

Kontinuerlig- og «flash»-måling av vevsglukose – et gjennombrudd for insulinbehandlingen?

NASJONALT DIABETESFORUM 2017

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Disclosures

Research: Recent research where equipment has been provided by Medtronic, Nordic InfuCare/Dexcom, HemoCue, Novo Nordisk and Menarini

Founder and previous board member of Diasend

Creator of a Dexcom CGM-Guide and Libre-Guide;
Guides for effective startup, feedback and optimization of CGM/FGM



“ IN GOD WE TRUST,
ALL OTHERS MUST
BRING DATA.”

• W. EDWARD DEMING

Kostnader

Diabetes teknologi - kostnader

Faktor	Barn, n 7000	Barn ökning	Vuxna, n 40100	Vuxna ökning
CSII	50% (3500) / 38.5 MSEK	70% (4900) / 53.9 MSEK	23% (8600) / 94.6 MSEK	40% (16400) / 1031 MSEK
CGM		45% (3150) / 88.2 MSEK		30% (12000) / 336 MSEK
FGM		45% (3150) / 40.9 MSEK		40% (16000) / 208 MSEK
SMBG		Less monitoring -34 MSEK		Less monitoring -173 MSEK
Total		149 MSEK		1402 MSEK

Kostnad för BG test stickor: 800-900 MSEK 10 år sedan!

Läkemedel (T1+2) korreleras till max 7% av totala kostnader: 630 MSEK

Stora kostnaden – komplikationer!

FGM/CGM – översikt Sverige

Libre

- Ingen kalibrering
- 14 dagar
- Behov av skanning
- Inga påminnelser eller larm

CGM / Dexcom G4 och G5

- Kalibrering 2 ggr per dag
- 7 dagar
- Påminnelser och larm

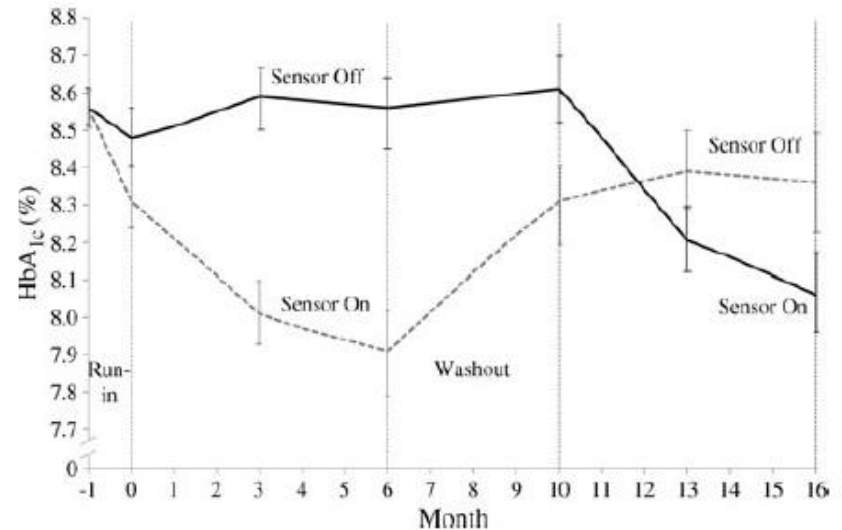
CGM / Medtronic Guardian Connect

- Kalibrering 2 ggr per dag
- 6 dagar
- Påminnelser och larm
- Koppling till insulinpump / 640G

