

The Bookends of Pregnancy

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Chair National Pregnancy in Diabetes (NPID) audit

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The views expressed here are my own.

20th
Anniversary

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Declarations of interest

Scientific Advisory Board: European Medtronic Advisory Board & Ypsomed UK

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Speaker's Bureau: Dexcom, Medtronic, Novo Nordisk, Roche, Sanofi, Ypsomed

A close-up photograph of a pregnant woman's belly, which is the central focus of the image. Her hands are gently cradling her abdomen from the bottom. She is wearing a dark-colored top. The background is plain white.

What this session covers

- ✓ Pregnancy preparation
- ✓ Pregnancy outcomes T1 & early-onset T2D
- ✓ Role of diabetes technology
- ✓ Postnatal follow-up

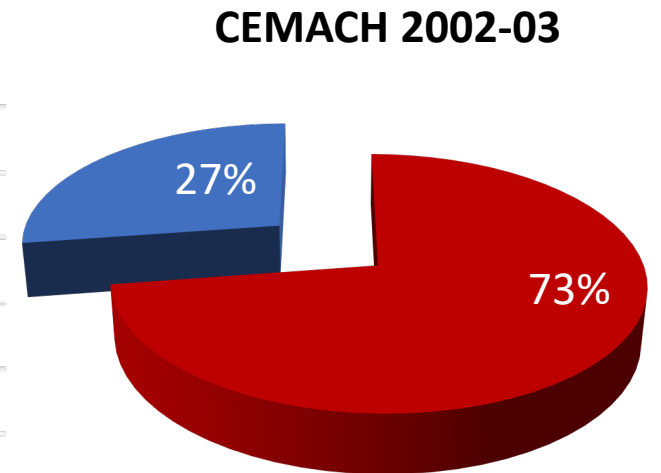
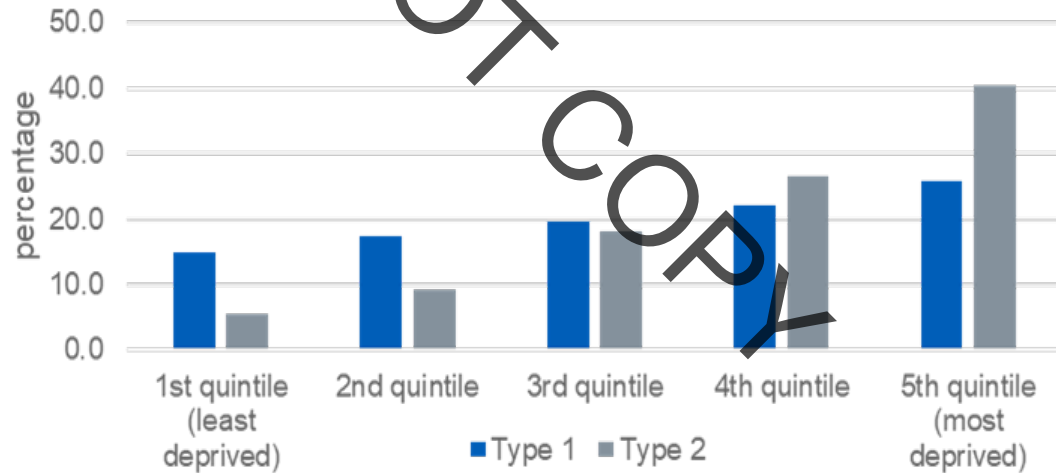
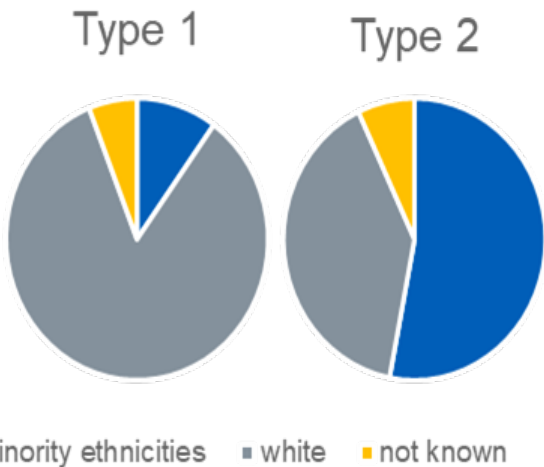
What is a successful pregnancy outcome?



