

# Continuous glucose monitoring alleviates parental fear of hypoglycaemia in children with type 1 diabetes mellitus.

HS Moore<sup>1</sup>, A Soni<sup>1</sup>, M Clemente<sup>1</sup>, SM Ng<sup>1</sup>

1. Southport and Ormskirk Hospital NHS Trust, Paediatric Department

Southport & Ormskirk Hospital



NHS Trust

## Introduction and Aim

Type 1 diabetes mellitus (T1DM) in children carries significant psychological stress for families, as well as considerable long-term complications if good metabolic control is not achieved(1). Tighter metabolic control carries the risk of increased episodes of hypoglycaemia (2,3), which some families find difficult to deal with, and it is postulated that families with a high level of fear of hypoglycaemia will run daily blood sugars higher in order to avoid this. In adults, fear of hypoglycaemia is common with it being classed as one of the most feared complications(4) of T1DM. Fear of hypoglycaemia has been found to be strongly linked to increased frequency of hypoglycaemic episodes, poor metabolic control and anxiety (5,6). Continuous glucose monitoring (CGM) provides real time measurements of glucose levels, providing constant information which helps to predict hyper and hypoglycaemia. A recent Cochrane meta-analysis showed that CGM technology can reduce HbA1C level without increase in the risk of hypoglycaemia(7). The risk of recurrent and severe hypoglycaemia causes significant anxiety and emotional morbidity for patients and families and the fear of hypoglycaemia remains one of the main limiting factors in achieving optimal glycaemic control (8). The aim of this study was to investigate the hypothesis that parental fear of hypoglycaemia is reduced after use of CGM.

## Method

Parents of children with T1DM who started use of CGM completed a modified version of the Hypoglycaemia Fear Survey for Parents of Young Children (HFS-PYC), a measure designed to assess fear and avoidance behaviours associated with hypoglycaemia. Parents completed the survey for both before and 6 months after the use of CGM. Scores were collated and analysed using student T-test.

## Results

- 13 patients (8 Male) participated in the study
- 9 patients were 12 years or older (age range 2-19 years, median 13 years)
- 6 aged >12yrs returned patient questionnaires.
- 2 patients and 1 parent were excluded from analysis as incomplete.
- Significant improvement was seen for parental fear of hypoglycaemia following use of CGM ( $p<0.001$ ).
- Three out of 4 patient questionnaires analysed showed decreased fear of hypoglycaemia following CGM use ( $p=0.10$ )
- Mean HbA1c in the preceding 6 months before CGM use was 66.7mmol/mol compared to 61.4mmol/mol 6 months post-CGM ( $p=0.52$ )

		Before	After	p-value
Parental (n=12)	Mean behaviour score	38.08	25.03	$p<0.001$
	Mean Worry Score	59.91	43.55	$p<0.001$
	Mean Total Score	98.33	71.17	$p<0.001$
Patient (aged >12yrs) (n=4)	Mean behaviour score	40.25	24.50	$p=0.096$
	Mean Worry Score	61.50	47.00	$p=0.16$
	Mean Total Score	102.75	71.50	$p=0.13$

## Discussion

In this study we have shown that parental fear of hypoglycaemia is significantly reduced following the use of CGM in children with T1DM. Our results are reflective of previous studies in adult participants who have T1DM and who have shown an improvement in fear of hypoglycaemia and quality of life in general (9,10). In terms of the children themselves, our results indicate that fear of hypoglycaemia is reduced in children aged >12 years but this was not significant. This may be due to the limited sample size and that the adolescents may have a different view of their diabetes compared to their parents, a concept explored by Markowitz et al (11) who reported different psychosocial impacts of CGM use on adolescents and their parents. Reducing the level of fear of hypoglycaemic episodes is just one aspect in helping patients work towards improved metabolic control in T1DM. Studies of longer-term CGM use (>6 months) have found that despite a reduction in HbA1c, children and adolescents may not be willing to wear a device as often, or for prolonged periods of time as is required to result in consistently achieving improved glucose metabolism (12). A recent RCT of CGM use in children has shown improvements in metabolic control and frequency of hypoglycaemic episodes, and the effect was not maintained when the CGM sensor was not used (13). Barriers of CGM usage should be addressed and education and support of CGM usage is vital.