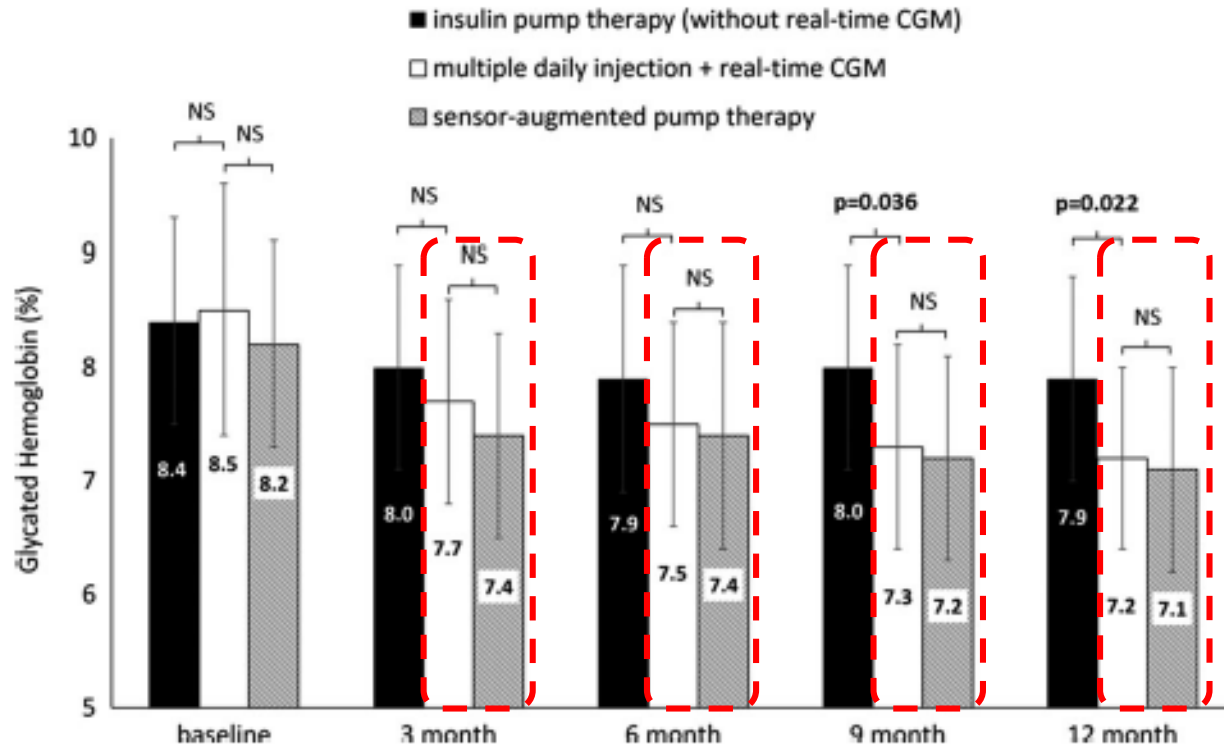
CGM – effekt på HbA1c

CGM och pump / Switch study

- HbA1c reducerades:
- 4,74 mmol/mol, $p < 0,001$
- Mindre tid spenderades med värden $< 3,9$ mmol/L: 19 vs. 31 min/dag, $p = 0,009$



Pump vs MDI+CGM och SAP



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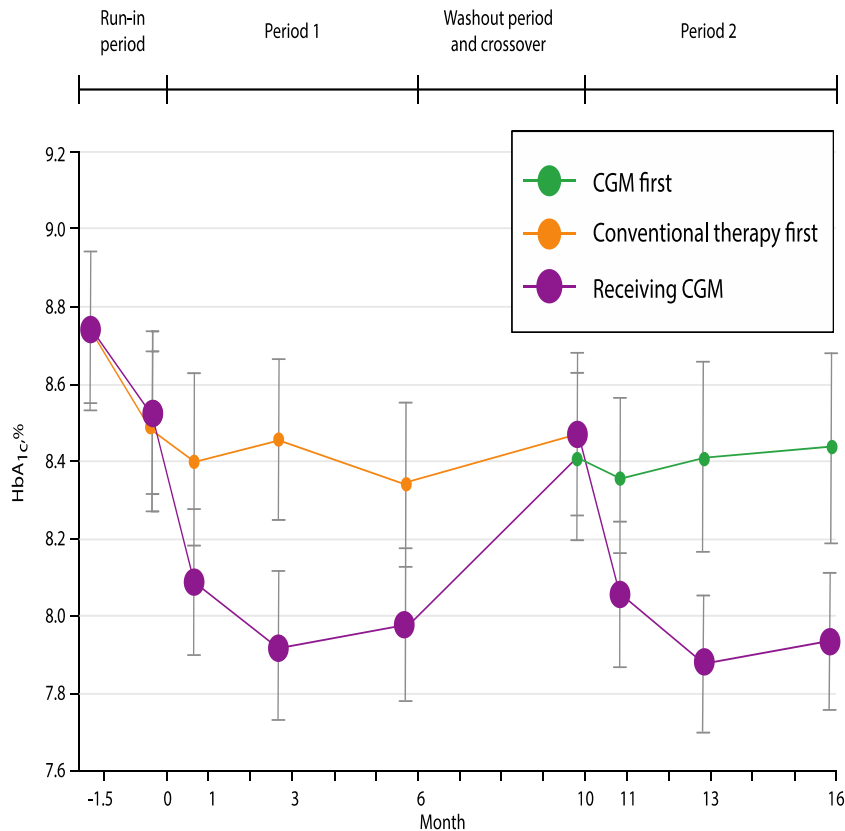


ORIGINAL ARTICLE

Comparison of Different Treatment Modalities for Type 1 Diabetes, Including Sensor-Augmented Insulin Regimens, in 52 Weeks of Follow-Up: A COMISAIR Study

