BOX 1. POSITIVE AND NEGATIVE ASPECTS OF CONTINUOUS SUBCUTANEOUS INSULIN INFUSION

**Positive**
- The basal rate on a pump can be adjusted on an hourly basis, which can match the actual background insulin an individual requires.
- During periods when more insulin is needed in the background, for example during times of stress or illness, the basal rate can be increased on a temporary basis.
- The basal rate can be temporarily decreased to match reduced insulin demands during exercise and alcohol consumption.
- Meals can be omitted giving the individual complete dietary freedom and flexibility.
- Blood-glucose levels are more predictable and both high and low values are easier for the pump user to self-treat.
- The individual can enjoy a more spontaneous and flexible lifestyle.

**Negative**
- The pump and consumables can be costly.
- Intensive experienced professional manpower is required to educate and support the patient.
- The pump may be considered a visible reminder of an individual’s diabetes as he/she must be connected to it for approximately 23 out of 24 hours each day.
- Some pump users (particularly women) worry about the pump spoiling the line of their clothes.
- Some individuals do not like to rely on technology.
- There is a frequent need to perform home blood–glucose monitoring.
- The amount and type of carbohydrate intake must be closely considered, along with the general composition of the food/meal to be consumed so an appropriate bolus dose of insulin can be calculated.
- There is an increased risk of diabetic ketoacidosis if elevated blood–glucose values are not aggressively dealt with by the pump user.
- Patients need an intensive education programme and ongoing review.
- Individuals need to carry spare supplies.


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**Software**

Modern pumps have software packages incorporated within them, which can help users make appropriate calculations of bolus doses of insulin, when used correctly. Some pumps can be linked to a continuous glucose monitoring (CGM) sensor, which will pass information about a user’s current blood–glucose level to the pump. These sensors can be inaccurate, however, so it is vital that users test their blood–glucose level using a fingerprick test before taking action based on the result from the sensor. Using CGM does not mean users no longer have to make proactive decisions about their diabetes management; the technology is not sophisticated enough to act as a “closed loop” system or artificial pancreas. At present, CGM use is neither supported by NICE guidance nor funded by the NHS, except in exceptional cases.

**Patient suitability for CSII**

Selecting individuals for CSII can be controversial. Even with modern pumps and intensive education programmes, it is not the treatment choice for everyone. Some of the indications that it may be appropriate are described below, but these are not comprehensive and it is vital that all prospective users are assessed by a multidisciplinary team that is experienced in CSII.

In my clinical practice the initial assessment appointment for CSII can take over two hours. The positive and negative aspects of using a pump are summarised in Box 1.

**Positive indications for CSII**

Insulin pump therapy can be helpful for people who experience glycaemic instability despite an optimised insulin regimen, and have a high level of self-care in diabetes management. Such circumstances include:
- Wide glycaemic fluctuations;
- Frequent hypoglycaemia;
- Unawareness of hypoglycaemia;
- Individuals who need greater lifestyle flexibility, for example shift workers;
- Dawn phenomena – this is caused by the release of a growth hormone between 3am and 9am and requires higher doses of insulin to accommodate; this can be factored into the user’s basal rate automatically to prevent a dawn rise in glucose;
- Complications of diabetes, such as gastroparesis (reduced gastric emptying) and severe neuropathy;
- Malabsorption syndromes; and
- Planning conception, pregnancy and breastfeeding (Sharma et al, 2011; Pickup, 2005; Bolderman, 2002; Pickup et al, 2002).

**Negative indications for CSII**

Individuals for whom insulin pump therapy may not be a suitable treatment choice include those who:
- Do not work in partnership with health professionals;
- Use their diabetes to manipulate situations, family, friends and health professionals;
- Experience frequent episodes of diabetic ketoacidosis;
- Have adherence issues or inadequate motivation to manage their diabetes;
- Have significant psychological or mental-health issues, which impact on their ability to manage their diabetes;
- Are not currently using an optimised insulin regimen;
- Have inappropriate self-care of their diabetes management;
- Show evidence of infrequent blood–glucose testing (Pickup, 2005; Bolderman, 2002).

To obtain NHS funding, prospective pump users must meet NICE (2008) criteria, which only support the use of insulin pump therapy for individuals with type 1 diabetes. NICE (2008) also indicates the situations in which this therapy should be withdrawn.

**The advantages of CSII**

To ensure that prospective pump users can make an informed choice about their diabetes management, it is essential they are aware of both the advantages and disadvantages of treatment options (Department of Health, 2001).

The main benefit of insulin pump therapy is that it is a precision delivery tool. Insulin is delivered as an individualised continuous infusion with extra bolus doses to cover meals and correction doses (Walsh and Roberts, 2006). It gives people with diabetes an opportunity to fully participate in their own self-care because they can make decisions and adjustments about aspects of the regimen on a movement–to–moment basis (NHS Technology Adoption Centre, 2011).