Living with type 1 diabetes and an insulin pump: a qualitative insight

Abstract
This study aims to provide a qualitative insight into the experiences of people living with type 1 diabetes mellitus (T1DM) who use an insulin pump, and thus inform diabetes care practices including psychological support programmes.

Patients attending a specialist T1DM outpatient clinic were invited to share their experience of living with an insulin pump. Participants took part in either a semi-structured interview or a focus group, which were audio-recorded and transcribed. The data were analysed using a framework approach based on the Optimal Health Wheel comprised of six domains including Physical, Social, Intellectual, Emotional, Occupational and Spiritual values.

A total of 15 individuals participated in a semi-structured interview (n=7) or a focus group (n=8). Participants were aged between 20 and 60 years with a duration of pump use ranging from 7 weeks to 9.5 years; the majority were female (n=12). A total of 19 sub-themes were identified under the six Optimal Health Wheel domains.

It was concluded that the Optimal Health Wheel is a useful framework for qualitative data analysis. Its application synthesised some new themes (emotional–physical interplay, self-esteem and personality, and sense of self), as well as building on previously described themes such as self-management and the pump’s physical presence. These provide insight into the lives of people living with T1DM and an insulin pump. Copyright © 2018 John Wiley & Sons.

Key words
type 1 diabetes mellitus; T1DM; continuous subcutaneous insulin infusion; CSII; insulin pump; qualitative research; qualitative methods; Optimal Health Program

Introduction
LIVING WITH TYPE 1 DIABETES MELLITUS (T1DM) requires a comprehensive set of self-management strategies to deal with the myriad of challenges it presents in day-to-day life. In addition to the physical consequences, the mental health and wellbeing of people living with this condition may also be affected. An Australian study found that 28% of people with T1DM lived with severe diabetes-related distress.1 High rates of self-reported anxiety (27%) and clinical depression (12%) have also been reported, although these rates vary across studies.2,3 The association between diabetes and its psychological burdens appears to be a vicious cycle. Diabetes-related distress compounded by co-morbid depression amplifies the challenge of optimising glycaemic control.4 Therefore, the optimal management of T1DM must consider psychosocial wellbeing as part of usual medical care.

People with diabetes who are more informed and motivated are more likely to experience better glycaemic control and quality of life.5 Ritholz et al.6 demonstrated that active rather than passive participation in T1DM self-management was associated with improved glycaemic control. This active approach is harnessed by discussions with health care professionals (HCPs) and the identification of psychosocial issues such as mood, quality of life, social support and self-efficacy that may complicate T1DM self-management. These findings highlight the need for a comprehensive management approach, with a strong focus on identifying and managing the key psychosocial issues affecting people living with T1DM.

Continuous subcutaneous insulin infusion (CSII) therapy or the ‘insulin pump’ is emerging as a mainstay in the management of T1DM. However, there are limited studies examining the psychosocial aspects of this treatment approach. Two systematic reviews suggest a possible improvement in quality of life among people using CSII
therapy, though the results from individual studies were inconsistent and employed poor methodology. More recent research remains promising; for example Shaban et al. suggest CSII therapy decreases the disease burden irrespective of HbA1c. Qualitative research is also needed to identify the key psychosocial issues at play. The role of qualitative research in behavioural diabetes is now well established but the few published studies are largely focused in the UK, the USA and Sweden.

One of the first studies examining patients’ experiences of CSII therapy was a mixed-methods study by Garmo et al. which concluded that improved glycaemic control does not necessarily correlate with improved treatment satisfaction. Later studies explored themes linked to treatment satisfaction including, inter alia, a new-found freedom and flexibility with CSII therapy; the supportive role of family; a learning curve when transitioning from multiple daily insulin injections (MDII); technology dependence; and new challenges associated with the pump’s attachment to the body. The positives and negatives of CSII therapy were succinctly synthesised as both a lifeline and a shackles in a more recent study by Garmo et al.

Further understanding these psychosocial aspects of T1DM can help inform psychological support services including self-management programmes such as the Optimal Health Program (OHP). The OHP is a holistic wellbeing-focused self-management programme for people living with chronic illness and is proposed to be beneficial for people living with T1DM.