- No congenital malformations
- Live mother + no stillbirth/neonatal death
- No neonatal intensive care
- No birth injuries/delivery complications
- No neonatal hypoglycaemia, jaundice, respiratory distress
- Baby normal size (<90th centile)

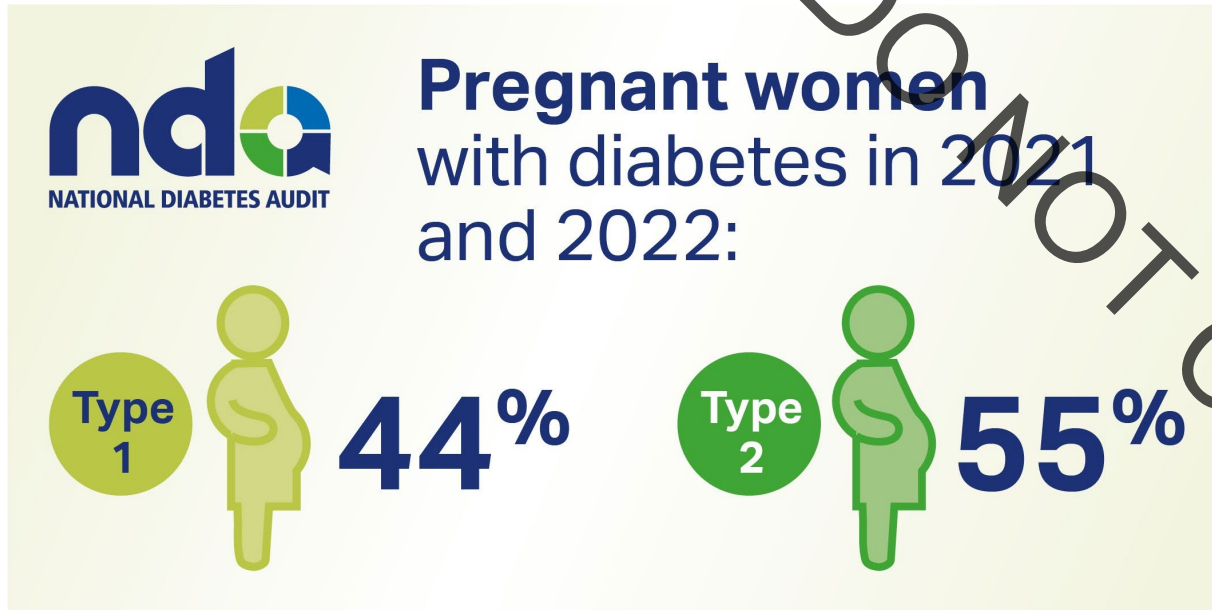
National Pregnancy in Diabetes (NPID) audit

- 2002-03 CEMACH 2,359 pregnancies (1707 T1D, 652 T2D)
- 2019-2022 NPID 4,828 pregnancies (2161 T1D, 2667 T2D)



Articles

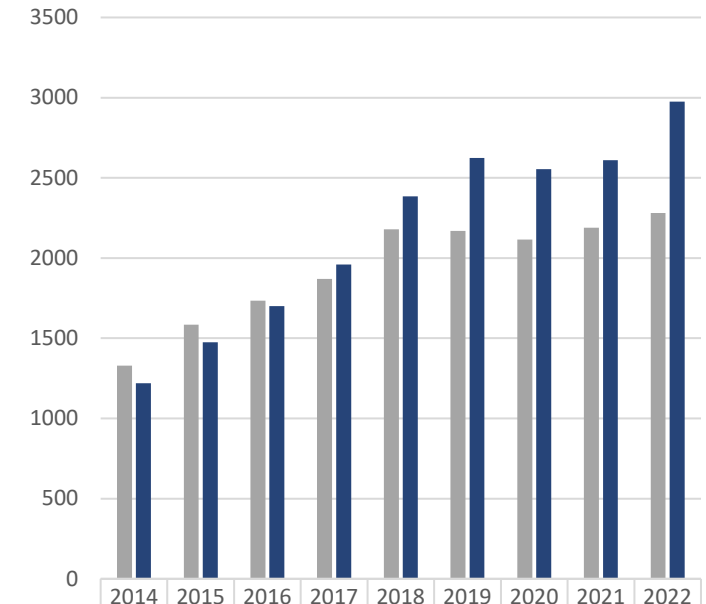
Population demographics



N= 4,470 T1D and N= 5,585 EOT2D pregnancies


N=184 services in 2021 (3 did not submit) and N=177 services in 2022 (9 did not submit)

