



Association of British Clinical Diabetologists



---

# ABCD nationwide audit of FreeStyle Libre (FSL)

---

**Dr Harshal Deshmukh MRCP MPH PhD**  
**NIHR Clinical Lecturer in Endocrinology and Diabetes**

**Dr Emma Wilmot**  
**Dr Chris Walton**  
**Dr Bob Ryder**  
**Prof Thozhukat Sathyapalan**



## ABCD nationwide audit of FreeStyle Libre

### Disclosures

- EW has received personal fees from Abbott Diabetes Care, Dexcom, Diasend, Eli Lilly, Medtronic, Novo Nordisk, Sanofi Aventis
- BR has received speaker fees, and/or consultancy fees and/or educational sponsorships from AstraZeneca, BioQuest, GI Dynamics, Janssen, Novo Nordisk, Sanofi-Aventis and Takeda
- HD TS and CW have no relevant disclosures

### Funding

The ABCD nationwide Freestyle Libre audit is supported by a grant from Abbott UK. The audit was independently initiated and performed by ABCD, and the authors remain independent in the analysis and preparation of this report. |

## ABCD nationwide audit of FreeStyle Libre



- **FreeStyle Libre is a flash glucose monitoring system which monitors interstitial glucose levels**
- **Consists of a sensor with a microfilament, worn on the back of the arm and a hand-held reader**
- **When the reader unit is passed over the sensor, it shows the interstitial glucose levels**
- **The sensor lasts for 14 days, then needs to be replaced**

## ABCD nationwide audit of FreeStyle Libre

The ABCD FSL Audit aims to explore the impact of the FSL on the following:

- HbA1c
- Hypoglycaemia awareness
- Resource utilisation: hospital admissions
- User satisfaction
- Diabetes related distress
- Discontinuation rate and causes

## ABCD nationwide audit of FreeStyle Libre

# Methods

## ABCD nationwide audit of FreeStyle Libre



- Audit conducted in 114 centres in the UK
- A secure IT tool was developed on the NHS computer network, N3, to make this process as easy and user friendly as possible

# ABCD nationwide audit of FreeStyle Libre

The ABCD Nationwide FreeStyle Libre audit is an independent audit supported by an unrestricted grant from Abbott

## ABCD Nationwide FreeStyle Libre Audit Pre-FreeStyle Libre Information Collection Form



Hospital Name  Centre ID

Date <input type="text"/> / <input type="text"/> / <input type="text"/>	<b>Ethnicity</b>		
Name of Clinician <input type="text"/>	White	<input type="checkbox"/> British	<input type="checkbox"/> Irish
Email <input type="text"/>	<input type="checkbox"/> Any other white background	<input type="checkbox"/> Indian	<input type="checkbox"/> Pakistani
NHS Number <input type="text"/>	Asian or Asian British	<input type="checkbox"/> Bangladeshi	<input type="checkbox"/> Any other Asian background
Forename <input type="text"/>	Black or Black British	<input type="checkbox"/> Caribbean	<input type="checkbox"/> African
Surname <input type="text"/>	<input type="checkbox"/> Any other	<input type="checkbox"/> White and Black Caribbean	<input type="checkbox"/> White Asian
Date of Birth <input type="text"/> / <input type="text"/> / <input type="text"/>	Mixed	<input type="checkbox"/> Any other mixed background group	<input type="checkbox"/> Chinese
Gender <input type="checkbox"/> Male <input type="checkbox"/> Female	Other ethnic group	<input type="checkbox"/> Any other group	<input type="checkbox"/> Not stated
Height (metres) <input type="text"/>	Weight (kg) <input type="text"/>	Body Mass Index <input type="text"/>	Duration of diabetes <input type="text"/> years
			<input type="text"/> months
<b>Type of diabetes</b>			
<input type="checkbox"/> Type 1 <input type="checkbox"/> Type 2 <input type="checkbox"/> MODY			
During pregnancy: <input type="checkbox"/> Gestational diabetes <input type="checkbox"/> Type 1 diabetes during pregnancy <input type="checkbox"/> Type 2 diabetes during pregnancy			
Other (please specify) <input type="text"/>			

### PATIENT USE OF FREESTYLE LIBRE

**In this assessment:**

Recorded prior to commencing FreeStyle Libre?  Recorded retrospectively – i.e. after FreeStyle Libre started?

