Can a Paediatric Insulin Pump Program be Successful in Rural Practice?

**Background**

Intensive insulin therapy, including insulin pump therapy (IPT) optimizes glycaemic control for paediatric patients with Type 1 diabetes mellitus (T1DM) and reduces the risk of long term complications. (1,2) Rural Australian children have been noted previously to be disadvantaged in terms of their ability to access all aspects of specialist diabetes care and psychological support. (3) Quality of Life of rural diabetic youth was shown to be reduced compared to urban diabetic youth (4) through our “Radical” model of care has maintained that discrepancy (5).

**IPT in rural Australia**

Most children in rural Australia wishing to commence IPT:
- must have access to a metropolitan IPT program which often have prolonged waiting times and
- will endure greater family dislocation than urban patients because the pre-pump education and follow up requirements are generally city-based.

The ability to deliver intensive diabetes treatment with IPT in rural Australia has been compromised by a lack of an Australian or international rural IPT model.

Hence rural diabetic youth are unfairly disadvantaged because of reduced accessibility to Insulin Pump Therapy.

**New rural model of care**

Gippsland Paediatrics is an independent rural paediatric practice based in South Eastern rural Australia. In 2007, we created a new multidisciplinary model of rural paediatric diabetes care – the RADICAL model (Rural Australian Diabetes Insulin Controlling, Activity & Lifestyle). (5) The Gippsland Paediatrics diabetes team comprises a general paediatrician, Credentialed Diabetes Educator and Credentialed Mental Health Nurse and currently cares for 64% of central and east Gippsland paediatric patients and adolescents with T1DM.

**Insulin Pump Program**

Within the framework of the new model of care, we established an insulin pump program. This included:

- **Planning phase** (early 2007) with the assistance of the John Hunter Childrens’ Hospital, Newcastle. This comprised team up-skilling protocol creation, private hospital arrangements and public presentations.
- **Implementation phase** (mid 2007) with patient selection, single pump manufacturer selection and organisation of pre-pump consultations, pump initiation and follow up.
- **Expansion phase** (2008) commencing IPT in younger and more challenging children, introduction of peer support and regular educational communication and evaluation of patients with “Carelink” and Continuous Blood Glucose Monitoring.

**Aim**

To evaluate a rural Australian paediatric Insulin Pump program, managed independently from a metropolitan paediatric center, in terms of:

- Glycaemic control
- Patient satisfaction
- Quality of life

**Methods**

Patients were eligible for analysis if they were a patient of Gippsland Paediatrics managed with IPT for more than 3 months.

**Glycaemic Control**

- Evaluation of glycaemic control involved comparison of pre-pump Hba1c (averaged over a 12 month period) with Hba1c in the most recent quarter of 2009 (Q4) of patients on IPT.
- Comparison of Hba1c of all Gippsland Paediatrics T1DM patients from 2006, 2007 and 2008 with 2009 Q4 IPT and non IPT patients
- Evaluation of the average Hba1c at 3, 6, 9, 12, 15 and 18, 21 and 24 months post IPT for all patients. Evaluation included dividing patients into those 12 years and under and 13 years and over.
- Complications of IPT in terms of severe hypoglycaemic episodes and admissions to hospital with unstable diabetes / DKA.

**Results (continued)**

Non IPT Hba1c in Q4 2009 was 8.4% ± 1.19 (median 7.6) and for the last 6 months of 2009 was 8.6% ± 2.06 (median 8.0%).

The overall Gippsland Paediatrics Hba1c (IPT and non IPT) in Q4 2009 was 7.8% ± 1.47 (median 7.4).

These results demonstrate significant improvement of glycaemic control since 2008 when average Hba1c of Gippsland Paediatrics patients was 9.6% ± 1.81 (median 9.7%) (p < 0.001).

**Patient Satisfaction**

A survey of patient satisfaction after at least 3 months on IPT was conducted. Patients (>13 years) and parents (if patient <13 years) were asked if they felt they had

- more freedom with IPT
- greater flexibility with living
- better control of diabetes with IPT
- improved their academic performance and sporting performance with IPT
- found it easier to manage sick days with IPT
- less concern with hypoglycaemic episodes
- less concern about diabetic complications; and
- liked having less needles

• supported by the IPT team

Responses were considered negative if answered “not at all” or “a little” and the response considered positive if the response was “moderately”, “very” and strongly positive if rated “extremely”.

**Quality of Life**

Measurement of Quality of Life of IPT patients was compared with non IPT patients using the Child Health Questionnaire CHQ Peds (parent completed of patient >10 years) and CHQ CFS6 (child completed if 10 years and over). CHQ has previously been validated for Australian diabetic youth. (6) Results were compared with 1999 rural diabetic youth data. (4)

**Results**

Glycaemic Control

By the completion of 2009, Gippsland Paediatrics had initiated IPT in 46 patients (average age 13.7 ± 5.0, range 4-25 years) and 3 others had commenced IPT to a metropolitan tertiary centre. One patient had ceased IPT. Those patients who have had their management transferred elsewhere.

Hence by the end of 2009, we managed 46 of our 64 patients with T1DM with IPT (72%). 43 patients had been managed with IPT for at least 3 months.

The mean Hba1c in Q4 on IPT was 7.5% ± 0.96 (median 7.4%). The mean Hba1c for IPT in last 6 months of 2009 was 7.6% ± 0.96 (median 7.5%).

**Conclusion**

- IPT can successfully be initiated and managed in a rural setting with glycaemic control comparable or better than tertiary metropolitan units, with strong patient satisfaction and with improved quality of life.
- Maintenance of improved glycaemic control with IPT is possible utilizing the type of model we have created, with small teams including educational and peer support delivering personal care with frequent communication.
- Insulin pumps are badly underutilised in Australia, particularly for rural children, who generally endure discriminatory lack of access to IPT. IPT is part of the solution to improve quality of life: IPT reduces short term hospital usage and offers long term benefits of reduced complications because of better glycaemic control and reduced insulin dosage.