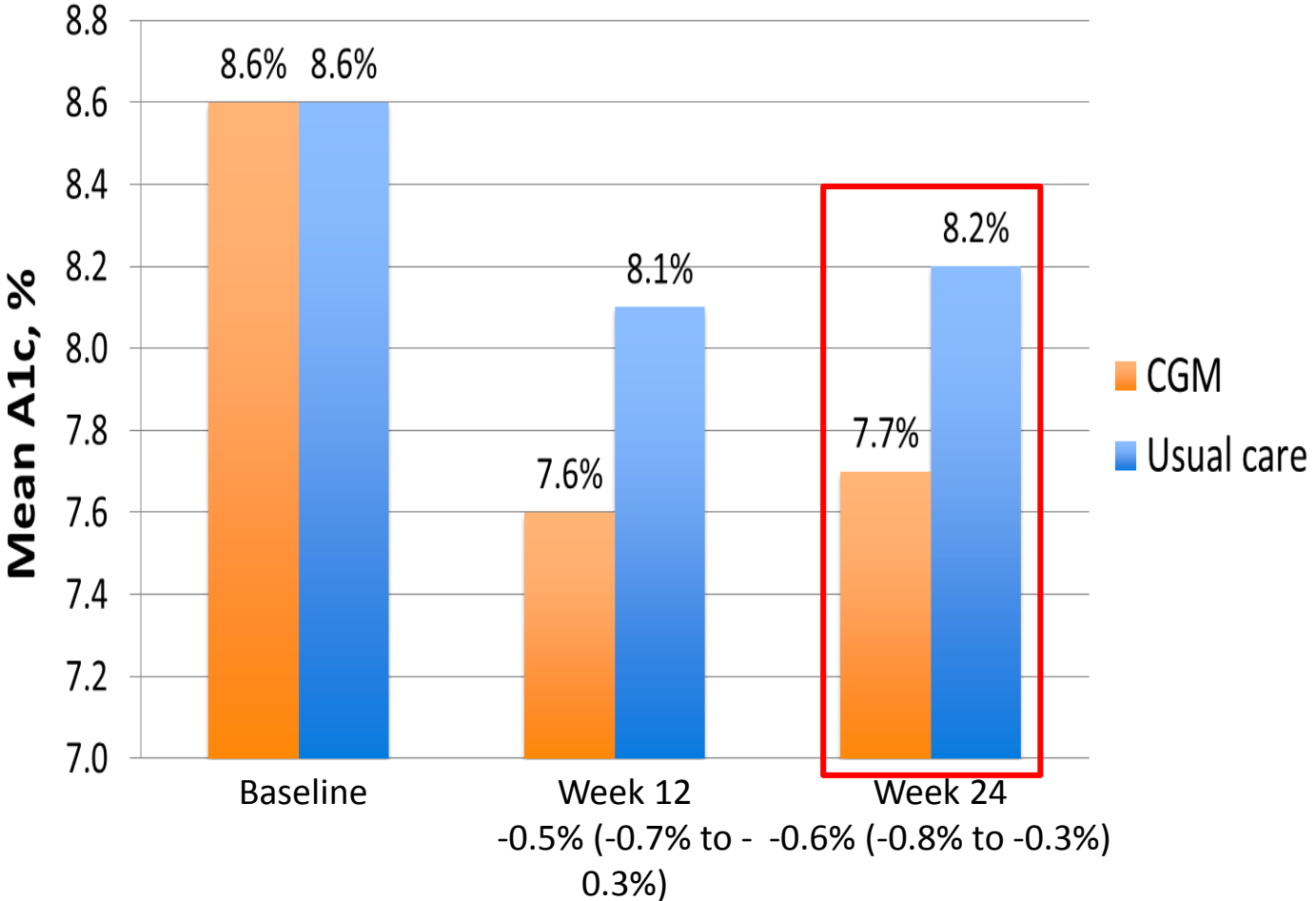
Jan Šoupal, MD,¹ Lenka Petruželková, MD,² Milan Flekač, MD, PhD,¹ Tomáš Pelc, MD,¹ Martin Matoulek, MD, PhD,¹ Martina Daňková, MSc,¹ Jan Škrha, MD, DrSc, MBA,¹ Štěpán Svačina, MD, DrSc, MBA,¹ and Martin Prázný, MD, PhD¹

CGM – GOLD (CGM + MDI)



- Patienter som stod på MDI förbättrade sin glukoskontroll först efter start och kontinuerligt användande av CGM

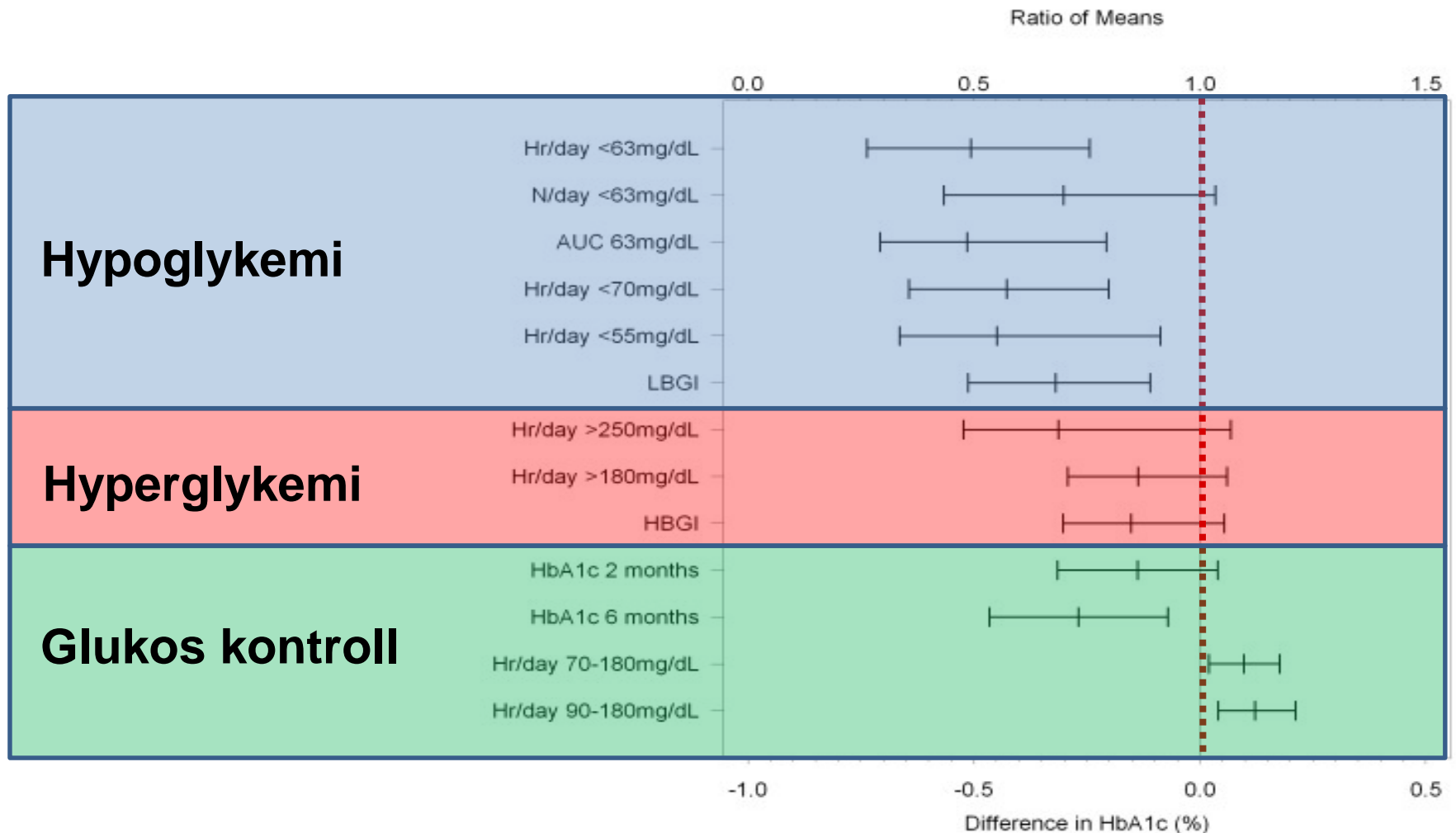
CGM DIAMOND (CGM + MDI/SPRUTA)