Prevalence (n) of type 1 and type 2 diabetes in England and Wales



Type 1 diabetes (n)	1330	1585	1735	1870	2180	2170	2115	2190	2280
Type 2 diabetes (n)	1220	1475	1700	1960	2385	2625	2555	2610	2975

Healthcare inequalities



Pregnant women with type 2 diabetes are more likely than those with type 1 to be:

- From **ethnic minorities**
- Living in **deprived areas**

Ethnic Minorities

<10% T1D

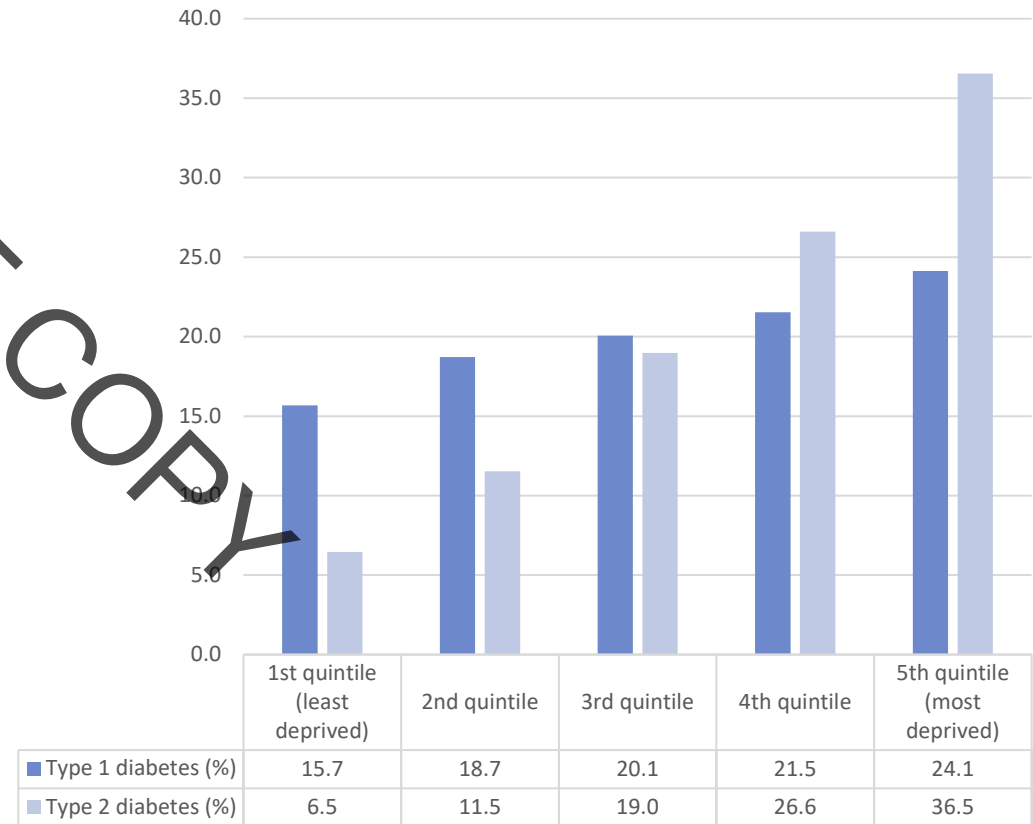
53% EOT2D

Least vs most deprived

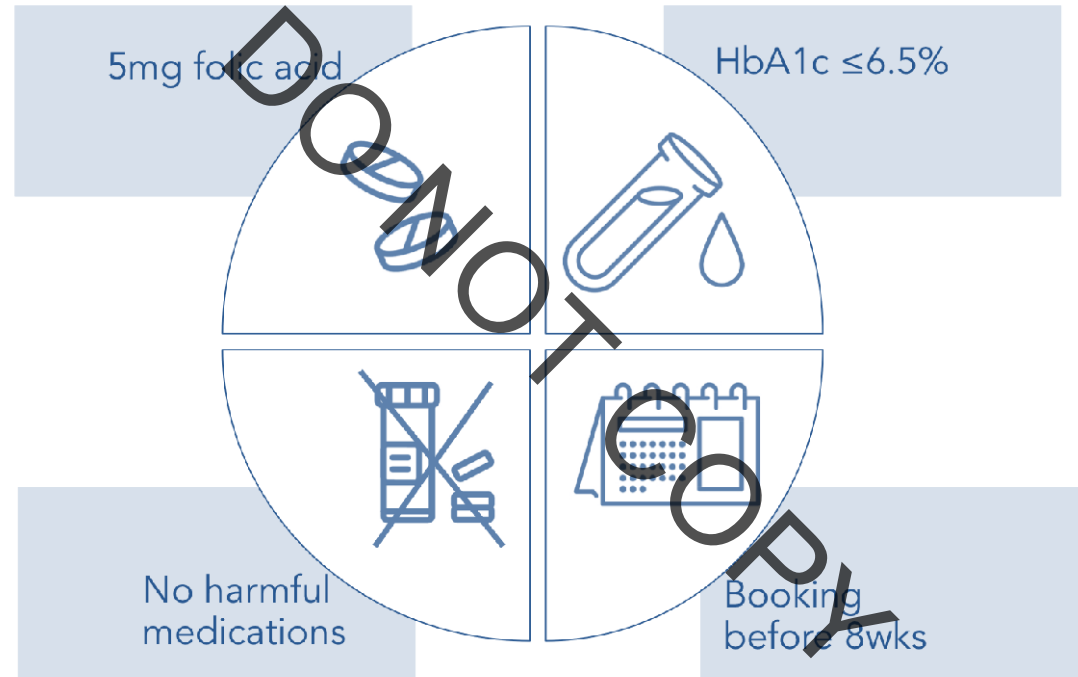
16% vs 24% T1D

6% vs 36% EOT2D

