million cases.[3] Due to the rise of diabetes in countries where TB is also prevalent, the burden of TB attributable to diabetes has risen from 10% in 2010 to 15% in 2013, due in most part to a 52% increase in diabetes prevalence in these countries, from 5.4% in 2010 to 8.2% in 2013.[3] Therefore, at the global level, the association between TB and diabetes is particularly important.

What is the evidence on the association between tuberculosis and diabetes in Australia?

There is limited published evidence regarding the association between TB and diabetes in Australia. Theoretically, there is no reason to think that the association is any different. However, the yield of bi-directional screening and the need to screen people with TB for diabetes or vice versa, is influenced by the background prevalence of both diseases in the population and therefore this may be different in the Australian context.

Approximately 1200-1300 Australians are notified as having TB each year (a case notification rate of 5.5 per 100,000 population) which is one of the lowest incidence rates globally.[24] As a result, Australia is classified as a low incidence TB country and population wide screening of people with diabetes for TB is not recommended. Conversely, diabetes is becoming more prevalent in Australia, especially among adults,[25] and this trend is predicted to increase.[9] While this does not signal that people with TB need to be screened for diabetes per se, there may be a case to screen people with TB who are at risk for diabetes (i.e. people who are overweight and obese, those who have a family history of diabetes and or those with other risk factors for diabetes). However, at the current time, there is no national guidance on screening individuals with TB for diabetes and this decision remains one for individual health care workers including doctors and nurses who are involved in the care and management of those with TB.

Only two published studies exist looking at the association between TB and diabetes in Australia. Dobler et al. assessed the relationship between TB and diabetes in Australia using a national

population based cohort study.[26] The aim of this study was to determine the risk of TB among people with diabetes in order to inform decision-making about latent TB infection screening in those with diabetes.[26] The authors linked data from TB notifications (stored in the National Notifiable Diseases Surveillance System) to data on diabetes from the National Diabetes Services Scheme Database.[26] Their primary outcome of interest was cases of TB (with culture confirmed TB as a secondary outcome).[26] They identified a total of 6276 cases of active TB between the years 2001 and 2006.[26] Of these, there were 271 cases of active TB (of whom 188 were culture positive) among 802,087 people with diabetes (0.04%) and 130 cases of TB among 273,023 people with diabetes who used insulin (0.05%).[26] When the relative risks were adjusted for potential confounding factors such as age, sex etc., the relative risks for TB among people with diabetes were 1.48 (95% CI 1.04-2.10) and 2.28 (95%CI 1.41-3.66) for people with diabetes and people with diabetes who used insulin, respectively.[26] The authors concluded that the presence of diabetes alone does not justify screening for latent TB infection.[26] However they suggest that when combined with other risk factors, the presence of diabetes may be sufficient to justify screening for latent TB infection.[26]

The second study was a 20 year retrospective study of 69 persons with culture-confirmed TB, diagnosed between 1995 and 2014, who had been admitted to a tertiary referral hospital in northern Queensland.[27] The aim of the study was to determine if diabetes was a risk factor for TB in a low TB-burden tropical region.[27] They examined medical records of persons with TB and determined if these people had evidence of pre-existing diabetes.[27] A total of 16 individuals (23.2%) with TB and co-morbid diabetes were identified.[27] Among this group, there was a significant association between TB and diabetes when compared to the general population ($p<0.0001$), and persons with diabetes had a seven fold risk of TB when compared to the general population (odds ratio 6.6, 95% CI 3.788-11.60). Seven people (43.8%) had a fasting blood glucose level greater than 6.0mmol/L) or an HbA1c greater than 6.5%.[27] They also found that people born overseas and Indigenous Australians were over-represented when compared to the general population and that the majority of overseas born individuals were from high incidence TB countries such as Papua New Guinea (n=16), India (n=3), Myanmar (n=2) and Sudan (n=2).[27] Furthermore, diabetes was found to be associated with pulmonary TB (when compared to extra pulmonary disease) (n=14; 87.5% for pulmonary TB vs. n=2; 12.5% for extra pulmonary TB, odds ratio 7.84, $p=0.0103$) and that persons with pulmonary TB were more likely to be infectious at diagnosis (i.e. to have sputum smear positive TB; n=13; 81.3%, odds ratio 6.603, $p=0.0084$).[27] They concluded that an association between the two conditions exists in this population (i.e. one of relatively low TB incidence) and recommended that additional studies be carried out to determine if this association extends to other low-burden TB areas as well as to determine how TB-diabetes co-morbidity impacts on disease severity and treatment outcomes.[27] They also suggest that screening and subsequent treatment of individuals with diabetes for latent TB infection may be warranted in certain settings.[27]

What are the recommendations regarding TB and diabetes?