What is the date of FreeStyle Libre start? (best estimate if uncertain)  /  /  If not, intended date of initiation of FreeStyle Libre  /  /

Use of a CGM within the last 6 months before starting FreeStyle Libre?  Yes  No Funding of FreeStyle Libre  NHS funded  Non-NHS funded

If non-NHS funded please give details

Professional recommendation  Other (please specify)

Patient initiated

continued overleaf

- Clinicians using FSL were invited to submit the data that they routinely collect
- Forms completed in clinic for later online submission or the online tool could be completed in real time

## ABCD nationwide audit of FreeStyle Libre

# Results



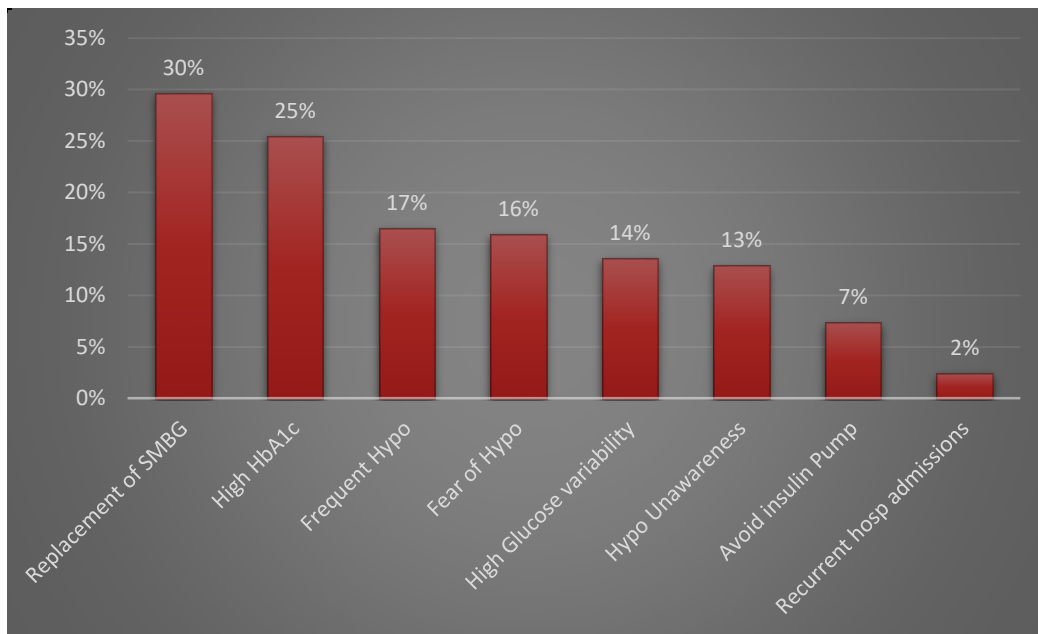
## ABCD nationwide audit of FreeStyle Libre

### Demographics and audit characteristics (n=**4,709**)

Age (IQR)	44 (31-56)
Type 1 Diabetes	99%
Female (%)	54%
Duration of Diabetes (yrs)	20 (11-23)
BMI (kg/m <sup>2</sup> )	26 (23-29)
Baseline HbA1c (mmol/mol)	67 (57-75)
Median HbA1c readings at baseline	2 (1-4)
Median HbA1c readings at follow-up	2 (1-3)
Patients with at least 1 follow-up	<b>1,299</b>
Median follow-up (months)	6 (1-5)