Beck R, Riddlesworth, T, Ruedy, K, et al. Effect of Continuous Glucose Monitoring on Glycemic Control in Adults with Type 1 Diabetes Using Injections for Insulin Delivery: The DIAMOND Randomized Clinical Trial. Paper presented at American Diabetes Association 76th Scientific Sessions; June 12, 2016; New Orleans, LA

CGM – effekt på hypoglykemier

CGM reducerar hypoglykemi



CGM – effekt på glukosvariabilitet



ORIGINAL ARTICLE

Measures of Glycemic Variability in Type 1 Diabetes and the Effect of Real-Time Continuous Glucose Monitoring

Ahmed H. El-Laboudi, PhD, MRCP, Ian F. Godsland, PhD,
Desmond G. Johnston, FMedSci, and Nick S. Oliver, FRCP

448 deltagare, randomiserade till CGM eller SMBG

Olika mått på glukosvariabilitet mättes vid start och efter 26 veckor

CGM medförde jämfört med SMBG **lägre glukosvariabilitet** inom de flesta av de olika metoder som evaluerades

När skall CGM startas?

Clinical Study

Clinical Efficacy of Two Different Methods to Initiate Sensor-Augmented Insulin Pumps: A Randomized Controlled Trial

Jesus Moreno-Fernandez,¹ Francisco Javier Gómez,²
Maria Ángeles Gálvez Moreno,³ and Justo P. Castaño⁴



CGM före SAP vs SAP före CGM?

TABLE 1: Baseline characteristics of the patients.

	CGM pre-CSII	CGM post-CSII	Total
N (number)	11	11	22
Sex (female/male) (number)	6/5	5/6	11/11
Age (years) (mean, range)	38.5, 20–59	34.8, 19–45	36.6, 19–59
Body-mass index (Kg/m ²) (mean ± SD)	25.7 ± 2.8	26.1 ± 3.6	25.9 ± 3.1
Diabetes duration (years) (mean ± SD)	18.6 ± 12.0	15.1 ± 9.1	16.8 ± 10.6
Daily insulin doses (units/Kg/day) (mean ± SD)	0.7 ± 0.4	0.8 ± 0.2	0.7 ± 0.3

RT-CGM pre-CSII: real-time continuous glucose monitoring before continuous subcutaneous insulin infusion; RT-CGM post-CSII: real-time continuous glucose monitoring after continuous subcutaneous insulin infusion.

TABLE 2: Glycemic outcomes.

	Baseline, mean ± SD			End of study, mean ± SD			Difference from baseline, MDC (95% CI, P)	
	CGM pre-CSII	CGM post-CSII	P	CGM pre-CSII	CGM post-CSII	P	CGM pre-CSII	CGM post-CSII
HbA _{1c} , %	7.6 ± 0.4	7.6 ± 0.5	0.92	7.0 ± 0.6	7.1 ± 0.6	0.90	-0.63 (-1.18, -0.08; P = 0.04)	-0.56% (-1.02, -0.11; P = 0.01)
Average interstitial glucose, mg/dL	155 ± 21	157 ± 26	0.72	140 ± 21	130 ± 38	0.31	-14 (-24, -5; P = 0.01)	-25 (-48, -2; P = 0.03)
% capillary glucose levels <70 mg/dL	10.8 ± 9.7	15.5 ± 15.6	0.60	4.5 ± 3.2	11.0 ± 8.1	0.03	-6.3 (-12.0, -0.5; P = 0.04)	-4.5 (-7, 16; P = 0.45)
% capillary glucose levels >180 mg/dL	19.6 ± 16.3	28.6 ± 17.3	0.06	26.6 ± 13.1	40.0 ± 32.8	0.47	7.0 (-19.4, 5.4; P = 0.23)	11.4 (-18.0, 40.1; P = 0.36)
Average AUC <70 mg/dL/day	2.5 ± 2.3	2.5 ± 4.3	0.35	0.7 ± 0.6	2.7 ± 2.5	0.01	-1.8 (-3.4, -0.2; P = 0.03)	-2.8 (-3.5, 0.6; P = 0.19)
Average AUC >180 mg/dL/day	19.9 ± 10.6	20.0 ± 15.3	0.67	9.8 ± 7.1	8.4 ± 7.8	0.42	-10.9 (-3.4, -0.2; P = 0.03)	-11.1 (-16.0, -0.2; P = 0.07)
Severe hypoglycemia events	0.9 ± 1.1	1.5 ± 3.6	0.71	0.0 ± 0.0	0.6 ± 1.0	0.03	-0.9 (-1.7, -0.2; P = 0.04)	-0.9 (-2.8, 1.0; P = 0.32)

RT-CGM pre-CSII: real-time continuous glucose monitoring before continuous subcutaneous insulin infusion; RT-CGM post-CSII: real-time continuous glucose monitoring after continuous subcutaneous insulin infusion; MDC: mean difference in change; CI: confidence interval.

