

Predictors Of Diabetes-related Distress Following Closed-loop Initiation In Adults With Type 1 Diabetes In The UK: Insights From The Association Of British Clinical Diabetologists

Alexandros L. Liarakos ^{1,2}, Thomas S.J. Crabtree ¹, Tomás P. Griffin ^{3,4}, Linn Langeland ¹, Iain C. Cranston ⁵, Shani A.D. Mathara Diddhenipothage ⁶, Jackie Elliott ^{7,8}, Niall J. Furlong ⁹, Janet Cardwell ⁹, Christopher Philbey ¹⁰, Lynn Sawyer ¹¹, Vernon J. Parfitt ¹¹, Zin Zin Htike ¹², Claire Williams ¹³, Shafie Kamaruddin ¹³, Partha Kar ^{5,14}, Robert E.J. Ryder ¹⁵, Pratik Choudhary ^{3,4}, Emma G. Wilmot ^{1,2}

1. University Hospitals of Derby and Burton NHS Foundation Trust, Derby, UK; 2. University of Nottingham, Nottingham, UK; 3. Leicester Diabetes Centre, Leicester, UK; 4. University of Leicester, Leicester, UK; 5. Portsmouth Hospitals University NHS Trust, Portsmouth, UK; 6. Oxford Centre for Diabetes Endocrinology and Metabolism, Oxford, UK; 7. Northern General Hospital, Sheffield, UK; 8. University of Sheffield, Sheffield, UK; 9. St Helens and Knowsley Hospitals NHS Trust, UK ; 10. Harrogate and District NHS Foundation Trust, Harrogate, UK; 11. North Bristol NHS Trust, Bristol, UK; 12. Nottingham University Hospitals NHS Trust, Queens Medical Centre, Nottingham, UK; 13. County Durham and Darlington NHS Foundation Trust, Durham, UK; 14. National Health Service England; 15. City Hospital, Birmingham, UK

BACKGROUND

The NHS England hybrid-closed loop (HCL) pilot provided access to HCL for adults with type 1 diabetes (T1D), managed with an insulin pump and intermittently scanned continuous glucose monitoring, with a HbA1c $\geq 8.5\%$.

OBJECTIVE

To assess the factors associated with improved diabetes-related distress (DRD) at follow up.

METHODS

Anonymized baseline and follow-up data were collected via a secure online tool. We performed logistic regression on several variables including age, gender, ethnicity, Gold score, HbA1c, sensor glucometrics, two-item diabetes distress score (DDS2), and total daily insulin dose (TDD).

Table 1. Associations between various characteristics and improved diabetes-related distress

Variable	Univariate		
	Coefficient	OR	P-Value
Age	-0.001	0.99	0.92
Gender, Female	-0.68	0.51	0.02
Ethnicity, White British	0.94	2.6	0.26
Multiple deprivation index	0.09	1.09	0.11
Diabetes duration	0.02	1.02	0.24
Duration of insulin pump therapy at baseline	0.009	1.0	0.62
Total daily dose of insulin (baseline)	-0.01	0.99	0.04
HbA1c, % (baseline)	-0.19	0.83	0.16
Time in range, % (70-180mg/dL, 3.9-10mmol/L) (baseline)	0.007	1.00	0.49
Time below range, % (<70mg/dL, <3.9mmol/L) (baseline)	-0.04	0.96	0.40
Time above range, % (>180mg/dL, >10mmol/L) (baseline)	-0.007	0.99	0.43
% coefficient of variation (baseline)	-0.001	0.99	0.97
Glucose management indicator, % (baseline)	0.01	1.01	0.46
Number of sensor scans/day (baseline)	-0.02	0.98	0.34
Gold score (baseline)	-0.08	0.92	0.34
Diabetes distress scale score (baseline)	-0.44	0.65	0.002
% time in closed loop	0.006	1.00	0.52
Change in HbA1c (%) from baseline	0.1	1.11	0.40
Change in time in range, % (70-180mg/dL, 3.9-10mmol/L) from baseline	0.009	1.00	0.25

CONCLUSION

HCL was associated with improvements in DRD in T1D, irrespective of ethnicity, deprivation status, baseline glucose outcomes and hypoglycemia awareness. Additional therapeutic interventions are needed to further reduce DRD in HCL users.

RESULTS

- Individuals (n = 298; 29 UK diabetes centres) with high DRD (DDS2 ≥ 3) at baseline with follow-up DDS2 data were included.
- 72% female; 86% White; median age 37 years (IQR 28-49) and diabetes duration 20 years (IQR 14-28); baseline HbA1c $9.5 \pm 0.9\%$.
- After 9 months (IQR 6-20), DRD improved (DDS2 < 3) in 205/298 (68.8%) (group A) and remained high in 93/298 (31.2%) (group B).
- Compared with group B, group A had lower baseline DDS2 (3.8 ± 0.8 vs 4.2 ± 0.9 , $p = 0.001$) and TDD (48.2 ± 21.3 vs 55.3 ± 33.0 , $p = 0.03$); no other significant between-group differences were observed.
- Improved DRD was inversely associated with baseline DDS2 ($B = -0.726$, $p = 0.03$) in the multivariable model, and female gender ($B = -0.68$, $p = 0.02$), baseline DDS2 ($B = -0.44$, $p = 0.002$), and TDD ($B = -0.01$, $p = 0.04$) in the univariate models (Table 1). No other associations were reported.