# ABCD nationwide audit of FreeStyle Libre

## Indications for FSL use in nation-wide FSL audit

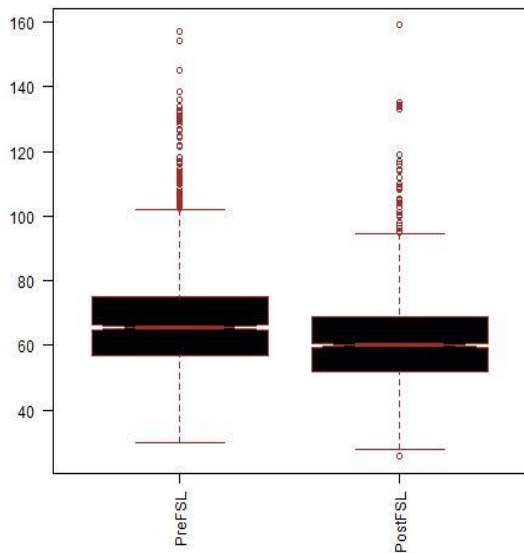


## ABCD nationwide audit of FreeStyle Libre

Effect on HbA1c (mmol/mol)

# ABCD nationwide audit of FreeStyle Libre

Median HbA1c Pre and Post FSL



Median pre-FSL HbA1c (IQR)	65.5(18)
Median post FSL HbA1c (IQR)	60 (17)
P-value*	<0.0001

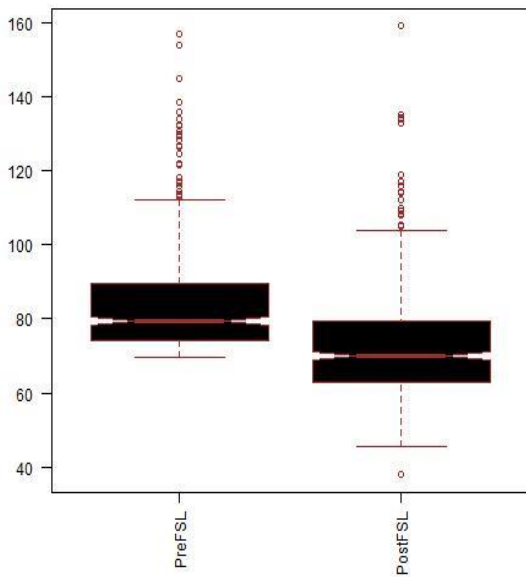


5.5 mmol/mol of HbA1c

\*P-value from Mann-Whitney U Test

# ABCD nationwide audit of FreeStyle Libre

Median HbA1c Pre and Post FSL



Baseline HbA1c > 69.5

Median pre-FSL HbA1c (IQR)	79.5 (15)
Median post FSL HbA1c (IQR)	70 (10)
P-value*	<0.0001



