

What are the practical complications people face when using insulin pumps?

In this section, a panel of multidisciplinary team members give their opinions on a recently published paper. In this issue, we investigate the practical issues of insulin pump therapy.

Nonmetabolic complications of continuous subcutaneous insulin infusion: a patient survey.

Pickup JC, Yemane N, Brackenridge A, Pender S (2014) *Diabetes Technol Ther* 16: 145–9

Diabetes Technol Ther

Non-metabolic complications of pump therapy

1 To understand the non-metabolic complications faced by people with T1D when using an insulin pump (continuous subcutaneous insulin infusion [CSII] therapy), the authors distributed standardised questionnaires in a UK insulin pump clinic for people with T1D to complete.

2 The questionnaire was self reported and asked for demographic details of the individual, pump manufacturer and insulin type used, infusion set and site problems, pump malfunctions,

frequency of complications and patient-related problems. There were open-ended questions and a free text section to give the participants an opportunity to expand outside the remit of the questions.

3 Ninety-two people who received CSII therapy for ≥ 6 months completed the questionnaire and were included in the analysis. The median length of time for CSII use was 3.3 (0.5–32.0) years and mean age of participants was 45.3 years. The mean duration of infusion set use was 3.2 ± 0.7 days.

4 The most common infusion set problems reported were kinking (64.1%) and blockage (54.3%).

5 The commonest infusion site problem was lipohypertrophy (26.1%), which occurred more often in those with a long duration of CSII use ($P=0.01$). In total, 17.4%

reported site infections.

6 Technical pump malfunctions occurred in 48% of individuals (43% in the first year of using CSII).

7 Most participants reported no change in their weight since using CSII therapy (51%).

8 Three people reported psychological issues as a result of CSII in the free text section. These included the pump reinforcing the presence of diabetes as a long-term condition and being bulky and difficult to conceal under clothes and swimwear, and the individuals being concerned about weight gain.

9 Most problems occurred during the first year of CSII use; however, problems with the insulin pump, infusion set and site were common after the first year, highlighting that improvements in their reliability continues to be required.



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When faced with a decision to prescribe a pump to an individual with diabetes, it is important to consider whether the pump will provide sufficient flexibility to meet the individual needs of the person and how it will effect their lived experience compared to insulin injections. The article by Pickup et al raises some interesting points about the use of technology for the treatment of type 1 diabetes by surveying individuals who use insulin pumps about their experiences.

With regard to the study itself, the overwhelming majority of Medtronic (Northridge, CA, USA) pump users (84.8% of participants) in the cohort and the arbitrary definitions of “frequent” for set-kinking and blockage make the results difficult to interpret, and the self-reported, retrospective data from a convenience sample of adults with type 1 diabetes at one clinic are also problematic. However, this should not detract from the importance of

examining the broader lived experience of pump therapy.

The quality of life benefits associated with insulin pump therapy compared with multiple daily injection therapy are widely reported (Nicolucci et al, 2008). These benefits include greater flexibility in lifestyle, increased freedom associated with food and greater perceived control over diabetes. Yet as technology advances and insulin pumps become “systems” with more and more additional features, the opportunity exists to fine-tune the use of these devices to better fit personal preference, lifestyle and greater control.

In the NHS, we take a very traditional medical model approach in the management of diabetes (type 1 and type 2); however, this is juxtaposed with the effective management of chronic conditions, where healthcare professionals are reliant on the behaviours of their patients for optimal outcomes. A paradigm shift to a holistic model providing tailored, personalised healthcare is long overdue (Barnard et al, 2014). Perhaps then,

people will be able to choose the insulin pump that best fits their individual needs, whether that be a standard pump, a sensor-augmented pump or pump system with handheld gadgetry.

The “important unanswered question” of the paper by Pickup et al (whether contemporary pump technology is more reliable and associated with fewer complications than early continuous subcutaneous insulin infusion) is, I suggest, somewhat erroneous. Perhaps the important unanswered question is whether contemporary pump technology is fit for purpose in an ever-changing technological landscape where continuous

glucose monitoring technology has improved significantly and the promise of closed-loop devices hovers ominously on the horizon. Can contemporary insulin pumps facilitate optimal diabetes management for people with very different lifestyles, different expectations and different approaches to their diabetes self-management? ■

Barnard KD, Lloyd CE, Dyson PA et al (2014) Kaleidoscope model of diabetes care: time for a rethink? *Diabet Med* **31**: 522–30

Nicolucci A, Maione A, Franciosi M et al (2008) Quality of life and treatment satisfaction in adults with type 1 diabetes: a comparison between continuous subcutaneous insulin infusion and multiple daily injections. *Diabet Med* **25**: 213–20



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Insulin pump therapy is now recognised as a safe, effective treatment for diabetes, and is associated with improved glycaemic control compared to other modes of insulin delivery, a decreased risk of hypoglycaemia and no increased risk of diabetic ketoacidosis (Pickup et al, 2008). However, it is a more complex therapy method than multiple daily injections and, therefore, there is potential for non-metabolic problems to adversely impact on the user’s experience of using a pump.

