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

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Background

Intensive insulin therapy, including insulin pump therapy (IPT) optimises 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) though our "Radical" model of care has eliminated 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 Inspiring Control, 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 (96% of central and east Gippsland paediatric T1DM) children 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 Children's 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 electronic 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 Paediatric 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.

Patient Satisfaction

A survey of patient satisfaction after at least 3 months on IPT was conducted. Patients (>13 yrs) and parents (if patient <13 yrs) 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;
- liked having less needles
- felt supported by the IPT team.

Reponses 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 PF50 (parent completed if patient < 10 years) or CHQ CF50 (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 in a metropolitan tertiary centre. One patient had ceased IPT. Two others 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% ± 0.98 (median 7.4%). The mean HbA1c for IPT in last 6 months of 2009 was 7.6% ± 0.96 (median 7.5%).

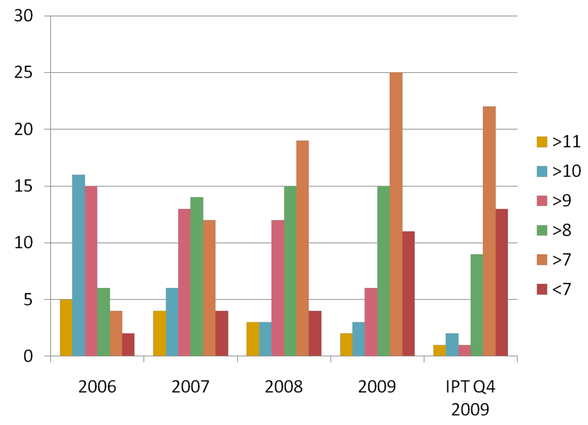
Results (continued)

Non IPT HbA1c in Q4 2009 was 8.4% ± 1.99 (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 2006 when average HbA1c of Gippsland Paediatrics patients was 9.6% ± 1.81 (median 9.7%) (p< 0.001).

HbA1c Gippsland Paediatrics 2006-2009

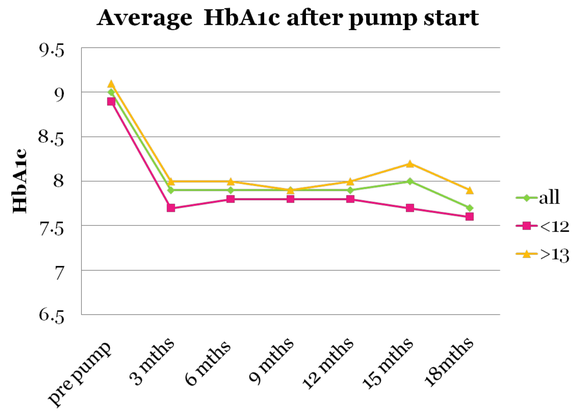


Year	Number N≤7.5%	Mean HbA1c	SD	Median	Range	
2006	48	9.6	1.81	9.7	6.6-11.5	3 (6%)
2007	53	8.8	1.40	8.9	5.6-11.5	8 (15%)
2008	59	8.6	1.39	8.2	6.5-13.5	11 (20%)
2009	64	8.0	1.36	7.8	6.2-13.3	25 (39%)
IPTQ409	43	7.5	0.99	7.4	6.1-10.3	26 (60%)
nIPTQ409	20	8.4	1.99	7.6	6.5 -12.5	9 (45%)
Q4<12 IPT	15	7.6	0.74	7.7	6.4 -8.7	9 (60%)
Q4>13 IPT	29	7.6	1.10	7.4	6.1-10.3	17 (58%)

These results compare favourably with published Australian and international tertiary centre glycaemic control. (7)

The average HbA1c was maintained at a steady level over 18 months. This contrasts significantly with a number of other studies as the initial enthusiasm about IPT diminishes.

Average HbA1c after pump start



We believe this result was achieved because:

• Our team is small, personal, non judgemental and includes emotional support

• The patient always sees the same team members who deliver a consistent message

• We maintain regular contact with all IPT patients through 2 weekly email offering advice and pump adjustments through Carelink

• We do not burden the patient with self adjustment of pump settings

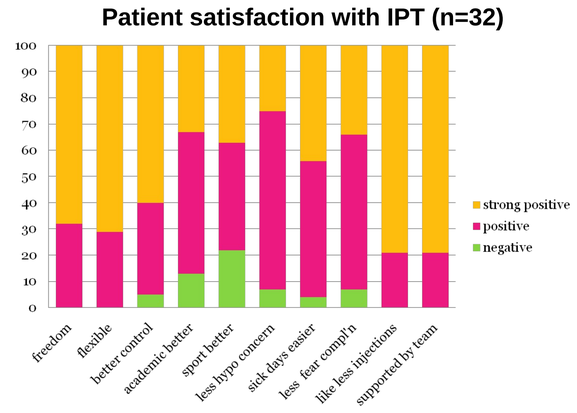
Total insulin dosage reduced by 24%. Severe hypoglycaemic episodes (seizures or reduced conscious state) were reduced to 7 episodes in total in 2.5 years.