This qualitative study aims to provide an Australian insight into the experiences of people living with T1DM and the psychosocial impact of CSII therapy. It also aims to elicit the attitudes and perceptions of participants regarding their physical, psychological and social health. This knowledge could inform HCPs about the challenges for people living with T1DM and the CSII therapy, as well as provide a basis for a holistic approach to optimising care.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
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<tbody>
<tr>
<td>Documentation</td>
<td>Each analytical stage was clearly recorded for transparency</td>
</tr>
<tr>
<td>Researcher triangulation</td>
<td>The second author (CO) independently reviewed the transcription, coding and thematic analysis stages for consistency and accuracy. All research assistants provided feedback on the interpretations, arriving at congruence</td>
</tr>
<tr>
<td>Participant triangulation</td>
<td>Feedback on a preliminary version of the results was sought from a sample of participants to ensure accuracy. The themes were revised accordingly</td>
</tr>
<tr>
<td>Use of quotes</td>
<td>Participants’ quotes have been included as exemplars of each theme, providing evidence for the interpretation</td>
</tr>
<tr>
<td>Data saturation</td>
<td>Participants were recruited until the point where no new themes emerged. This was independently reviewed by the second author (CO)</td>
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</table>

Table 1. Strategies to ensure rigour

Research design and methods

Design

This study was part of a larger mixed-methods study aimed at assessing the mental health of people living with T1DM and the need for psychological support. Ethics approval was received from the St Vincent’s Hospital (Melbourne) Research Governance Unit (reference number LRR 060-12).

Recruitment

The study was conducted at a tertiary hospital in Melbourne, Victoria, Australia. During 2014 to 2016, eligible participants attending a specialist adult T1DM clinic who used CSII therapy were approached by a research assistant in the waiting room. They were invited to share their experiences of living with T1DM and using CSII therapy by participating in an interview or focus group. The T1DM clinic has approximately 200 patients aged between 18–80 years, with a mean age of 40 years. It is estimated that 23% of all attendees use CSII therapy.

Interviews

The focus groups were co-facilitated by a research assistant and a research psychologist. The interviews were facilitated by one of three research assistants. All three research assistants were final year medical students (two female, one male) who interviewed the participants they recruited. The same research psychologist (CO) and psychiatrist (DC) supervised all research assistants. All interviews and focus groups began with a demographic questionnaire and then comprised the same semi-structured format involving eight questions exploring the participants’ experiences of living with T1DM and CSII therapy (see Appendix 1, available online at www.practicaldiabetes.com). Each focus group and interview was audio recorded.

Analysis

An adaptation of the five-stage framework approach, as described by Smith and Firth, was used to analyse the data. Initially, the audio-recordings were transcribed and imported into the qualitative data software, Nivo (QSR International, Victoria, Australia). The lead author (DG) then undertook a process of data immersion which involved thorough familiarisation with all data. The transcripts were then coded based on an a priori framework, namely the Optimal Health Wheel. This was chosen by the authors because of its holistic consideration to optimising health comprising six domains, namely Physical, Social, Intellectual, Emotional, Occupational and Spiritual (as defined in Appendix 2, available online at www.practicaldiabetes.com). Thematic analysis was then applied to identify sub-themes for each domain. Themes were compared both within and across each transcript. In addition, the relationships between themes were explored until a succinct synthesis was concluded. A number of strategies were deployed to ensure rigour, as described in Table 1.
Results
A total of 15 participants were recruited; seven participated in a semi-structured interview and eight in a focus group. Participants were aged between 20 and 60 years with a duration of pump use ranging from 7 weeks to 9.5 years; the majority were female (n=12). The demographic data of the participants involved in this study and that of all patients of the T1DM specialist clinic are summarised in Table 2. The thematic analysis identified 19 sub-themes associated with the six domains of the Optimal Health Wheel (Figure 1).

Intellectual domain of optimal health
Diabetes education. Participants found that the transition phase from MDII to CSII therapy required a significant investment in time and resources to build on their diabetes knowledge-base and be comfortable with their new therapy. Carbohydrate counting was a new but important concept for many during this phase. It was also acknowledged that diabetes education was key to optimising self-management.

‘I mean once you learn all of it, it’s almost like re-learning diabetes again.’