Deprivation in type 1 and type 2 diabetes 2021/22



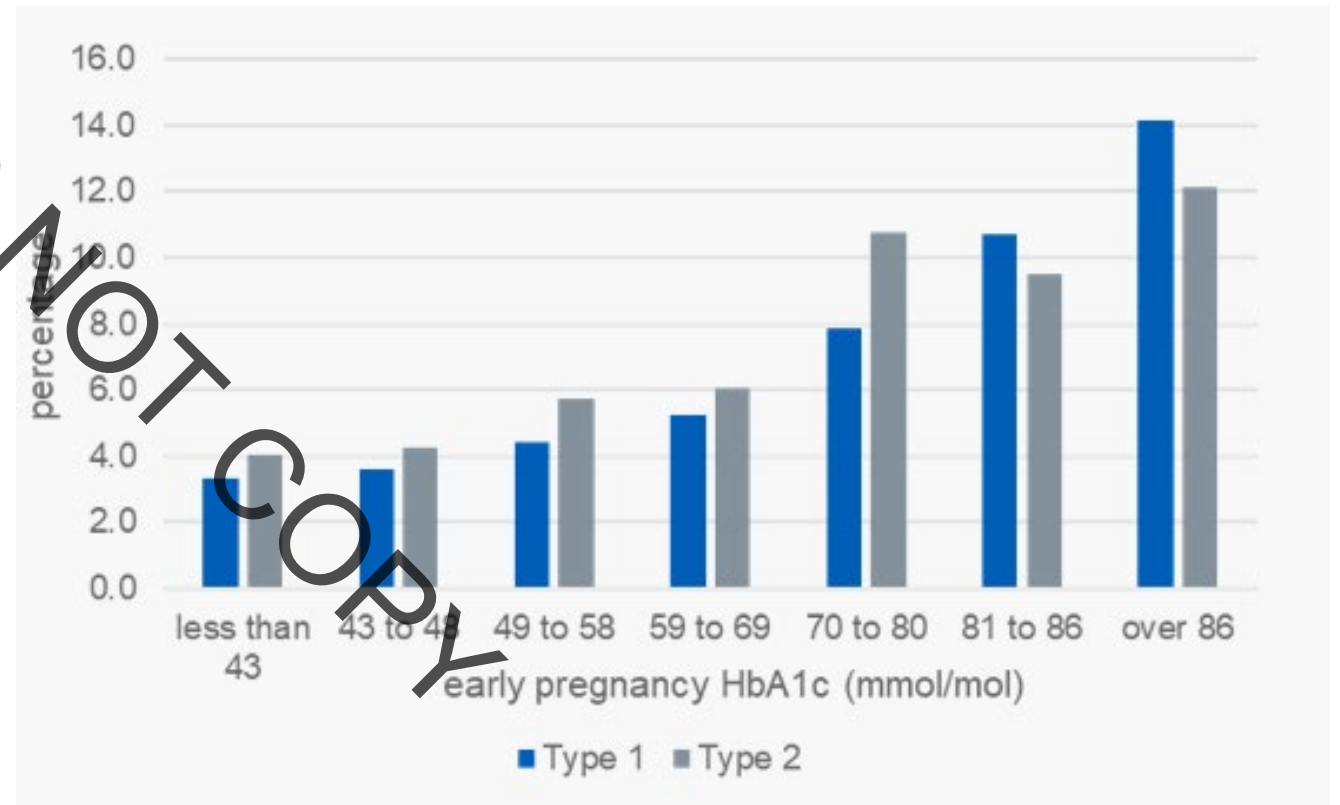
Planning for a safe & healthy pregnancy



<https://www.tommys.org/pregnancy-information/planning-pregnancy/planning-for-pregnancy-tool>
<https://abcd.care/resource/planning-pregnancy>

Maternal glucose is key risk factor for serious adverse outcomes

- HbA1c > 48 mmol/mol is the key risk factor for serious adverse pregnancy outcomes (congenital malformations and stillbirth or neonatal death)
- Aiming for HbA1c < 48 mmol/mol at start of pregnancy
- Using contraception until 'pregnancy ready'



