

## **Project Title**

Flash CONTinuous glucose monitoring in TRansition to Outpatient: Libre fortype 2  
Diabetes Mellitus (CONTROL-DM)

## **Project Lead and Members**

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## **Organisation(s) Involved**

Woodlands Health, Tan Tock Seng Hospital

## **Healthcare Family Group(s) Involved in this Project**

Medical, Nursing, Pharmacy

## **Applicable Specialty or Discipline**

Endocrinology, Nursing Service, Pharmacy

## **Project Period**

Start date: Not Applicable

Completed date: Not Applicable

## **Aims**

To explore the use of FGM in patients with T2DM requiring insulin who at risk of hypoglycaemia or hyperglycaemia, in facilitating the transition care from inpatient to the ambulatory setting.

We hypothesised that Flash Glucose Monitoring (FGM) improves glycaemic control and patient satisfaction, compared to finger-prick self-monitoring of blood glucose (SMBG) during transitional care from inpatient to outpatient.

## **Project Attachment**

See poster attached/below

## **Background**

See poster attached/below

## **Methods**

See poster attached/below

## **Results**

See poster attached/below

## **Lessons Learnt**

See poster attached/below

## **Conclusion**

See poster attached/below

## **Additional Information**

Accorded the Singapore Health & Biomedical Congress 2023 (Best Poster Award (Clinical Research)) Bronze Award

## **Project Category**

Care Continuum

Chronic Care, Self care

Care & Process Redesign

Value Based Care, Patient Satisfaction

**Keywords**

Glucose monitoring, Type 2 Diabetes, Glycaemic control

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# Flash CONTinuous glucose monitoring in TRansition to Outpatient: Libre for type 2 Diabetes Mellitus (CONTROL-DM)

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## INTRODUCTION

Type 2 diabetes mellitus (T2DM) is one of the most common comorbidities in hospitalised patients. Locally, the presence of T2DM has been associated with a very high risk of re-admissions and increased hospital length of stay. Hospitalised patients with poorly controlled diabetes often need insulin therapy to improve glycaemic control. As patients transit to discharge and recovery at home, various factors influence the maintenance of diabetes control. Achieving optimal glycaemic control necessitates frequent blood glucose monitoring. Patients, however may perceive repeated self-SMBG as inconvenient, intrusive and laborious, resulting in reduced compliance and poor glycaemic outcomes. Ambulatory flash glucose monitoring (FGM) may help to overcome this and facilitate more rapid achievement of euglycaemia in the individual with diabetes, due to the benefit of immediate minute-to-minute feedback of glucose levels with changes in diet, medication and activity.

## AIM

To explore the use of FGM in patients with T2DM requiring insulin who at risk of hypoglycaemia or hyperglycaemia, in facilitating the transition care from inpatient to the ambulatory setting. We hypothesised that Flash Glucose Monitoring (FGM) improves glycaemic control and patient satisfaction, compared to finger-prick self-monitoring of blood glucose (SMBG) during transitional care from inpatient to outpatient.

## METHODOLOGY

This pilot study is a prospective, parallel, open-label randomized control trial of Flash CGM (FGM) versus routine care with self-monitoring of blood glucose (SMBG). We conducted a 12-week study in 34 hospitalised T2DM patients on insulin (HbA1c  $\geq 9\%$ ) upon transition to discharge. Patients were randomized 1:1 into (Group A) Freestyle Libre FGM given at weeks 0, 6 and 12, or SMBG (Group B) for the entire study duration using block randomisation. Primary outcome was HbA1c measurement at week 12. Secondary endpoints included patient satisfaction, motivation and quality-of-life (QoL) using surveys (Diabetes Distress Score (DDS), Glucose Monitoring Satisfaction Survey (GMSS) and Audit of Diabetes-Dependent QoL). Healthcare professionals' timed activities were measured for resource utilization.