From their clinic, Pickup et al surveyed 92 people with diabetes who had been on pump therapy for at least 6 months. Issues with the insulin infusion sets (particularly kinking and blockage) and pump malfunctions, which affected 48% of participants, were identified.

These findings are consistent with our experiences as healthcare professionals in a busy pump service, although in our local audits the main concern for our users was site infection, with redness at the infusion site a relatively common complaint, rarely progressing to abscess formation (Dudley and Hammond, 2002). Those who had experienced this complication recognised that it was related to complacency with managing their infusion sets. They were probably being less scrupulous with hygiene when inserting the infusion sets, and were certainly leaving the infusion

sets in for longer than the recommended 3 days. In their article, Pickup et al report that infusion sets were left in place for an average of 3.2 days, ranging from 2 to 6 days.

Despite any perceived problems with the pumps, users are generally not persuaded to return to multiple injection therapy; in the National Pump Audit, only 2% of those who started on pump therapy had stopped using it (Weston, 2014). Therefore, to minimise the impact of adverse events associated with using an insulin pump by avoiding them in the first instance, users need to be educated to maintain scrupulous hygiene, to change the infusion sets at most every 3 days, and, if blockages occur, to consider switching to insulin aspart if not already using it. They should also know what to do should these events occur, i.e. insert a new infusion set, switch back to injection therapy, or call their pump company’s technical helpline. In this way user satisfaction and safety will be preserved. ■

Dudley S, Hammond PJ (2002) Safety aspects of insulin pump therapy. *Diab Med* **19** (Suppl 2): A50

Pickup JC, Sutton AJ (2008) Severe hypoglycaemia and glycaemic control in type 1 diabetes: meta-analysis of multiple daily injections compared with continuous subcutaneous insulin infusion. *Diabet Med* **25**: 765–74

Weston P (2014) National Insulin Pump Audit: adult data. Presented at: *Diabetes UK Professional Conference*. Liverpool, UK, 5–7 March

A patient’s perspective



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In an attempt to answer the question above, and having read and re-read the article a number of times, I kept coming back to the “lived experience” as a theme for my perspective.

From a personal perspective, I can honestly say that I have had very few

issues living with my current insulin pump for the last 2 years, so I took the opportunity to canvas some friends and ask for their shared experiences; between us we have over 50 years of experience living with continuous subcutaneous insulin infusion (CSII).

“Yawn” – Now, do I dare stretch before checking where the pump is and

how taut the tubing is? If you wear a pouch this is less of an issue (however, still a consideration) but if you let your pump “go commando”, then every morning there is a quick check before you move so that the morning stretch doesn’t turn into a morning full set change too! So, pump secure, tubing free – stretch, and on with the day!

It is only when you break down what have become ingrained daily habits that you start to be able to ask the question “is that a complication?” The paper by Pickup et al covers perfectly adequately the measurable faults (kinks and blockages) but doesn’t address the wider livability issues of CSII.

Every shower, every bath, every swim, every rub down with a towel and every change of clothes is a potential minefield of ripped out cannulas, stretched tubing, and pumps pulled out of pockets and dropped on the floor – let alone down the toilet! However, these sort of things become the background noise to the daily lived experience, and it is only the rare complete disaster that is even noticed once one has become accustomed to the “routine” of pump-life. In no particular order, the main practical challenges that I have found are:

- The volume of spare parts that need to be carried every time you leave the home (cannulas, sets, insulin, batteries, caps, etc.).
- Being inventive in finding fresh infusion sites to prevent lipohypertrophy.

- Ongoing training and education (e.g. hints, tips and hacks for living with a pump).
- Door handles!
- Learning how to dress and undress, and wash, bathe and shower with a cannula and pump as a companion.
- Sports and exercise.

The psycho-social elements of using CSII for the management of type 1 diabetes cannot be underestimated. The Lubben Social Network Scale, which was specifically designed to measure social isolation by measuring perceived social support, shows that low scores are correlated with mortality, all-cause hospitalisation and depression (Lubben and Gironda, 2004). Among a small group of CSII users, it would perhaps not be surprising if most of them did not know another person with both type 1 diabetes and who uses a pump. Creating opportunities for people to share their lived experience has value beyond measure. Therefore, the opportunity to discuss with others with and without diabetes who “get it” is a rare treat – something that is available at the Diabetes Online Community (visit www.gbdoc.co.uk for more details). ■

Lubben J and Gironda M (2004) Measuring social networks and assessing their benefits. In: Phillipson C, Allan G, Morgan D (eds). *Social networks and social exclusion: Sociological and policy perspectives*. Ashgate Publishing Limited, Hampshire: 20–35