Planning for a safe & healthy pregnancy

Risks and complications

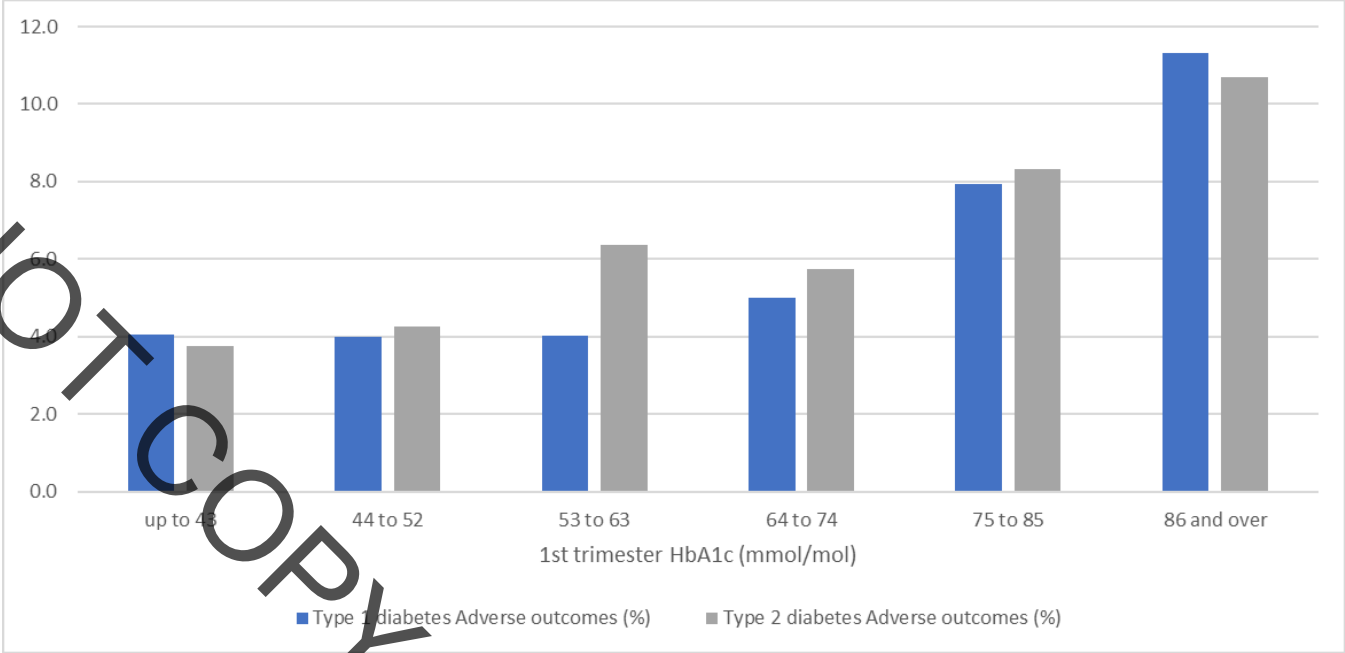


For women with diabetes who do not plan their pregnancy, the risk of a serious complication (e.g. stillbirth, serious heart or birth defect) is about 1 in 10.

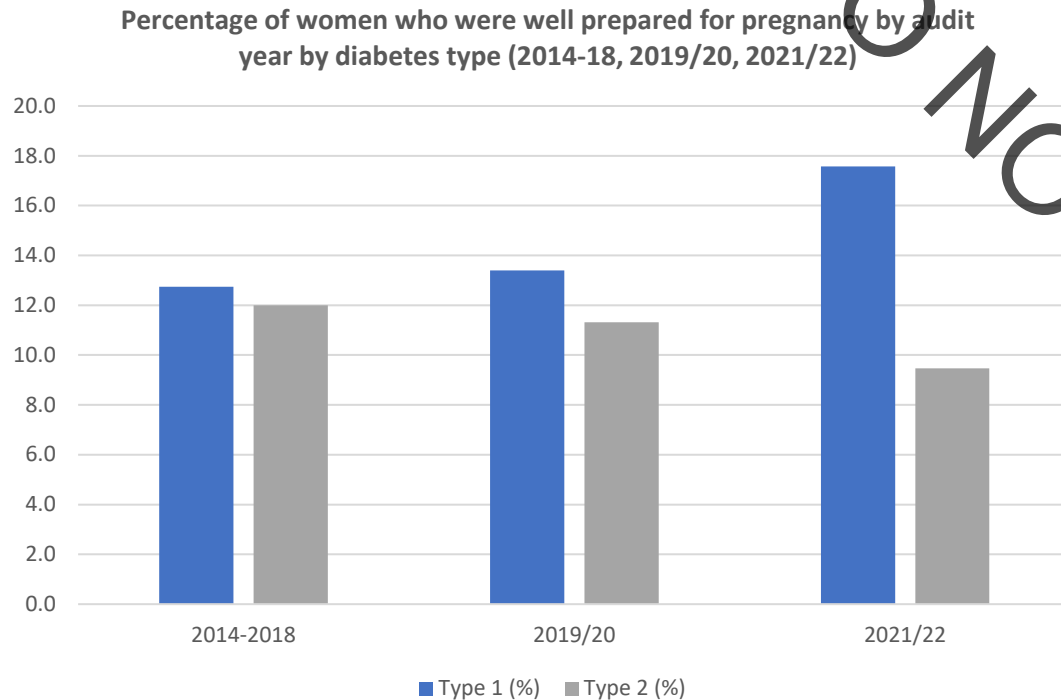
Reassuringly, if you do plan your pregnancy with your diabetes team, your risk of serious complications falls closer to that of women without diabetes (1 in 50).



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Pregnancy preparation



Pregnant women with **type 2 diabetes** are more likely than those with type 1 to:

- Experience **health inequalities** before and during pregnancy. This finding is unchanged since **2014**.

Booking gestation 9 vs 7 weeks for EOT2D vs T1D

Median BMI 33 - 64% taking metformin, 21% 5mg folic acid and <10% EOT2D well prepared for pregnancy

What could have been different?