## RESULTS

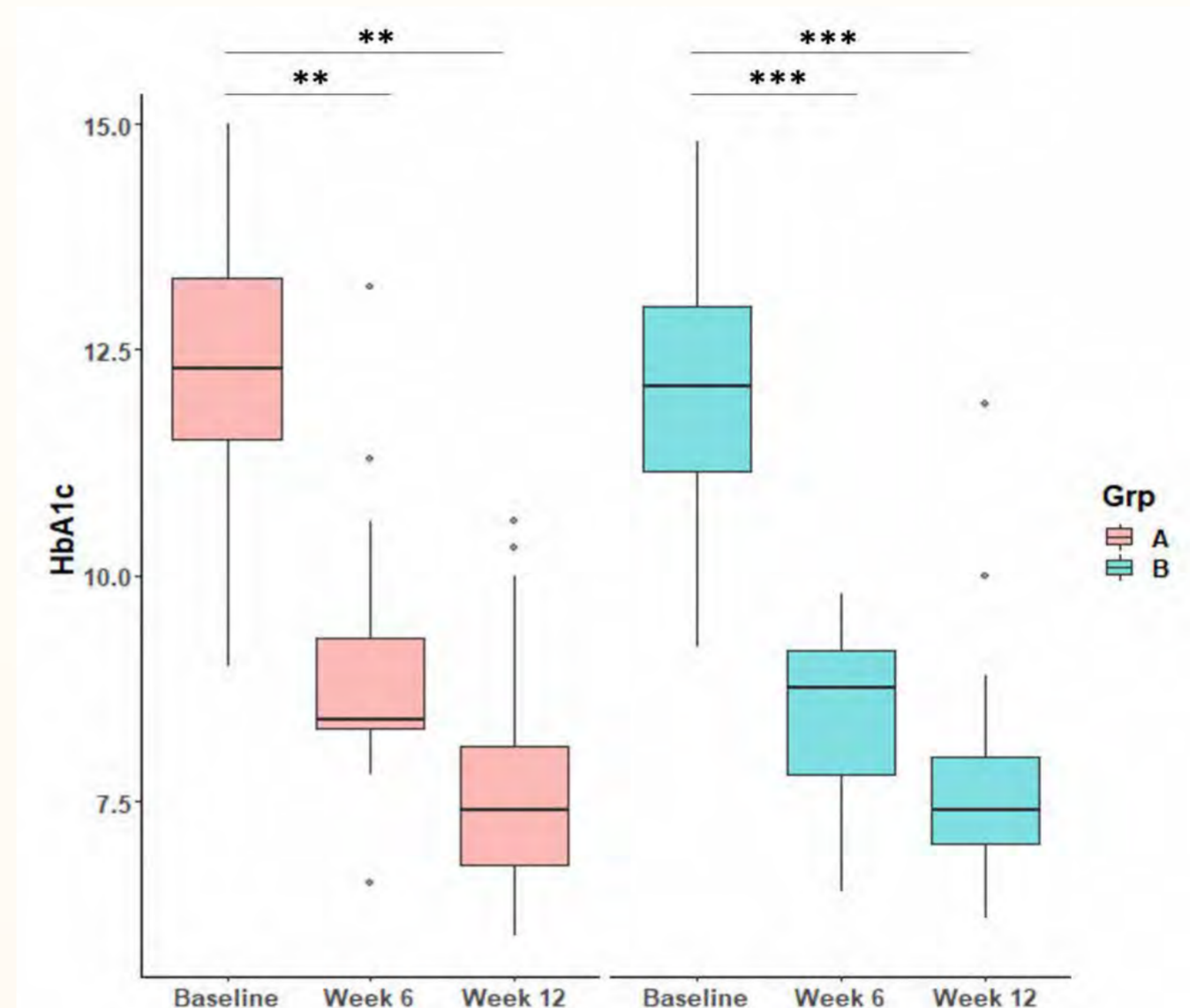
Baseline characteristics were similar between groups (Table 1). Overall, HbA1c improved by 4.90% (95%CI: 3.55-5.25%,  $p < 0.001$ ) over 12 weeks with no significant difference between groups [A: 4.80%, 95%CI: 3.35-5.75%,  $p = 0.0017$ ; B: 5.00%, 95%CI: 3.10-5.50%,  $p < 0.001$ ] (Figure 1). Time in range, average glucose and coefficient of variance of glucose achieved at week 12 were similar between groups. BMI did not change in both groups despite marked improvements in glycemia. GMSS, QoL scores and time-spent by healthcare professionals were similar between groups. HbA1c improvement was positive correlated with higher GMSS score ( $p = 0.007$ ) and shorter duration of T2DM ( $p = 0.037$ ) (Table 2).