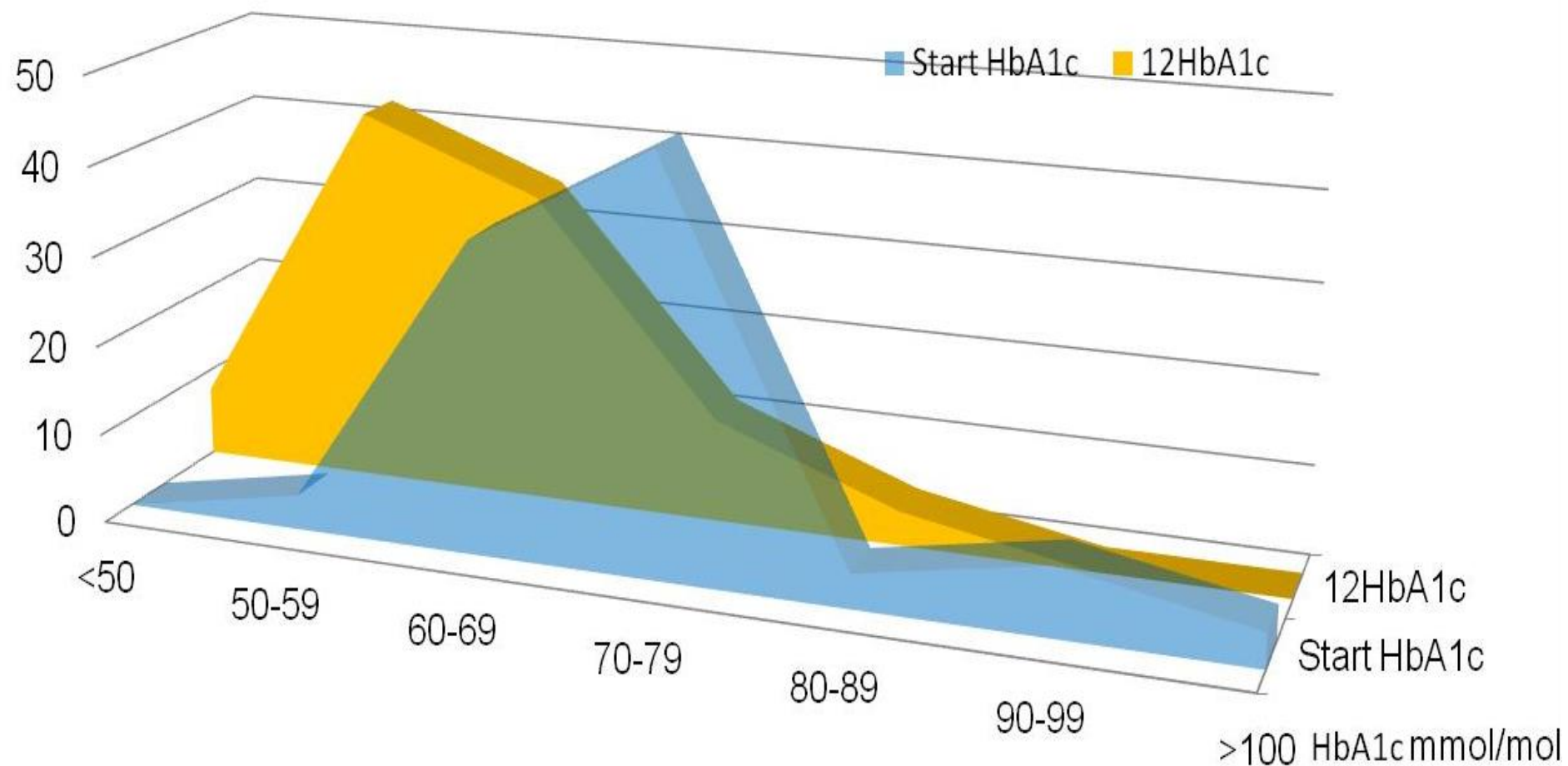
CGM före SAP (start pump)!

- ✓ **Större andel fortsätter med CGM (adherence);**
84.6 ± 11.1% vs 64.0 ± 25.4%, p=0.01
- ✓ **Hypoglykemier minskar** endast i grupp där CGM startas före pump; -6.3%, 95% CI, p=0.04
- ✓ **Högre tillfredsställelse hos användaren;**
27.3 ± 9.3% vs 32.9 ± 7.2%, p=0.04

CGM / Resultat barn: Kungsbacka

Real time CGM at a pediatric unit: Distribution of HbA1c in percentage at start and at evaluation 2013-12-31

%



FGM/Libre introduciras...