Planning for a safe & healthy pregnancy



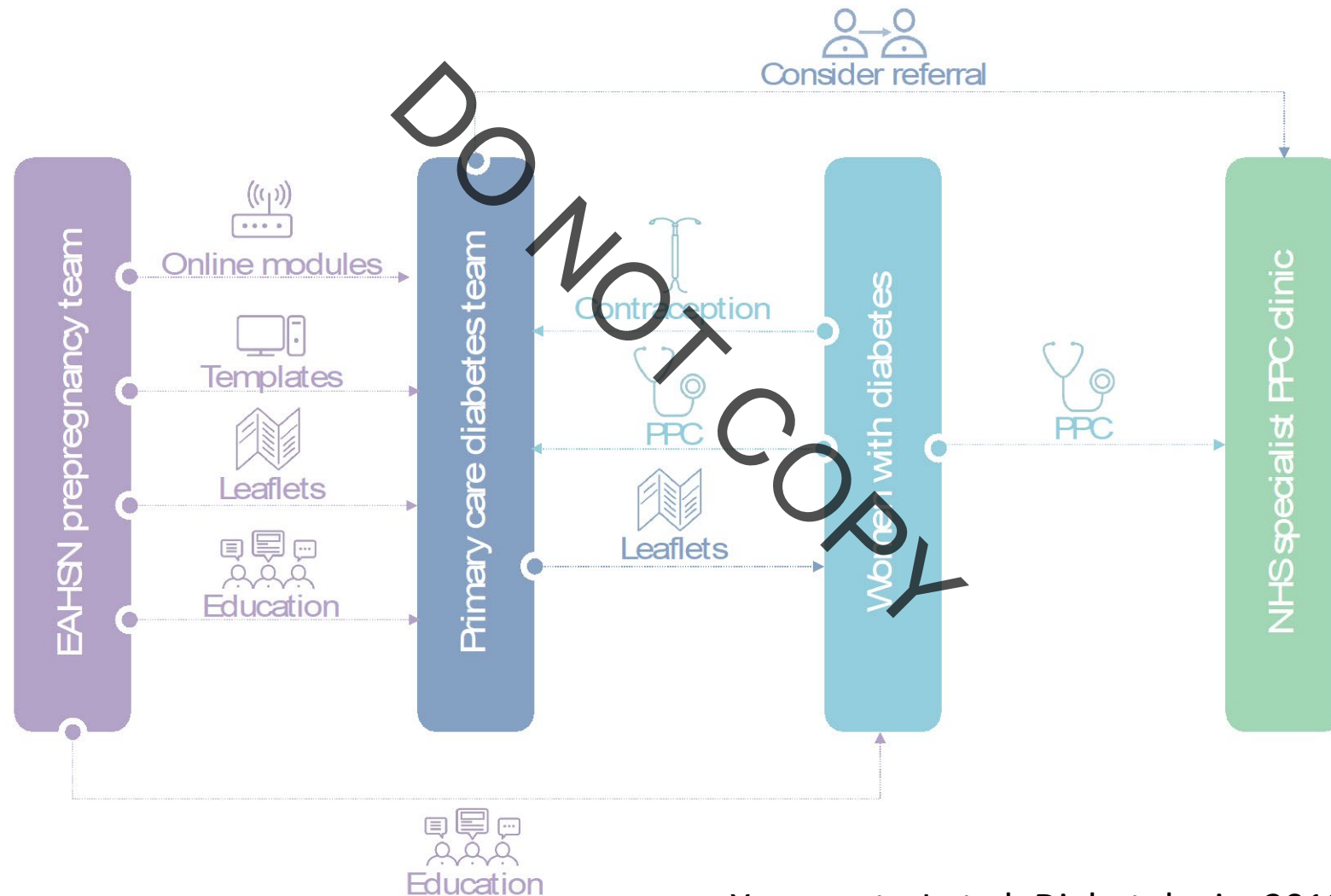
Risks and complications



For women with diabetes who do not plan their pregnancy, the risk of a serious complication (e.g. stillbirth, serious heart or birth defect) is about 1 in 10.

- ✓ Working with diabetes team to get 'pregnancy ready' reduces these risks to 1 in 50
- ✓ HbA1c less than 48 mmol/mol (advise women with HbA1c >86 mmol/mol to avoid pregnancy i.e. SAFE EFFECTIVE CONTRACEPTION)
- ✓ Check all medication is safe and on folic acid 5mg od

Community-based pre-pregnancy care improves pregnancy preparation in T2D



T2Day press release

NHS offers extra help for under-40s with diabetes

Eleanor Hayward
Health Correspondent

The NHS is to offer weight-loss programmes for under-40s with type 2 diabetes as a record number of younger adults develop the disease.