This learning process involved engagement with a variety of resources including diabetes educators, doctors and dietitians, as well as workshops, diabetic support groups and pump manufacturers. Less formal means of education such as friends and researching the internet were also found to be informative.

‘We’ve got other supports through other people with diabetes, which is probably the best source of information.’

Diabetes insight. Participants described a journey of life-long learning whereby observing one’s condition allowed unique nuances to be learnt. This led to the realisation of new insights into their condition through a trial-and-error approach as well as reflecting on past experiences.

‘The learning curve, in terms of how quickly can I learn and adjust to things, [has] been the hardest thing in terms of finding out what I can and cannot get away with and how quickly I can learn to make sure that I’m okay with doing certain things.’

For some participants, embarking on CSII therapy and taking part in diabetes education facilitated a better understanding and a deeper insight into their life with T1DM.

‘I think I understand my diabetes a bit better now.’

Occupational domain of optimal health
Lifestyle freedom. Participants described the significant impact of T1DM on their lifestyle. However, CSII therapy was perceived to have a

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Participants</th>
<th>% Pump users attending T1DM clinic</th>
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</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>80%</td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–29 years</td>
<td>2</td>
<td>13%</td>
</tr>
<tr>
<td>30–40 years</td>
<td>8</td>
<td>53%</td>
</tr>
<tr>
<td>&gt;40 years</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td><strong>Time living with T1DM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>1</td>
<td>7%</td>
</tr>
<tr>
<td>10–25 years</td>
<td>6</td>
<td>40%</td>
</tr>
<tr>
<td>&gt;25 years</td>
<td>8</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Time living with pump</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 years</td>
<td>4</td>
<td>27%</td>
</tr>
<tr>
<td>2–5 years</td>
<td>4</td>
<td>27%</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>7</td>
<td>47%</td>
</tr>
</tbody>
</table>

Table 2. Demographic characteristics of participants and those attending the type 1 diabetes clinic.
positive effect, by improving freedom and flexibility, including ease with managing diabetes in social situations, fewer hypoglycaemic episodes when exercising, greater capacity to do household chores, improved employment performance and more confidence to travel.

'It gives me a large amount of flexibility with what I want to do. Being able to move around with a lot more ease if I'm out, or whether it's a day or a couple of days whatever the case may be, it's always on me.'

**Dietary flexibility.** For many participants, diet was a key focus of T1DM self-management. CSII therapy was found to promote greater flexibility with regard to food choices and timing of food consumption as well as making it easier for people with T1DM to dine out socially. It also resulted in less regulated administration of post-prandial insulin.

'You're much more flexible about food. If you don't have time for eating, it doesn't matter! You don't have a hypo because you didn't eat lunch at a specific time. That's really the main difference is the flexibility.'

**New restrictions.** Participants described new restrictions on their lifestyle since commencing CSII therapy. Female participants commented on difficulties with concealing the pump when wearing certain clothing. The pump's physical presence could prove obtrusive when exercising and many participants were frustrated that their choice of pump wasn't waterproof, especially when visiting the beach. Some of these restrictions were overcome by temporarily disconnecting the pump, although this created new challenges.

'When I go in the water, I just take [the pump] off. The only issue is that sand can get caught in it. I'm not going to get the sand out. I just tell my friends to go to the beaches with the bigger sand so it can't get caught in it.'

**Social domain of optimal health**

**Therapeutic relationships.** All participants appreciated their rapport and ease of access with HCPs and pump manufacturers. However, for many this was overshadowed by encounters with HCPs who failed to express empathy.

'We're humans first, diabetics second. We've all got jobs or families or whatever, and in speaking with my diabetic friends they won't tell their endocrinologist the full story because the endo doesn't look at the issues of balancing diabetes amongst life. They just go “bad diabetic.”'

**Personal relationships.** The vital role of family and friends in supporting someone living with T1DM was acknowledged. Often family and friends make many sacrifices and share the burden or responsibility of living with a chronic illness. In times of need or ill health, these relationships acted as a safety-net because many participants felt vulnerable.

'Mum would come and check on me if she thought there was something wrong and I wasn’t awake at my normal hour or something, so it was kind of like that safety-net.'