9.5 mmol/mol of HbA1c

\*P-value from Mann-Whitney U Test

## ABCD nationwide audit of FreeStyle Libre

### Effect on Hypoglycaemia

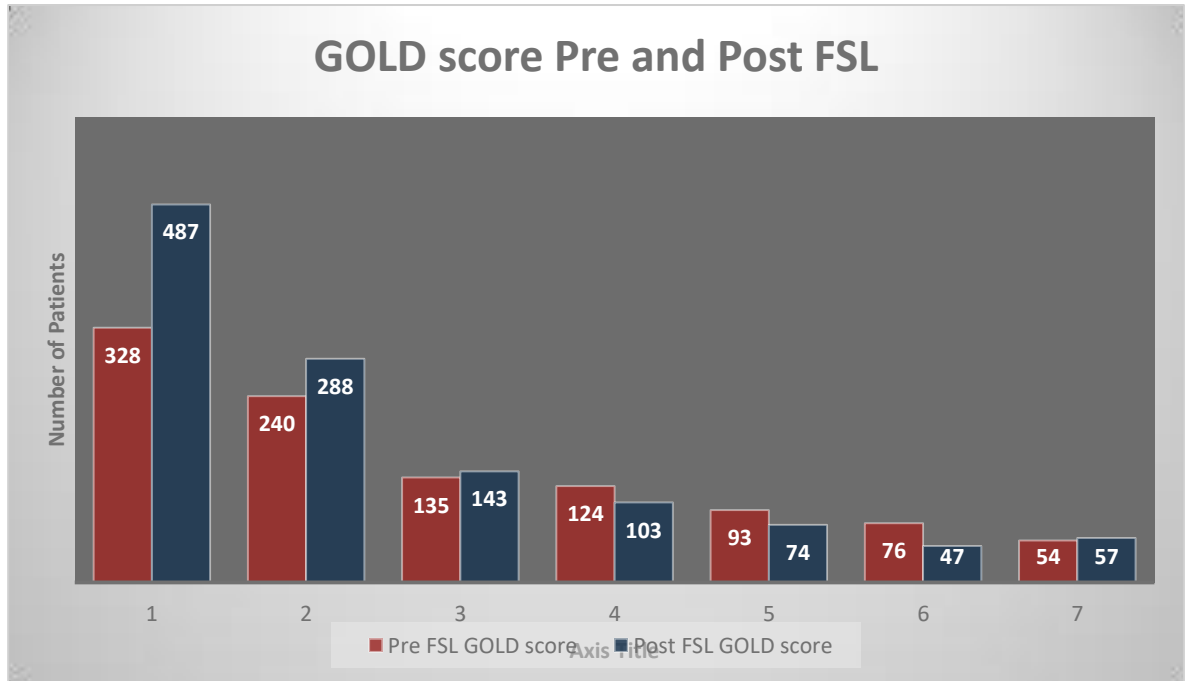
## ABCD nationwide audit of FreeStyle Libre

Effect on Hypoglycaemia (GOLD Score\*)



\*Gold AE, MacLeod KM, Frier BM Diabetes Care 1994

## ABCD nationwide audit of FreeStyle Libre



9% patients reported had reversal of hypoglycaemic unawareness (GOLD score dropped below 4)

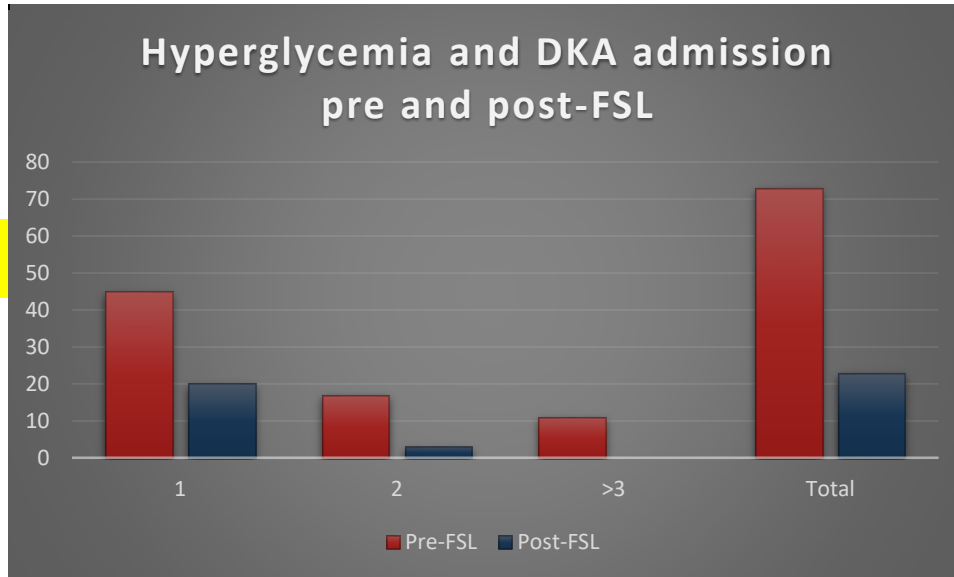


## ABCD nationwide audit of FreeStyle Libre

- **79%** reported that with use of FSL they were able to reduce the proportion of time in hypoglycaemia
- **31%** able to reduce rate of hypoglycaemia
- **39%** had reduced nocturnal hypoglycaemia