In recognition of the association between TB and diabetes, and the care needs of people with both conditions, international guidance has been developed. The *Collaborative Framework for Care and Control of Tuberculosis and Diabetes* was published by the International Union Against Tuberculosis and Lung Disease and the World Health Organization in 2011.[28] The Framework recognises that changes in lifestyle and diet have contributed to an increase in the prevalence of diabetes in many low and middle income countries where TB is also prevalent, and that this growing burden of diabetes contributes to an increase in rates of TB.[28] Therefore, the Framework has been developed to assist health care program managers and policy makers, clinicians and others who are engaged in the care of people with both conditions and management of programs to "establish a co-ordinated response to both diseases, at organisational and clinical levels".[28] The Framework includes nine provisional recommendations which are summarised in Table 1 below.[28] While the Framework is relevant to all countries, it may be particularly relevant to countries with a high burden of TB and or a high or rapidly increasing prevalence of diabetes.[28]

Table 1: Provisional recommendations from the Collaborative Framework for Care and Control of Tuberculosis and Diabetes

Establish joint mechanisms for collaboration
1. Joint co-ordination should be established at regional, district and/ or local levels (sensitive to country-specific factors) with representation from all relevant stakeholders. A joint plan for activities should be drawn up and reflected in national plans for communicable diseases and TB.
2. Surveillance of TB should be initiated among diabetes patients in settings with medium to high burdens of TB.
3. Surveillance of diabetes should be initiated among patients with TB in all countries.
4. Where collaborative activities are being established, national programs should agree a core set of indicators and tools to collect data for monitoring and evaluating activities to improve care and prevention of both diseases. Diabetes programs should explore the possibility of adapting the Directly Observed Treatment Short-course system to monitor and report diabetes cases and treatment outcomes.
Detect and manage TB in patients with diabetes
5. At a minimum, people with diabetes should be screened for chronic cough (that is, cough lasting more than 2 weeks) at the time of their diagnosis with diabetes and, if possible, during regular check-ups. Those with positive TB symptoms should be examined as per national guidelines. Other diagnostic procedures (for example, for extrapulmonary TB) should also be pursued vigorously as per national guidelines.
6. Screening for TB diseases on broader indications (for example, for all people in whom diabetes is diagnosed, regardless of symptoms) should be explored as part of the research agenda to improve the diagnosis of TB among people with diabetes.
7. A referral system should be established so that patients suspected of having TB are promptly referred to TB diagnostic and treatment centres and evaluated in accordance with guidelines of the national TB control programme.
8. Case finding for TB should be intensified by increasing awareness of and knowledge about the interactions between diabetes and TB, including joint risk factors, among healthcare workers and the populations they serve.
9. Health-care facilities, including diabetes clinics, should have in place an infection control plan that includes administrative and environmental control measures to reduce transmission of TB within health- care settings. These measures should adhere to WHO international guidelines for infection control.
10. Treatment and case management of TB in people with diabetes should be provided in accordance with existing TB treatment guidelines and international standards. The same TB treatment regimen should be prescribed for people with diabetes as for people without diabetes.
Detect and manage diabetes in patients with TB
11. Patients with TB should be screened for diabetes at the start of their treatment, where resources for diagnosis are available. The type of screening and diagnostic tests should be adapted to the context of local health systems and availability of resources, while awaiting additional evidence on the best screening and diagnostic approach or approaches.
12. Management of diabetes in patients with TB should be provided in line with existing management guidelines.