**Communal relationships.** Many participants took comfort in being able to share their experiences with others who live with T1DM. These relationships not only provide support and information but the relatability provided reassurance. Communal relationships often originated through diabetes organisations or attendance at diabetes camps as a child. The opportunity to attend a camp was frequently mentioned as a very valuable experience (n=15).

'Being around other people that were all the same as you. That really helped hone in that you’re not the only one out there.'

**Society.** Interactions with society often provided a source of frustration for participants because they felt there was a general lack of understanding of T1DM and many people are quick to make judgments or offer presumptuous advice. There were also differing levels of societal acceptance of pump use. Many participants described instances of annoyance when T1DM was conflated with type 2 diabetes mellitus (T2DM), which brought issues of stigmatisation.

'Another thing that really annoys me is the way people say “diabetes” and that there’s no distinction. And you’re like I didn’t do this to myself! I didn’t overeat. I exercised and everything. I didn’t cause this!'

**Emotional domain of optimal health**

**Mental burden.** Living with T1DM took a toll on participants’ emotional health and wellbeing. The impact of the pump is multifaceted and complex. In some instances, it relieves the stress of essential yet constant self-management, but it also acts as a source of frustration when faults occurred. For three participants, the mental burden of living with T1DM was perceived to contribute significantly to a period of depression.

'I went through a stage of really bad depression about four years ago and that was quite hard. But I think that was also a bit of just being over having to do everything all the time, every day.'

Participants’ perceptions of the mental burden associated with T1DM changed through different stages of their journey. When commencing CSII therapy some participants described the need to be emotionally prepared in order to cope with the change in self-management. Additionally, participants struggled during the transition phase from parental care to independence with self-management.

'[You] definitely have to be mentally ready to wear something 24 hours a day and have a constant reminder of your diabetes.'

**Emotional–physical interplay.** There were many reports of the strong link between emotional and physical health. Participants noticed the influence of variations in glycaemic levels on mood.

'When I’m low I get really grumpy.'

However, there was a reciprocal relationship whereby fluctuations in mood can also influence glycaemic control.

'The effect of the emotions – like I said about my brother being institutionalised and every time I went to see him I would have the worst hypo. If I ever had a really emotional family time like a death in the family or something like that [it] just wreaks havoc.'

Most participants expressed an improved sense of wellbeing since commencing CSII therapy, which was
thought to originate from the administration of a basal rate of insulin.

‘You’ve got the medication going in the whole time so you’ve got that baseline there, so you feel better on the whole.’

Self-esteem and personality. Participants reported that living with T1DM has a significant impact on their self-esteem by being conscious of feeling different from others.

‘I used to look at myself like damaged goods. And would expect people to expect, not less from me, but I wouldn’t expect as high from people I had in my life because of it. So I’d hang out with idiots who’d treat me like rubbish because [I thought] I don’t really deserve [any better].’

One interviewer made explicit observations on participants’ personality and commented on their apparent strong-will and confidence. These observations were also supported by a participant’s own reflections of her personality. CSII therapy also had an influence on her way of dealing with life stressors.

‘Everyone who knew me before I got a pump noticed a huge difference. My mum said to me “I’ve finally got my daughter back” because when I got [the pump] my whole personality, everything changed. You’re just so moody from [your blood glucose level] being up and down.’

Fear of complications. Many participants felt vulnerable compared to the general population and described a fear of hypoglycaemic episodes, pump malfunctioning and diabetic complications.

‘I have a fear of losing my legs whenever I get a cut.’

Spiritual domain of optimal health
Sense of self. When considering whether to embark on CSII therapy, participants gave much thought to the prospect of being constantly connected to and dependent on technology. This instigated the reconceptualisation of their self-concept to incorporate the pump as an appendage of the body. For some participants, they felt defined by their T1DM when using the pump because it acted as a constant visual and tactile reminder. Other participants felt more frequently reminded of their condition when using MDII because of the conscious effort it required.

‘I went through a stage where I really hated [the pump]. It being on my side all the time was like I had to carry a little robot to stay alive. That really annoyed me, but I got over that quite fast.’

Many participants acknowledged that they felt different from the general population. Despite this, they strived for a sense of normality; the pump assisted in this quest by reducing the conscious effort required for self-management allowing participants to forget about their condition at times.