## ABCD nationwide audit of FreeStyle Libre

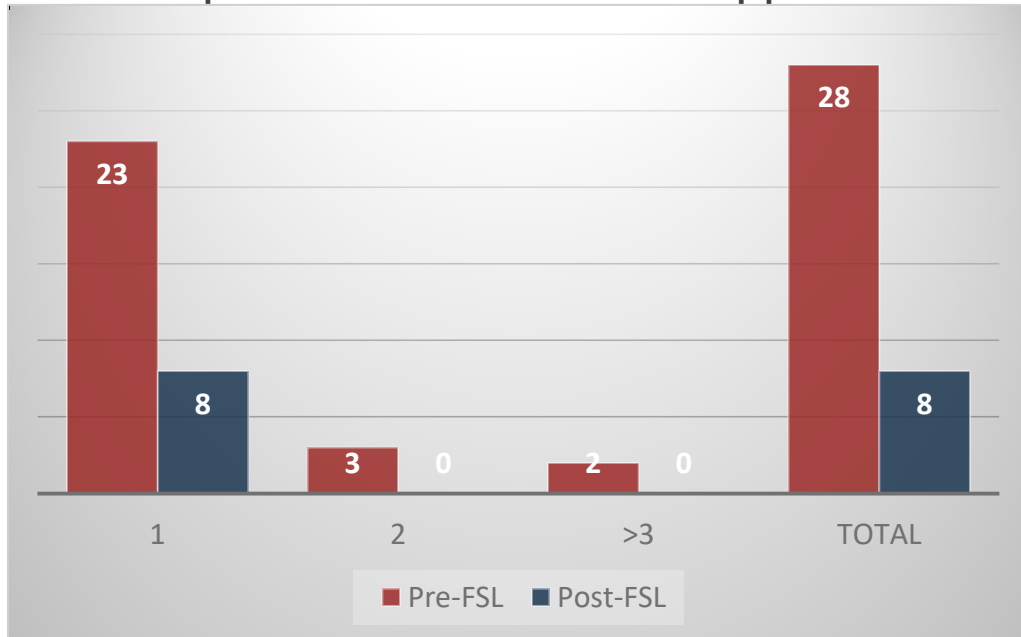
Effect on Hospital Admissions Median Follow-up period of 6 months



Hyperglycaemia and DKA admission dropped from 7.3% to 1.9%

## ABCD nationwide audit of FreeStyle Libre

Effect on Hospital Admissions Median Follow-up period of 6 months



Hypoglycaemia admission dropped from 2.71% to 0.5%

## ABCD nationwide audit of FreeStyle Libre

### Diabetes distress score Discontinuation

- Significant improvement in diabetes-related emotional score
- 3 (2-4) at baseline to 2 (1-3) at follow-up  
P<0.0001] in both components of brief DDSS
- **1%** users had discontinued using FSL at 6 month follow-up majority of them because of lack of funding

## ABCD nationwide audit of FreeStyle Libre

### User comments

*“Improved peace of mind”*

*“I find my freestyle libre invaluable due to my lifestyle and hill walking. For my sport I could be doing BG tests up to 15 times per day or more.”*

*“We've had the libre for just over 2 years, it has completely transformed my sons diabetes care. He loves it! Gone are the painful finger pricks 12 times a day, gone are the nights of him being woken by a finger prick, now he can sleep through while I scan him”*

## ABCD nationwide audit of FreeStyle Libre

### Conclusions

FSL use associated with

- ✓ Significant improvement in HbA1c
- ✓ Significant improvement in Gold Score
- ✓ Possible reduction in hospital admissions due to DKA/Hypo and Hyperglycaemia (1 year f/u data awaited)
- ✓ Improved diabetes related distress

**Need for more follow-up data to see if beneficial effects are sustained**

## **ABCD nationwide audit of FreeStyle Libre**

### **Acknowledgements**

- **People living with diabetes who are using the FreeStyle Libre**
- **Clinicians and support staff at the hospitals**
- **ABCD**

ABCD nationwide FreeStyle Libre audit – initial setup, maintenance and nationwide analysis: Sathyapalan T, Wilmot E, Walton C, Deshmukh H, Ryder, REJ, Cull ML.