**Table 1.** Baseline characteristics between groups

Baseline characteristics	A (N=13)	B (N=14)	p-value
Age, years	46.3 (7.7)	45.2 (13.3)	0.798
Gender: Male, n(%)	11 (84.6)	9 (64.3)	0.385
Smoker: Yes, n(%)	5 (38.5)	3 (21.4)	0.420
BMI, kg/m <sup>2</sup>	26.6 (4.7)	30.2 (5.1)	0.064
Education level, n(%)			0.820
Primary	0 (0)	1 (7)	
Secondary	7 (54)	6 (43)	
College	4 (31)	3 (21)	
University	2 (15)	4 (29)	
DM duration, years	10.0 (0.0-14.0)	3.0 (0.3-11.5)	0.749
Baseline HbA1c	12.3 (11.5-13.3)	12.1 (11.2-13.0)	0.627
Cr, $\mu\text{mol/l}$	72 (68-82)	65 (52-80)	0.234
TDD, baseline, units/kg	0.19 (0.15-0.54)	0.17 (0.15-0.42)	0.593

**Table 2.** Multivariate linear regression of factors associated with improvement in HbA1c at week 12

Variable	P-value	Estimate	95% CI
Age	0.873	0.0055	-0.066, 0.077
Gender: M vs F	0.056	-1.59	-3.22, -0.042
BMI	0.082	-0.118	-0.253, 0.017
<b>DM duration</b>	<b>0.037*</b>	<b>-0.097</b>	<b>-0.187, -0.007</b>
<b>Baseline GMSS</b>	<b>0.007*</b>	<b>1.37</b>	<b>0.420, 2.32</b>



**Figure 1.** HbA1c change at week 6 and 12 compared to baseline.

\*\* $p < 0.01$ , \*\*\* $p < 0.001$

## DISCUSSION

Inpatient admission often provides an opportunity to optimise diabetes care in patients with poorly controlled diabetes. During transition from hospital to home, diabetes treatment may be intensified due to hyperglycaemia, such as starting insulin therapy, or, de-escalated, due to risks of hypoglycaemia. To facilitate a safe discharge, frequent self glucose monitoring is required for the optimization of diabetes care. We have demonstrated that FGM is non-inferior to SMBG during the transitional care period with significant improvements in HbA1c in patients with T2DM. Not surprisingly, patients who are more satisfied with their glucometer (higher GMSS scores) have better HbA1c improvement. Consistent with current literature, a shorter duration of diabetes correlates with better HbA1c improvements. Chronicity of T2DM may result in diminished motivation and diabetes distress leading to poor glycaemic control.

## CONCLUSION

FGM is a feasible alternative to SMBG in the transitional-care period with clinically significant improvements in HbA1c in patients with poorly-controlled T2DM, without increasing DM-related stress or resource utilization.

## REFERENCES

- Hirschman KB, Bixby MB. Transitions in Care from the Hospital to Home for Patients With Diabetes. *Diabetes Spectr*. 2014 Aug;27(3):192–5.
- Wan W, Skandari MR, Minc A, Nathan AG, Zarei P, et al. Cost-effectiveness of Continuous Glucose Monitoring for Adults With Type 1 Diabetes Compared With Self-Monitoring of Blood Glucose: The DIAMOND Randomized Trial. *Diabetes Care*. 2018;41(6):1227–34.
- Rushakoff RJ, Sullivan MM, MacMaster HW, Shah AD, Rajkomar A, Glidden DV, et al. Association Between a Virtual Glucose Management Service and Glycemic Control in Hospitalized Adult Patients: An Observational Study. *Ann Intern Med*. 2017 May 2;166(9):621–7.
- Miller KM, Beck RW, Bergenstal RM, Golland RS, Haller MJ, McGill JB, et al. Evidence of a Strong Association Between Frequency of Self-Monitoring of Blood Glucose and Hemoglobin A1c Levels in T1D Exchange Clinic Registry Participants. *Diabetes Care*. 2013 Jul;36(7):2009–14.
- Verma M, Paneri S, Badi P, Raman PG. Effect of increasing duration of diabetes mellitus type 2 on glycated hemoglobin and insulin sensitivity. *Indian J Clin Biochem*. 2006 Mar;21(1):142-6. doi: 10.1007/BF02913083.

## ACKNOWLEDGEMENT

SPROUTS GRANT 2020