FGM/CGM – översikt Sverige

Libre

- Ingen kalibrering
- 14 dagar
- Behov av skanning
- Inga påminnelser eller larm

CGM / Dexcom G4 och G5

- Kalibrering 2 ggr per dag
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- Påminnelser och larm
- Koppling till insulinpump / 640G

FGM / Resultat bland vuxna

Novel glucose-sensing technology and hypoglycaemia in type 1 diabetes: a multicentre, non-masked, randomised controlled trial



Jan Bolinder, Ramiro Antuna, Petronella Geelhoed-Duijvestijn, Jens Kröger, Raimund Weitgasser

Hypoglykemi

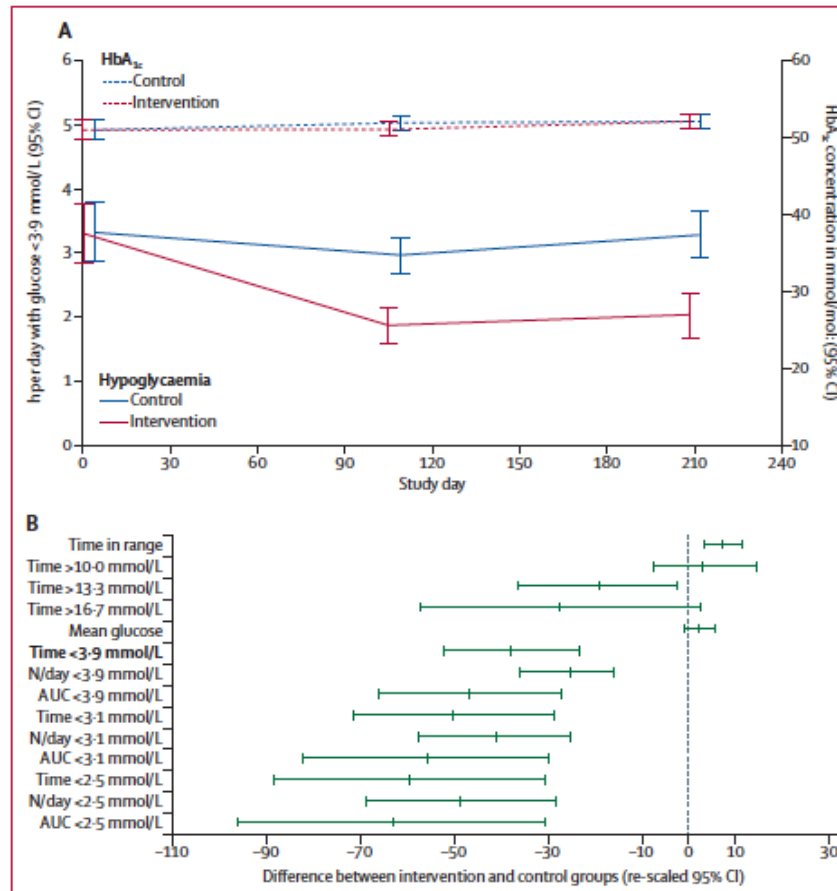


Figure 2: Difference in groups for changes in time with hypoglycaemia and HbA_{1c} (A) and with glucose higher or lower than glycaemic thresholds (B)
 In A, control and intervention study day offset for clarity. In B, re-scaled confidence intervals are confidence intervals for the difference in the intervention group from the control group at 6 months expressed as a percentage of the control group adjusted mean.

Frekvens skanning

the intervention.