## England

Aintree University Hospital NHS Foundation Trust, Aintree University Hospital : Wallymahmed M, Samad S. Alder Hey Children's NHS Foundation Trust – Paediatric, Alder Hey Children's Hospital: Mehta F, Spengler C. Ashford And St Peter's Hospitals NHS Foundation Trust, St Peter's Hospital: Banatwalla R, McBride J, Roberts M. Bedford Hospital NHS Trust - Adult and Paediatric, Bedford Hospital: Brown J, Khetriwal B, Long J, Tomeo J. Birmingham Community Healthcare NHS Trust, Lansdowne Health Centre: Tait K. Birmingham Women's and Children's NHS Trust, Birmingham Children's Hospital: Pemberton J. Brighton And Sussex University Hospitals NHS Trust, Royal Sussex County Hospital: Chakera A, Suarez A. Bromley Healthcare Community Interest Company (Community Diabetes Services), Beckenham Beacon: Cheah Y. Cambridge University Hospitals NHS Foundation Trust, Addenbrooke's Hospital: O'Reilly F, Thankamony A. Chesterfield Royal Hospital NHS Foundation Trust, Chesterfield Royal Hospital: Bills G, Cooper H, Foley C. City Hospitals Sunderland NHS Foundation Trust, Sunderland Royal Hospital: Bishop D, Fenwick L, Hooper N, Lee A, Nayyar R. Counties Of Chester Hospital NHS Foundation Trust, Counties Of Chester Hospital: Ahmed SH, Bridges J, Esram L. County Durham And Darlington NHS Foundation Trust, University Hospital Of North Durham: Devlin S, Dobson H, Kamaruddin S. County Durham And Darlington NHS Foundation Trust, Darlington Memorial Hospital: Kamaruddin S, Kirby C. County Durham And Darlington NHS Foundation Trust, Bishop Auckland Hospital: Stelling A. Croydon Health Services NHS Trust, Croydon University Hospital: Chuah L, Lovie K. Derby Teaching Hospitals NHS Foundation Trust, Royal Derby Hospital: Carpenter J, Gerrard K, Heskeht E, Hughes M, Langeland L, Marchant E, Monks K, Morrison A, Owen S, Ruston S, Sellahewa K, Smith J, Stanton P, Taylor A, Taylor N, Taylor R, West S, Wildsmith S, Wilmot E. Doncaster And Bassetlaw Hospitals NHS Foundation Trust, Doncaster Royal Infirmary: Garbutt S. Dorset County Hospital NHS Foundation Trust, Dorset County Hospital: Wotherpoon F. East And North Hertfordshire NHS Trust, Lister Hospital: Thornton M, Troke R. East And North Hertfordshire NHS Trust, Queen Elizabeth II Hospital: Thornton M. East Kent Hospitals University NHS Foundation Trust, William Harvey Hospital: Christian P. East Lancashire Hospitals NHS Trust, Royal Blackburn Hospital: Ramtoola S. East Suffolk and North Essex NHS Foundation Trust, Colchester General Hospital: Cackett N, Jordan N. East Sussex Healthcare NHS Trust, Conquest Hospital: Aung KK, Dashora U. Frimley Health NHS Foundation Trust, Frimley Park Hospital: Bailey N, Henke C, Mukhtar R, Tringham J. Gateshead Health NHS Foundation Trust, Queen Elizabeth Hospital: Tsatlifis V, Scott L, Reid J, Pearsall A. Harrogate And District NHS Foundation Trust, Harrogate District Hospital: Hammond P, Rahman S. Hull and East Yorkshire Hospitals NHS Trust, Hull Royal Infirmary: Deshmukh H, Gupta S, Van-Tilburg Rogers R, Sathyapalan T. Isle Of Wight NHS Trust, St Mary's Hospital: Tabus M, Whittingstall L. Lancashire Care NHS Foundation Trust - (Diabetes