## Conclusions

There is limited published evidence regarding the effect of use of CGM in paediatric populations with T1DM on either metabolic control or fear of hypoglycaemia. This study builds upon the current evidence from adult studies that CGM may be a useful tool to both improve metabolic control and reduce the fear of hypoglycaemia in parents of children with T1DM. Further studies are required to show the significance in reduction of FOH in children themselves.

## References

1. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group. *N Engl J Med.* 1993;329(14):977
2. Wild D, von Maltzahn R, Brohan E, Christensen T, Clauson P, Gonder-Frederick L. A critical review of the literature on fear of hypoglycemia in diabetes: Implications for diabetes management and patient education. *Patient Educ Couns.* 2007;68(1):10-5.
3. Anderbro T, Amsberg S, Adamson U, Bolinder J, Lins PE, Wredling R, et al. Fear of hypoglycaemia in adults with Type 1 diabetes. *Diabet Med.* 2010;27(10):1151
4. Schopman JE, Geddes J, Frier BM. Frequency of symptomatic and asymptomatic hypoglycaemia in Type 1 diabetes: effect of impaired awareness of hypoglycaemia. *Diabet Med.* 2011;28(3):352-5.
5. Irvine AA, Cox D, Gonder-Frederick L. Fear of hypoglycemia: relationship to physical and psychological symptoms in patients with insulin-dependent diabetes mellitus. *Health Psychol.* 1992;11(2):135-8.
6. Pramming S, Thorsteinsson B, Bendtsen I, Binder C. Symptomatic hypoglycaemia in 411 type 1 diabetic patients. *Diabet Med.* 1991;8(3):217-22.
7. Langendam M, Luijck YM, Hooft L, et al. Continuous glucose monitoring systems for type 1 diabetes mellitus. *Cochrane Database Syst Rev* 2012; 1:CD008101.
8. Anderbro T, Gonder-Frederick L, Bolinder J, Lins PE, Wredling R, Moberg E, et al. Fear of hypoglycemia: relationship to hypoglycemic risk and psychological factors. *Acta Diabetol.* 2015;52(3):581-9.
9. Al Hayek AA, Robert AA, Braham RB, Issa BA, Al Sabaan FS. Predictive Risk Factors for Fear of Hypoglycemia and Anxiety-Related Emotional Disorders among Adolescents with Type 1 Diabetes. *Med Princ Pract.* 2015;24(3):222-30.
10. Walker TC, Yucha CB. Continuous glucose monitors: use of waveform versus glycemic values in the improvements of glucose control, quality of life, and fear of hypoglycemia. *J Diabetes Sci Technol.* 2014;8(3):488-93
11. Markowitz JT, Pratt K, Aggarwal J, Volkering LK, Laffel LM. Psychosocial correlates of continuous glucose monitoring use in youth and adults with type 1 diabetes and parents of youth. *Diabetes Technol Ther.* 2012;14(6):523-6
12. De Bock M, Cooper M, Retterath A, Nicholas J, Ly T, Jones T, et al. Continuous Glucose Monitoring Adherence: Lessons From a Clinical Trial to Predict Outpatient Behaviours. *J Diabetes Science Technol.* 2016
13. Battelino T, Conget I, Olsen B, Shutz-Fuhrmann I, Hommel E, Hoogma R, et al. The Use and Efficacy of Continuous Glucose Monitoring in Type 1 Diabetes Treated with Insulin Pump Therapy: A Randomised Controlled Trial. *Diabetologica* (2012) 55:3155-3162

