Technology

The value of protocols and checklists for perioperative and peripartum use of CSII

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As use of insulin pump therapy becomes increasingly common in the UK, with almost 5% of those with type 1 diabetes now using continuous subcutaneous insulin infusion (CSII; NHS Diabetes unpublished data) the report from the Mayo Clinic, Arizona (Boyle et al, 2012; summarised alongside), on a protocol for using CSII in surgical patients, is timely. Once confidence with pump therapy is established, it is likely that teams will consider extending the use of CSII to the inpatient setting.

In our experience, the first area of the hospital to take an interest in pump therapy was the labour ward, and to date we have had approximately 50 women who have completed pregnancy on an insulin pump – all of whom remained on the pump throughout the peripartum phase. As a consequence, anaesthetic colleagues became more aware of CSII therapy and, after appropriate training, pump users undergoing short elective surgical procedures were maintained on CSII throughout the intraoperative period.

As Boyle et al emphasise, CSII should be discontinued in those who are acutely ill and are likely to benefit from intravenous insulin to tightly control blood glucose levels.

In other inpatient settings it is reasonable to consider continuing CSII therapy provided that adequate protocols are in place and the staff have been appropriately trained. The authors are quick to point out that they are not necessarily advocating the use of CSII perioperatively, as there is no evidence base to support or reject its use in this setting. The nature of the clinic where they are based means that the protocol has been designed for adult surgical settings. In addition, the authors have identified metrics to be recorded in individuals continuing CSII during surgery, several of which appear designed to aid reimbursement for the interventions required to support CSII at this time. Nevertheless, the protocol provides useful guidance that should act as a memory aid for patients, diabetes teams, ward teams, surgeons and anaesthetists.

> ***"This paper is not ground-breaking, but the pragmatic, common-sense advice is likely to be of benefit to any unit wanting to use pump therapy in inpatient areas, such as surgery."***

Specific issues raised, which could be potentially overlooked, include siting of the infusion set, and the effect of intraoperative radiology and electrocautery. A useful perioperative insulin pump checklist is provided, and this could be tailored to particular institutions and different settings, such as the labour ward. We have found similar pre-admission and labour ward checklists very useful in making sure that our pregnant pump users are able to continue CSII effectively during the peripartum period.

This paper is not ground-breaking, but the pragmatic, common-sense advice is likely to be of benefit to any unit wanting to use pump therapy in inpatient areas, such as surgery.

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Guidance for perioperative use of CSII therapy

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓

1 There is a lack of guidance on CSII use while the pump user is undergoing an operation.

2 A multidisciplinary working group reviewed the literature regarding the use of CSII in the perioperative period with a view to developing guidelines to standardise care.

3 There is a paucity of safety data on CSII use in the perioperative period.

4 The group's aim was not to advocate for or against perioperative CSII use, so these data were not reviewed.

5 The group identified a number of safety issues justifying the need for guidance, including a lack of standardisation of care, challenges presented by different surgical scenarios and movement of the patient disconnecting the insulin pump.

6 Despite the number of different clinical scenarios, the group developed a set of standardised guidelines and a checklist, and decided that CSII use perioperatively was feasible.

7 The group recommend that each hospital should develop a policy outlining clear procedures for CSII use during surgery.

8 The guidelines emphasise the importance of education of all staff involved in an insulin-pump user's care and of sharing the decision to use CSII perioperatively with the user.

Boyle ME, Seifert KM, Beer KA et al (2012) Guidelines for application of continuous subcutaneous insulin infusion (insulin pump) therapy in the perioperative period. *J Diabetes Sci Technol* **6**: 184–90

DIABETIC MEDICINE

Time lag and accuracy of glucose sensors during falling versus rising glucose levels

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The lag between subcutaneous glucose sensor readings and blood glucose levels can be problematic for people with T1D, because it may not alert them to a rapidly falling blood glucose level.

2 The authors of this analysis looked at glucose fluctuations from 95 data segments, during which very frequent reference blood glucose monitoring had been performed.

3 After exclusion of data segments with substantial sensor error, 72 data segments were analysed (36 for rising glucose and 36 for falling).