Specialist Nursing Service), Minerva Health Centre: Keat G. Lancashire Teaching Hospitals NHS Foundation Trust: Royal Preston Hospital: Baxter S, Byrne J, Orme K, Vaidya A. London North West Healthcare NHS Trust, Central Middlesex Hospital: Muralidhara K, Luton And Dunstable Hospital NHS Foundation Trust, Luton & Dunstable Hospital: Wong KF. Maidstone And Tunbridge Wells NHS Trust, The Tunbridge Wells Hospital: Barnes D. Mid Yorkshire Hospitals NHS Trust, Pontefract General Infirmary: Dobson H, Gardiner S, Roberts S. Mid Yorkshire Hospitals NHS Trust, Pinderfields General Hospital: Dobson H, Gallear K, Gardiner S, Jennians S, Jones S, Roberts S, Watson E. Mid Yorkshire Hospitals NHS Trust, Dewsbury & District Hospital: Caine G, Gardiner S, Dobson H, Jones S, Scott K. NHS Bury CCG, St Gabriel's Medical Centre: Deacon R. NHS North East Essex CCG, Bluebell Surgery: Addington H, Chandler H, Holcombe A, Jagger C, khawnekar D, Kingston T, Roberts L, Streeting J, Walsh C. North Bristol NHS Trust, Southmead Hospital: Parfitt V. North Cumbria University Hospitals NHS Trust, West Cumberland Hospital: Green K, Wardyne C, Whitehead P. North Cumbria University Hospitals NHS Trust, Cumberland Infirmary: Carruthers C, Edge J, Overend L, Whitehead P. North Lincolnshire & Goole NHS Foundation Trust, Scunthorpe General Hospital: Pothina NP. North West Anglia NHS Foundation Trust, Peterborough City Hospital: Yong D. Northamptonshire Diabetes Network, Kettering General Hospital: Kilvert A, Margabanthu G, Smith L. Northamptonshire Diabetes Network, Northampton General Hospital: Haase L, Kilvert A, Nash C, Thomson K. Northumbria Healthcare NHS Foundation Trust, North Tyne-side General Hospital: King S, Potter C. Oxford University Hospitals NHS Trust, Churchill Hospital: Panch H, Lumb A, Tan G. Oxford University Hospitals NHS Trust, John Radcliffe Hospital: Cheeseman M, Tan G. Pennine Acute Hospitals NHS Trust, Fairfield Hospital: Rowles S. Pennine Acute Hospitals NHS Trust, Rochdale Infirmary: Prakash P. Pennine Acute Hospitals NHS Trust, North Manchester General Hospital: Baxter R, Wild J. Portsmouth Hospitals NHS Trust, Queen Alexandra Hospital: Cranston I. Royal Cornwall Hospitals NHS Trust, Royal Cornwall Hospital (Trillick): England A, Mallam K. Royal Devon And Exeter NHS Foundation Trust, Royal Devon & Exeter Hospital (Wonford): Walker N. Royal Liverpool And Royal Green University Hospitals NHS Trust, Royal Liverpool University Hospital: Zaidi R. Royal Surrey County Hospital NHS Foundation Trust, Royal Surrey County Hospital: Hall C, Herring R, O'Dowd C. Royal United Hospital Bath NHS Trust, Royal United Hospital: Robinson A. Salford Royal Foundation Trust, Royal: Muddalir RN, Paisley A. Salisbury NHS Foundation Trust, Salisbury District Hospital: Anderson C, Lawrence J, Madgwick S, Sandwell and West Birmingham Hospitals NHS Trust, Diabetes & Endocrine at City Hospital: Burbridge W, Cull ML, Harris L, Lloyd J, Ryder REJ, Wyres M. South Tees Hospitals NHS Foundation Trust, James Cook University Hospital: Burns M, Murray A. South Warwickshire NHS Foundation Trust, Warwick Hospital: Kakad R. Southern Health NHS