In addition to the Framework, the *International Standards of TB Care* also recommend that each person with TB should have a thorough assessment for co-morbid conditions, which includes diabetes.[29] This is in recognition of the well documented association between the two conditions and the known impact of diabetes on TB treatment outcomes.[29] Referral, management and care of individuals with TB and diabetes is also emphasised, as screening or assessment is a necessary first step, but health care workers caring for those with TB are encouraged to go beyond screening to effective and evidence based management and care of these indivduals.[29]

Box 1: Standard 17 of the International Standards of TB Care

All providers should conduct a thorough assessment for co-morbid conditions and other factors that could affect tuberculosis treatment response or outcome and identify additional services that would support an optimal outcome for each patient. These services should be incorporated into an individualized plan of care that includes assessment of and referrals for treatment of other illnesses. Particular attention should be paid to diseases or conditions known to affect treatment outcome, for example, diabetes mellitus, drug and alcohol abuse, undernutrition, and tobacco smoking. Referrals to other psychosocial support services or to such services as antenatal or well-baby care should also be provided.

In addition to these international guidance documents, other national or regional recommendations are in place. These include the Pacific Standards to Manage Tuberculosis and Diabetes.[30] However, there is no guidance on TB-diabetes bi-directional screening in Australia at the present time. Individual clinicians and nurses may be offering diabetes screening to individuals with TB based on clinical judgement and a risk assessment, however this is not standard practice in all jurisdictional settings across Australia, nor is it routinely recommended.

Conclusion

Tuberculosis and diabetes are strongly associated.[10] Diabetes heightens the risk of developing tuberculosis and also worsens TB treatment outcomes.[10, 11] Approximately 15% of global TB is attributable to diabetes.[3] In the Australian context, the association between TB and diabetes has been demonstrated,[26, 27] however rates of TB are low and therefore screening for TB among people with diabetes as part of routine diabetes care is currently not recommended. However, it is important to remember that diabetes is a risk factor for TB and for any person with diabetes who has symptoms suggestive of TB, referral for TB screening may be appropriate. Further, the currently available research indicates that for persons with diabetes and other risk factors for TB, screening for latent TB infection may be warranted. However, formal guidance on this is not available at the present time. For persons with TB, screening for diabetes is largely a clinical decision and more Australian evidence is needed to determine if this should be a part of routine TB care.

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Inaugural ADEA Fellow

ADEA is very excited to announce and congratulate the very first ADEA Fellow:

***Marita Ariola**, RN CDE FADEA*

Marita is a Diabetes Educator Clinical Nurse Consultant at Canterbury Hospital NSW.

Her experience and diabetes service management includes both outpatient and inpatient services specialising in Type 2 diabetes and GDM with multicultural clientele. Marita has been Canterbury hospital's only Diabetes Educator for 18 years. She initiated setting up the Diabetes Services, including various clinics for the hospital and the community. The population continues to grow in the area and the services are in high demand. After years of advocacy, Marita was successful in the approval of a proposal for another diabetes educator position in 2016.

Marita has been a member of ADEA since 1993 and a CDE since 2002.

About ADEA Fellowship

ADEA has introduced the ADEA Fellowship in 2017.

The ADEA Board has been making efforts to increase the value and recognition of CDEs, in line with the Strategic Plan, and having a Fellowship program that provides external recognition for expertise and contribution, through the use of post-nominal aligns with the current and new strategic plans.

The addition of ADEA Fellowship to membership awards is an opportunity for ADEA to identify and elevate the significance of the award and institute appropriate recognition. A gap was recognised by the ADEA Board for long term members with extensive experience, who may not have mechanisms that identify their achievements. The Fellowship category of membership is voluntary and provides recognition that is both individually and externally focused.

Fellowship benefits include:

- Recognition of expertise in diabetes leadership, education and management
- Certificate of recognition
- Post nominal (FADEA)
- Opportunity to present at a leadership forum at an ADEA Conference.

Members eligible to apply for ADEA Fellowship:

- continued CDE status for 15 or more years
- fulltime work in diabetes for the five (5) years preceding the fellowship application
- have the endorsement of two (2) CDEs, who have been CDEs for at least five (5) years and who have known the applicant for at least five (5) years and can verify their work in diabetes.

The ongoing recognition as a Fellow of ADEA will be dependent on the maintenance of the individual's CDE status.

To apply for recognition as an ADEA Fellow, please refer to the information on the ADEA website:
https://www.adea.com.au/about-us/membership-benefits/adea-fellowship/