4 Lag was measured in two ways: the time delay at the vertical mid-point of the glucose change (regression delay) and the optimal time shift required to minimise the difference between glucose sensor signals and blood glucose values drawn concurrently (shift optimisation).

5 The regression delay analysis produced a mean sensor lag of 8.9 minutes (95% confidence interval [CI], 6.1–11.6) for rising glucose levels versus 1.5 minutes (95% CI, –2.6 to –5.5) for falling ($P<0.005$).

6 The shift optimisation method produced similar results with a lag that was longer for rising than for falling segments (8.3 minutes [95% CI, 5.8–10.7] vs 1.5 minutes [95% CI, –2.2 to –5.2]; $P<0.001$).

7 The authors concluded that the lag was shorter and the sensors were more accurate during falling compared with rising glucose segments.

Ward WK, Engle JM, Branigan D et al (2011) The effect of rising vs. falling glucose level on amperometric glucose sensor lag and accuracy in type 1 diabetes. *Diabet Med* Dec 12 [Epub ahead of print]

DIABETIC MEDICINE

Pregnant women with T1D and T2D found CGM useful

Readability	✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓

1 The authors of this study evaluated satisfaction and barriers to continuous glucose monitoring (CGM) in 54 pregnant women with T1D and 14 with T2D who were offered CGM for 6 days at a median of 9 weeks (range, 6–14 weeks).

2 A total of 43 (65%) women used CGM for at least 5 days.

3 Analysis of the treatment satisfaction questionnaire revealed that 16 women (24%) reported discomfort with CGM during the daytime and 12 women (18%) during sleep.

4 Fifty-two percent of the women reported improved diabetes understanding, 83% would recommend CGM to others but 36% discontinued CGM earlier than planned.

5 It was concluded that most of the pregnant women found CGM useful. The reasons for discontinuing CGM included skin irritation, technical problems or sensor inaccuracy.

Secher AL, Madsen AB, Ringholm L et al (2012) Patient satisfaction and barriers to initiating real-time continuous glucose monitoring in early pregnancy in women with diabetes. *Diabet Med* **29**: 272–7

DIABETES CARE

Randomised trial of real-time CGM in young children

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

1 The benefit of continuous glucose monitoring (CGM) in children aged 4–9 years was assessed in this randomised clinical trial.

2 After a run-in phase, 146 children with T1D were randomly assigned to real-time CGM or usual care.

3 The primary outcome (reduction in HbA_{1c} level at 26 weeks by ≥5.5 mmol/mol [≥0.5 percentage points] without the occurrence of hypoglycaemia) was achieved by 19% of the CGM group and 28% of the control group ($P=0.17$). Parents reported a high satisfaction with CGM.

4 The authors concluded that CGM did not improve glycaemic control in this age-group and that integrating the glucose data into diabetes management remained a challenging barrier to overcome.

Mauras N, Beck R, Xing D et al (2011) A randomized clinical trial to assess the efficacy and safety of real-time continuous glucose monitoring in the management of type 1 diabetes in young children aged 4 to <10 years. *Diabetes Care* **35**: 204–10

DIABETES TECHNOLOGY AND THERAPEUTICS

User evaluation of OmniPod system

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The treatment satisfaction, comfort and function of the wireless OmniPod™ Insulin management System (Insulet Corporation, Bedford, USA) was evaluated in 29 people with T1D (mean age 24±5.1 years) in this randomised two-arm crossover study.

2 Participants used either the OmniPod system or conventional CSII for two consecutive 12-week periods.

3 Treatment satisfaction was evaluated by questionnaire: 43% "would switch to OmniPod", 36% were "undecided" and 21% "would not switch pumps". HbA_{1c} levels significantly decreased in both groups.

4 The authors concluded that OmniPod was well-received by young adults with T1D.

Lebenthal Y, Lazar L, Benzaquen H et al (2012) Patient perceptions of using the OmniPod system compared with conventional insulin pumps in young adults with type 1 diabetes. *Diabetes Technol Ther* **14**: 411–7

"Most of the pregnant women found continuous glucose monitoring (CGM) useful. The reasons for discontinuing CGM included skin irritation, technical problems or sensor inaccuracy."