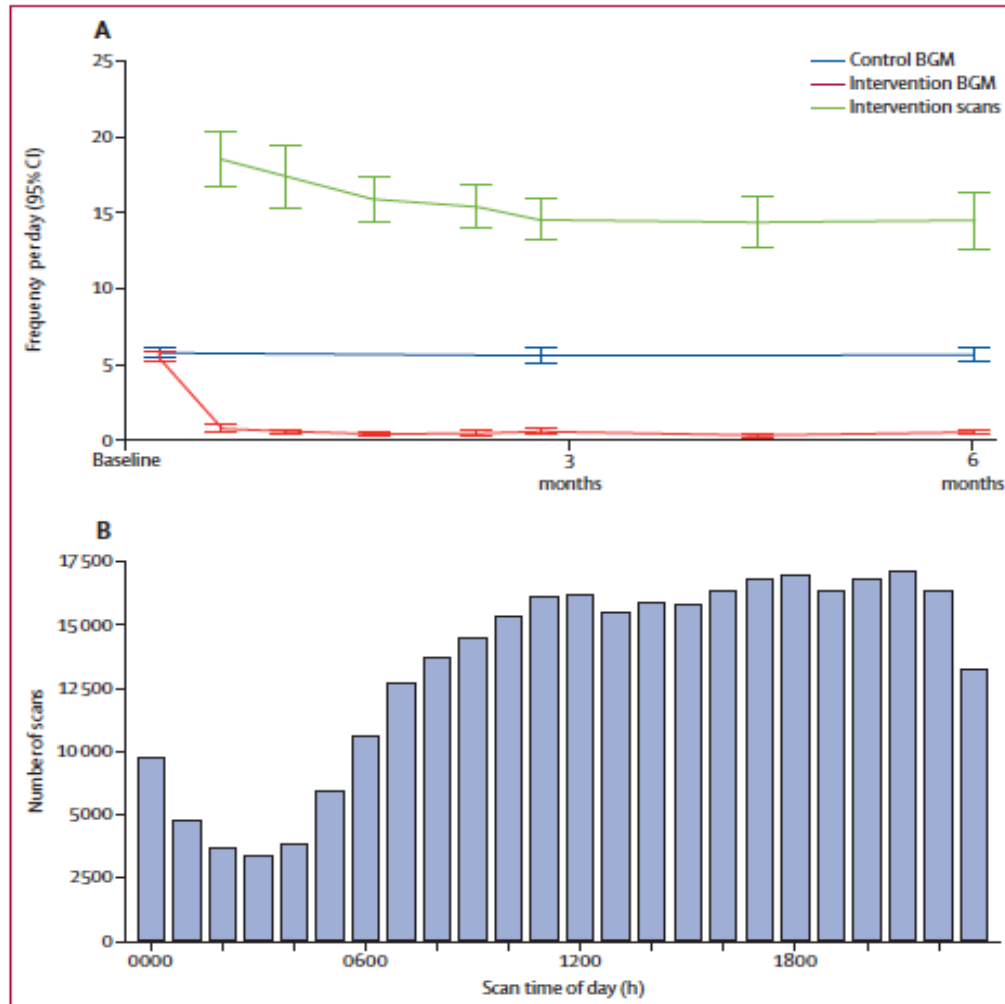
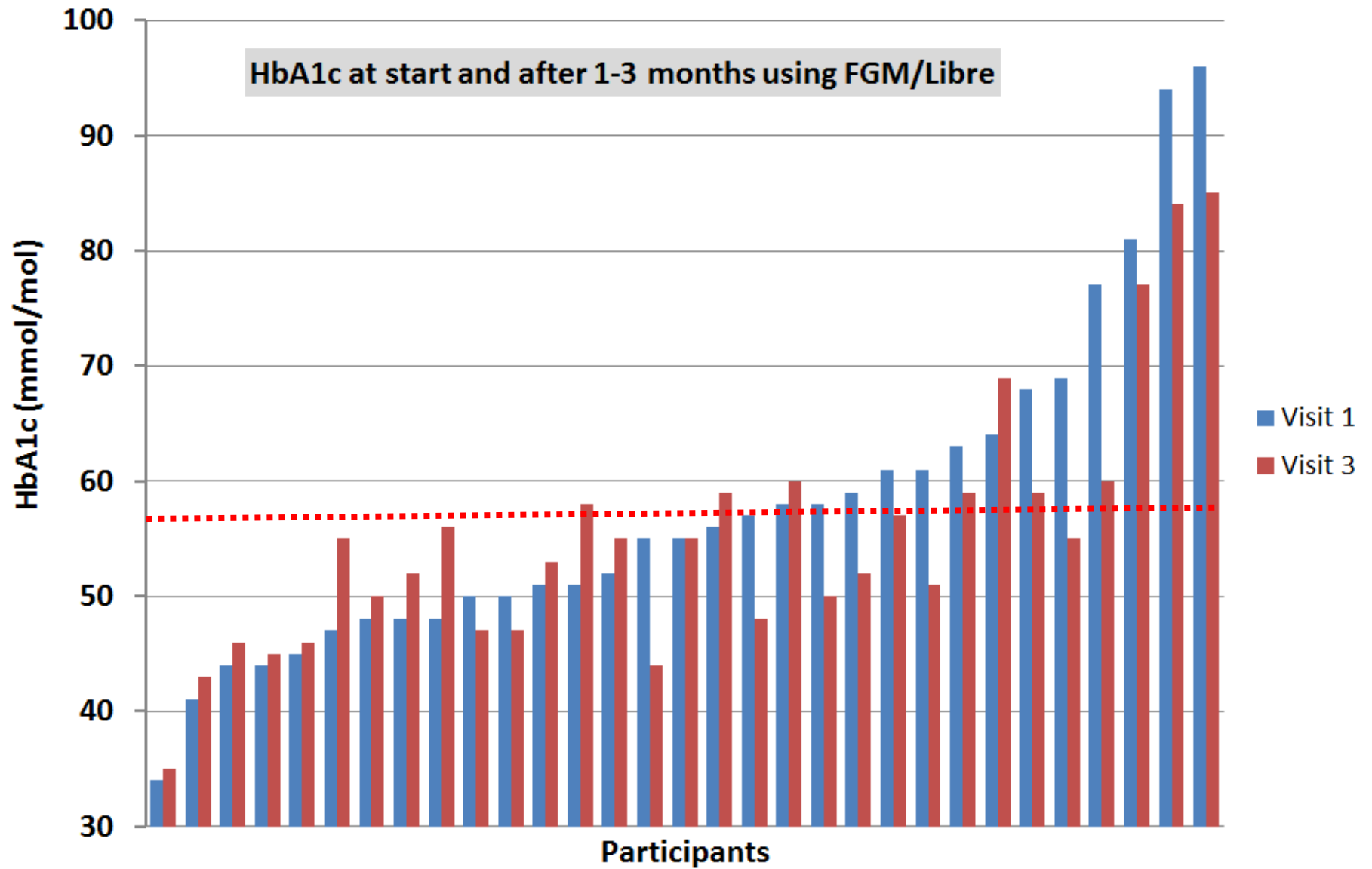