Hospital presentations and admissions for unstable diabetes for all our patients have reduced from 11 in 2006 to 5 in 2008 and 2 in 2009. (p<0.01)

Patient Satisfaction with IPT

32 of 43 patients or parents completed the survey. Positive or strong positive responses were given to all questions.

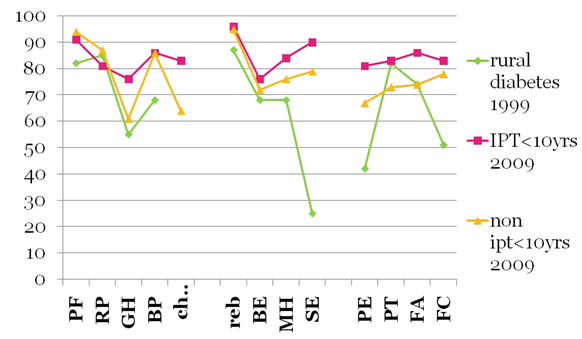
Patient satisfaction with IPT (n=32)



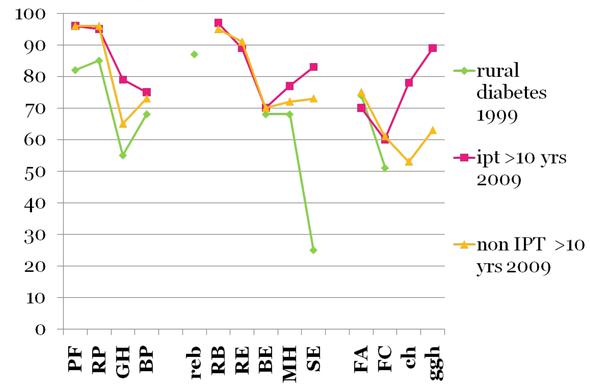
Quality of Life

14 PH50 (9 on IPT) and 39 CH50 (22 on IPT) were completed. For all ages (IPT and non IPT) there was clear redressing of the previously described reduced QoL for rural diabetic youth. (4) IPT improved QoL further with significant effect on mental health, self esteem, physical functioning, general health, parental emotional impact, parental time impact, family activity and change in health above non IPT patients.

QoL IPT vs. non IPT < 10 yrs



QoL IPT vs. non IPT > 10 yrs



Physical domain physical functioning PF, role physical RP, general health GH , bodily pain BP,
Psychosocial domain role emotional/behavioural reb, role behavioural RB, behaviour BE, mental health MH, self esteem SE
Family domain parent impact (emotional) PE, parent impact (time) PT, family activities FA, family cohesion FC)
Change in health ch, Global general health ggh

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 utilising the type of model we have created, with small teams including emotional 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.

REFERENCES

1. National Health and Medical Research Council Clinical practice guidelines: Type 1 diabetes in children and adolescents. Prepared by the Australasian Paediatric Endocrine Group for the Department of Health and Ageing. March 2005
2. Diabetes Control and Complications Trial Research Group; The relationship of glycaemic exposure (HbA1c) to risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. Diabetes 44:968-984 1995
3. Handelsman P, Jackson L. A national needs assessment of children and adolescents with diabetes in Australia 1999. Juvenile Diabetes Foundation Australia, Sydney 1999
4. Cameron FJ, Clarke C, Hesketh et al. Regional and urban Victorian diabetic youth: clinical and quality of life outcomes. J Paediatr Child Health. 2002 Dec; 38(6):593-6.
5. Goss PW, Paterson MA, Renalson J. A 'radical' new rural model for pediatric diabetes care. Pediatric Diabetes 2010:11:296-304
6. Wake M, Hesketh K, Cameron F. The Child Health Questionnaire in children with diabetes: cross sectional survey of parents and adolescent- reported functional health status. Diabet. Med 2000;17:700-7
7. De Beaufort CE, Swift PG, Skinner CT et al. Continuing stability of center differences in pediatric diabetes care: do advances in diabetes treatment improve outcome? The Hvidoere Study Group on Childhood Diabetes. Diabetes Care. 2007 Sep;30(9):2245-50. .

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