‘[The pump has] given me a feeling I’m not a diabetic.’

Perspectives and mindset. Most participants were very accepting of their T1DM diagnosis, although they described times in their past when this had varied. Often during their youth, participants reported they felt a need to rebel against the restrictions of living with T1DM. They acknowledged that their attitudes towards T1DM influenced their self-management. Yet, there was an underlying stoicism during trying times.

‘[Diabetes] is restrictive, it’s annoying, but there’s nothing you can do about it. You just got to get on as best you can really.’

Future outlook. There were many variations among participants’ future outlook. However, CSII therapy generally brought more hope and made the future look much brighter than previously.

‘I feel that [the pump] has given me a lot more hope for the future, [now] that I have better control.’

Physical domain of optimal health
Self-management. The self-management of T1DM was viewed as a crucial yet burdensome necessity. It was perceived as requiring much attention, at the least including frequent blood glucose testing and the administration of insulin. This self-management is further complicated by the dynamic state of T1DM.

‘In my instance it seems nothing is ever quite stable. It’s not like you ever set and forget. You need to tweak the allowances. What works for six months may not work for the next six months.’

However, participants explained that CSII therapy made self-management significantly easier and it was more achievable to optimise their glycaemic control. Other subjective benefits of the CSII therapy included improved ability to lose weight, less bruising, and reduced pain. It also shifted the control paradigm whereby pump users reported to gain power in the management of their T1DM.

‘You’re in control of it instead of [the condition] being in control of you.’

Pump therapy. The decision to embark on CSII therapy considered a number of factors including the need to be constantly connected to technology, recommendations for pregnancy, and the ability to improve glycaemic control and minimise the risk of developing diabetes complications. However, participants acknowledged that there is no one-size-fits-all approach for optimal therapy and the pump is not suitable for everyone. They also commented on a number of barriers to accessing pump therapy including cost, private health insurance bureaucracy and living in rural areas.

‘I’ve got a group of four friends who are all diabetic and one of them is on [MDII] still. She gets really good sugar levels on that. She’s not keen on changing because it suits her really well. I think she even gets better sugar levels than what I do sometimes.’

Many participants expressed the desire to realise future developments in technology and overcome some of the challenges that the pump created, including visibility issues, technology failures and scarring. There was a general enthusiasm for newer technologies such as continuous glucose monitoring. Participants also suggested areas of improvement including reduced size, waterproofing, improved usability and multi-device connectivity.

Additional health challenges. Participants frequently recalled their experiences of hypoglycaemic episodes and diabetic complications. However, CSII therapy helped to stabilise glycaemic control and reduce the frequency of the hypoglycaemic episodes. Having said this, many participants were still expectant of diabetic complications.

‘The other thing is you could do everything perfectly, have great control,
and still suffer eye damage, heart attacks and cancers that are more predominant in the disease.’

The relationship between T1DM with hormones and pregnancy was raised by a number of participants. CSII therapy was perceived as beneficial in controlling the impact of these factors on glycaemic control.

‘I think it was really good during my pregnancy. During the pregnancy you change your rates a lot. So it was really handy.’

The participants realised that they were not exempt from other health issues. Many spoke about their need to juggle their T1DM with other health conditions and the difficulties that this created.

‘My HbA1c have never hit what they were prior to coeliac disease.’

Discussion
This study highlights many of the benefits of CSII therapy over MDII therapy, yet it is not without its flaws. All participants concluded that CSII therapy significantly reduced the self-management and psychosocial burden of living with T1DM. Despite being a biased sample with all participants being current pump users, these benefits appear to outweigh the negative aspects and this is why it is thought that discontinuation rates of CSII therapy are low.19

The psychosocial benefits, in addition to previously established improved glycaemic control, provide convincing motivation for people living with T1DM to use CSII therapy. However, the reasons to make the transition to pump therapy are not widely published. This study suggests that they incorporate a range of factors such as poor glycaemic control with MDII, HCP persuasion and improved tolerability, with additional health issues including pregnancy. Once the decision has been made to transition, there is an intensive education phase. This phase presents an opportunity for people living with T1DM to gain a more comprehensive understanding of their condition. This information may be empowering enough to realise improved quality of life and better glycaemic control without the need to transition to CSII therapy.