Foundation Trust, Fenwick Hospital: Thorne K. Southport And Ormskirk Hospital NHS Trust, Ormskirk & District General Hospital: Khan S, Kirkhani J, Ng SM. St Helens and Knowsley Teaching Hospitals NHS Foundation Trust, Whiston Hospital: Peers V. Stockport NHS Foundation Trust, Stepping Hill Hospital: Bell R, Mason-Cave S. Surrey And Sussex Healthcare NHS Trust, East Surrey Hospital: Clark J, Streatfield N. Surrey And Sussex Healthcare NHS Trust, Crawley Hospital: Godwin H. Sussex Community Foundation Trust, Moulsecomb Health Centre: Lipscomb D, Rezaazadeh E. The Dudley Group NHS Foundation Trust, Russells Hall Hospital: Khan S, Solomon AL, Vamvakopoulos J. The Hillingdon Hospitals NHS Foundation Trust, Hillingdon Hospital: Baburaj R, Narayanaswamy S. The Princess Alexandra Hospital NHS Trust, Princess Alexandra Hospital: Nuti A, Sennik D. The Queen Elizabeth Hospital, King's Lynn, NHS Foundation Trust, The Queen Elizabeth Hospital: Wnuk W. University Hospital Southampton NHS Foundation Trust, Southampton General Hospital: Newland-Jones P. University Hospitals Birmingham NHS Foundation Trust, Heartlands Hospital: Forsdick H, Narendran P. University Hospitals Birmingham NHS Foundation Trust, Good Hope Hospital: Narendran P, Peasgood A, Saraf S, Whitaker E. University Hospitals Birmingham NHS Foundation Trust, Queen Elizabeth Hospital: Grandy L, Morrison J, Narendran P, Ross L. University Hospitals of Leicester NHS Trust, Leicester General Hospital: Gregory R, Mistry I, Wilson C. University Hospitals of Leicester NHS Trust, Leicester Royal Infirmary: Sundaram P. University Hospitals of Morecambe Bay NHS Foundation Trust, Royal Lancaster Infirmary: Begum N.M, Dampella S, Dring H, Jackson S, Mustafa E, Shanahan T. University Hospitals of Morecambe Bay NHS Foundation Trust, Furness General Hospital: Dring H, Hay C, Hodson K, Shanahan T. Warrington And Halton Hospitals NHS Foundation Trust, Warrington Hospital: Gopalakrishna A, Saunders S. West Hertfordshire Hospitals NHS Trust, Watford General Hospital: Fullerton S, Mitchell H. West Suffolk NHS Foundation Trust, West Suffolk Hospital: Cockerill H, Harding J, Hunt M. Western Sussex Hospitals NHS Trust, St Richard's Hospital: Cranfield L, Lacey A, Mackie C, Smith Z, Worsfold J. Western Sussex Hospitals NHS Trust, Worthing Hospital: Beacher P, Lacey A, Middleton N. Wirral University Teaching Hospital NHS Foundation Trust, Arrow Park Hospital: Comber S, Cookson R. Wrightington, Wigan And Leigh NHS Foundation Trust, Royal Albert Edward Infirmary: Brookes C, Ollerton A. York Teaching Hospital NHS Foundation Trust, Scarborough Hospital: Hemming V.

## Scotland

NHS Lanarkshire, Monklands Hospital NHS Trust: Sandeep T. NHS Lanarkshire, Hairmyres, Stonehouse Hospitals NHS Trust: Littlejohn N. NHS Tayside, Ninewells Hospital: Malik I

## Wales

Aberawte Bro Morgannwg University NHS Trust, Morriston Hospital: Shinkrishnapalasuriya N, Udiawar M. Aberawte Bro Morgannwg University NHS Trust, Neath Port Talbot Hospital: Min T, Peter R

## Acknowledgment

The ABCD nationwide FreeStyle Libre audit is an independent audit supported by an unrestricted grant from Abbott.