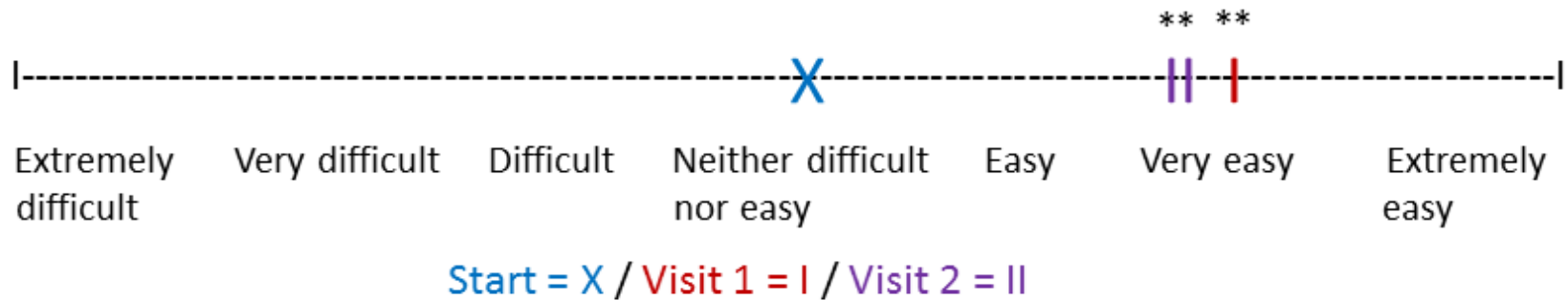
Figure 4: Glucose monitoring frequency (A) and total number of scans by time of day in the intervention group (B) Number of scans performed across all intervention participants over 6 months by time of day. BGM= blood glucose monitoring.

FGM / Resultat barn: Kungsbacka

HbA1c at start and after 1-3 months using FGM/Libre



Compared to SMBG: How difficult is it to achieve good glucose control?



Alla ville fortsätta med FGM/Libre!

Om ditt barn eller du får diabetes
- Hade inte du velat ha en sensor?

Nuläge i Kungsbacka - barnklinik

Glukosmätning – ett aktivt val...

5%

PLASMA GLUCOSE /
BLOOD

45%

FGM / LIBRE

50%

CGM STAND ALONE

FGM AND PUMP

CGM SAP

Glukosmätning – användaren...

Föräldrar:

- Vi har fått livet tillbaks (CGM)
- Nu kan vi sova på nätterna och behöver inte längre mäta blodsocker (CGM)

Lärare:

- Allt går enklare med kommunikation och beslut när barnen, vi och föräldrarna ser samma sak via följarfunktionen (CGM + FGM)

Vad har bromsat implementeringen?

REVIEW

Continuous Glucose Monitoring: A Review of Successes, Challenges, and Opportunities

David Rodbard, MD



Sjukvårdspersonalen har utgjort hinder;
- **Ny teknik kräver tid och ansträngning**
Utbildning till sjukvård utpekad som viktigt
Utbildning till patient utpekad som viktigt

Utbildning och träning är viktigt

Körkort och träning...



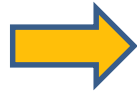
Dexcom G4 Guide!

DEXCOM | G4[®]
PLATINUM

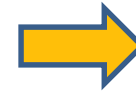
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PLATINUM

CGM 1
Start



CGM 2
Aktivt
användande



CGM 3
Optimerad
effekt



Speciell del för sjukvårdspersonal med riktade praktiska råd

Smart – Dexcom G5 Guide

CGM Step 1

Getting Started With Continuous Glucose Monitoring



CGM Step 2

Active use of the alert functions



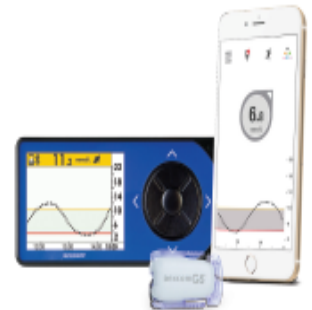
CGM Step 3

Optimising the benefit of CGM using trend arrows



USER GUIDE CGM

- 1 Getting started with continuous glucose monitoring
- 2 Active use of the alert functions
- 3 Optimising the benefit of CGM using trend arrows



Guardian Connect – web



**KLICKA BARA PÅ
SKÄRMEN OCH
LEK MED
GUARDIAN
CONNECT
-APPEN**

KLICKA PÅ TELEFONEN

VILL DU VETA
**HUR DET
FUNKERAR?**

TAREDA PÅ MER

Presentation Freestyle Libre Guide



Guide Freestyle Libre

“I denna guide har vi samlat en hel del råd som skall kunna leda till ett bättre och effektivt användande av Freestyle Libre – börjaskanna för bästa effekt!”

- Peter Adolfsson, Överläkare

Libre Guide – steg för steg (Web)

Välj diabetestyp och följ guiden

TYP 1



Barn ➔



Vuxen ➔

TYP 2



Vuxen ➔

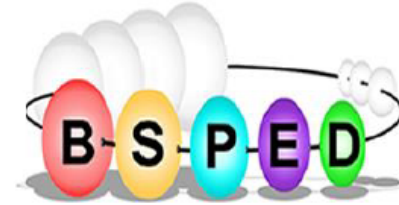
HÄLSO- OCH
SJUKVÅRDSPERSONAL



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Association of Children's Diabetes Clinicians



Clinical Guideline

A Practical Approach to the Management of Continuous Glucose Monitoring (CGM) / Real-Time Flash Glucose Scanning (FGS) in Type 1 Diabetes Mellitus in Children and Young People Under 18 years

FOR STAFF

Healthcare professionals involved in care of children and young people with Type 1 Diabetes Mellitus

PATIENTS

Children and young people with diabetes mellitus

Version 1,
January 2017
Review 2020

Authors: ACDC Guideline Development Group N Wright, SM Ng, JC Agwu, P Adolfsson, J Drew, J Pemberton, M Kershaw, S Bissell, C Moudiotis, F Regan, C Gardner, A Astle, A Adams, G Adams, P Manning, A Timmis, A Soni, E Williams

Tack- Q&A



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