Despite widely published evidence that CSII therapy significantly improves glycaemic control, not all participants in this study perceived such improvement.8 Everett et al.20 examined the barriers to improving glycaemic control and suggested that the fear of a hypoglycaemic episode was the most significant limiting factor. This fear is compounded by additional vulnerabilities including low self-esteem and body image issues.21 Despite these vulnerabilities, our study concluded that the participants were generally very accepting of their T1DM, and it has been suggested that better acceptance of their condition is correlated with improved glycaemic control.9

People living with T1DM clearly value the role of the support team that surrounds them, including HCPs, family and friends. In fact, family and friends often share the burden of living with T1DM.22 However, the relationship with society is not as positive, with issues of sharing the stigmatisation of T2DM, a lack of T1DM understanding and a tendency to offer presumptuous advice.23 Many participants spoke about educational activities during their schooling which aimed at breaking down these misconceptions among peers, yet they still described demeaning experiences from teachers and peers. Additionally, there is significant variation in the levels of acceptance of pump use in the general population ranging from indifference to hostility.24 Therefore, there is a need for further strategies and interventions in order to combat these negative conceptualisations. Arguably, pump manufacturers have an important role to make CSII therapy more socially understood.

Participants’ interactions with HCPs also had some negative aspects. It was disappointing to learn of these experiences which were largely due to a lack of empathy, patient-centred care and a holistic approach to the management of T1DM.

Many participants spoke about feeling emotionally vulnerable which led them on a lifelong quest for a sense of normality. This phenomenon has been commented on in previous research.16,21,25 The pump appears to assist with this quest by reducing social vulnerability and learning to accept one’s self. However, some participants described new emotional challenges such as the permanent attachment to the pump. Psychological support strategies are important in overcoming these vulnerabilities and challenges.

This study employed the Optimal Health Wheel as a novel framework of qualitative data analysis. It was chosen for its holistic approach to health and translatability to use in self-management programmes, as previously demonstrated, for other chronic diseases.17,20–29 This study provides additional evidence to the findings of Ritholz et al.30 for the role of self-management programmes in diabetes. Such programmes can be used as an opportunity to discuss active approaches to self-management and coping strategies to deal with the psychosocial burden of living with T1DM.

The implementation of self-management programmes and psychological support in the management of T1DM is still poorly established, particularly compared to T2DM. This is in part due to the large number of interventions available, the difficulty in establishing which components of the varied interventions might indeed be beneficial, and what outcomes capture both physical and psychosocial measures. There exists some promising evidence for these interventions.29 However, a review by Harkness et al.30 failed to identify any specific intervention that showed improvement across both physical and mental health. Therefore, the development of such interventions remains a challenge, despite the need for a psychosocial approach to the care of people living with T1DM. Some isolated studies have shown promising results and these should be encouraged.31

Limitations
Three different interviewers facilitated the focus groups and interviews in this study. In order to ensure consistency across interviewers, similar training was provided and the same question schedule was used for all focus groups and interviews. Despite this, there may be differences in interview style. Furthermore, the semi-structured interview schedule has the potential to limit the ability to gain a true and thorough appreciation of participants’ experiences.
While the gender ratio of participants was similar to that of all CSII therapy users attending the targeted clinic, there appeared to be bias towards the 30–40-year-old age group. This may have changed the focus of the sub-themes. For example, childbearing was a recurrent topic mentioned in this study.

**Future directions**

This study has highlighted a need for psychological support services as part of routine care for those living with T1DM and using an insulin pump. Future research should be focused on building additional evidence for these services including self-management programmes. Furthermore, the findings of this study can be used to tailor the Optimal Health Program for use in people living with T1DM. The themes of such programmes should be a core part of continued education for HCPs working in diabetes care.

This study outlines a number of key pump design suggestions and improvements, which should be used to inform pump manufacturers on future technological developments in order to improve user-friendliness. More qualitative studies exploring the practicalities of pump use, such as that undertaken by O’Kane et al., should be encouraged.

The psychosocial impact of newer technologies in the treatment of T1DM, including continuous glucose monitors, should not be forgotten. Therefore, further qualitative studies, such as this one, must be carried out to examine the psychosocial repercussions. In particular, future studies should look at differences between rural and metropolitan experiences and how perceptions of CSII therapy change with time. There should also be efforts made to explore why people discontinue CSII therapy, which is a cohort not captured in this study.

**Conclusions**

This study has successfully utilised the Optimal Health Wheel as a framework for qualitative data analysis. We identified 19 key themes, which provide insight into the lives of people living with T1DM and an insulin pump. These themes are consistent with, and add to, the limited research in this field. These concepts should be at the forefront for all HCPs who care for pump users in order to provide a holistic approach to their care and optimise their management. People living with T1DM should also be informed about these themes when considering CSII therapy, as the decision involves balancing quality of life concerns with improved glycaemic control. Furthermore, our findings are invaluable in the development of psychological support programmes in order to improve both glycaemic control and general well-being of people living with T1DM.

**Acknowledgements**

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**Declaration of interests**

There are no relevant conflicts of interest to disclose. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**References**

References are available online at www.practicaldiabetes.com.
References


Appendix 1. Interview schedule

1. Tell me about your experience of living with type 1 diabetes and using an insulin pump.

2. What was your experience in making the transition from using injections to the pump?

3. Tell me about how your day-to-day lifestyle changed using the insulin pump compared to daily injections.

4. What is your future outlook for your health and overall wellbeing?

5. Tell me about your experience where your management has gone off track.

6. What have been some of the hardest things to cope with so far whilst you’ve been living with diabetes?

7. What have been some helpful supports that you’ve had throughout different stages of your diabetes?

8. Is there anything else you’d like to add?

Appendix 2. Definitions of the 6 domains of the Optimal Health Wheel

- **Social.** This involves the relationships with family, friends and other people in the wider community that we interact with from day to day. It considers not only the quantity of relationships but also the quality of our interactions with others. This area considers our level of comfort and ability to assess resources in the community.

- **Emotional.** This area recognises awareness and acceptance of our feelings. It involves the capacity to manage our feelings and related behaviours including the ability to manage stress.

- **Intellectual.** This area relates to our ability to think, concentrate, learn and solve problems. It recognises the need for mental stimulation and challenge in daily life to learn and develop our understanding of ourselves and the world we live in.

- **Occupational.** This area not only includes work (paid or voluntary) but involves all of the things that we do to occupy our time including looking after ourselves, family and home and participating in leisure activities/hobbies or study. It includes choosing activities that are consistent with our values, interests and goals and achieving a balance between these activities that maintain our health.

- **Spiritual.** This area considers the meaning and purpose of our lives and how consistent our actions are with our beliefs and values. It may or may not include identification with a common belief system or faith.

- **Physical.** This involves taking an active role in maintaining our physical health and choosing behaviours that promote health. It involves being aware of what physical illness we are vulnerable to and looking out for early warning signs that indicate we might become unwell.

Appendix 2. Definitions of the 6 domains of the Optimal Health Wheel (cont.)

- **Physical.** This category involves the relationships with family, friends and other people in the wider community. It considers not only the quantity of relationships but also the quality of our interactions with others. This area considers our level of comfort and ability to assess resources in the community.

- **Emotional.** This area recognises awareness and acceptance of our feelings. It involves the capacity to manage our feelings and related behaviours including the ability to manage stress.

- **Intellectual.** This area relates to our ability to think, concentrate, learn and solve problems. It recognises the need for mental stimulation and challenge in daily life to learn and develop our understanding of ourselves and the world we live in.

- **Occupational.** This area not only includes work (paid or voluntary) but involves all of the things that we do to occupy our time including looking after ourselves, family and home and participating in leisure activities/hobbies or study. It includes choosing activities that are consistent with our values, interests and goals and achieving a balance between these activities that maintain our health.

- **Spiritual.** This area considers the meaning and purpose of our lives and how consistent our actions are with our beliefs and values. It may or may not include identification with a common belief system or faith.

- **Physical.** This involves taking an active role in maintaining our physical health and choosing behaviours that promote health. It involves being aware of what physical illness we are vulnerable to and looking out for early warning signs that indicate we might become unwell.