In the UK, 148,000 people aged between 18 to 39 have what medical orthodoxy has regarded as a condition of middle age.

But the rise in type 2 diabetes in under-40s has risen faster in Britain than anywhere else in the world, increasing five-fold since 1990.

The new scheme is the first to target this group, who are at high risk of deadly complications including kidney failure, heart attack and stroke.

Younger patients will be offered extra one-to-one reviews and support, plus the option of new weight-loss drugs. Treatments could include Ozempic, a weekly injection available on the NHS to treat type 2 diabetes. It is, however, in

short supply globally because of its off-label use as a drug for the overweight.

Patients will also have the option of a 12-week "soup and shakes" diet, which has been proven to put type 2 diabetes into remission.

Early-onset type 2 diabetes is a more aggressive form of the disease. Research shows that life expectancy falls by 11 years on average in those who develop it at 20, compared with a reduced life expectancy of two years when given a diagnosis at 65.

Professor Jonathan Valabhji, national clinical director for diabetes and obesity said: "Type 2 diabetes in people under 40 is a growing problem globally. We know this age group is least likely to complete vital annual health checks. The programme will provide targeted intervention."

Chris Askew, chief executive of Diabetes UK, said the programme was a "vital step to improving care for younger people with diabetes."

NHS

People in England with diabetes to get targeted support in new roll-out

By Paul Gallagher
HEALTH CORRESPONDENT

Tens of thousands of people in England living with early onset type 2 diabetes will benefit from more intensive and targeted care, thanks to a world-first initiative being rolled out by the NHS.

About 140,000 people aged 18 to 39 will receive extra tailored checks from health workers and support with diabetes, such as controlling blood sugar levels, managing weight and minimising cardiovascular risk. Patients will also benefit from

extra one-to-one reviews as well as the option of new medicines and treatments where indicated, to help better manage their diabetes.

NHS England said it was the first health system in the world to put in place a national, targeted programme for this high-risk group.

Addressing the extra risks associated with the condition during pregnancy, there will also be dedicated support available for women, including

access to contraception and folic acid supplements.

Eligible individuals may also be able to access the NHS Type 2 Diabetes Path to Remission Programme – a year-long scheme including 12 weeks of low-calorie total diet replacement products and support to reintroduce food, which aims to help patients to improve their blood sugar levels, reduce diabetes-related medication and in some cases put

140,000
Number of people aged 18 to 39 who will receive support managing their weight and blood sugar levels

their type 2 diabetes into remission. Professor Jonathan Valabhji, the national clinical director for diabetes and obesity, said: "Type 2 diabetes in people under 40 is a growing problem globally. England is no exception, meaning there is an ever-increasing challenge for the NHS."

"We know that this age group is least likely to complete vital annual health checks but we want to ensure people are able to manage their diabetes well and reduce the risk of serious complications, which is exactly why we have embarked on an ambitious and world-first initiative."

Under-40s with type 2 diabetes are set to have their care 'transformed' by a world-first NHS programme which gives patients tailored support

- Patients will benefit from extra one-to-one reviews and option of new treatments
- **READ MORE:** The four health measurements that EVERYONE should know

PULSE

At the heart of

News Views Clinical Pulse R

Home News Clinical areas Diabetes New NHS type 2 diabetes

NHS to focus on diabetes checks for under 40s after 'alarming' rise in young people

World-first initiative will offer more intensive and targeted care under new national programme, officials announced

New NHS type 2 diabetes programme targets support at young people

Women with diabetes have obstetric and neonatal complications

LGA

1 in 2 women with **T1DM**

1 in 4 women with **T2DM**

Caesarean section

3 in 4 of babies of mums with **T1DM**

1 in 2 of babies of mums with **T2DM**

Preterm birth

1 in 2 women with **T1DM**

1 in 4 women with **T2DM**

NICU

1 in 2 babies of mums with **T1DM**

1 in 3 babies of mums with **T2DM**

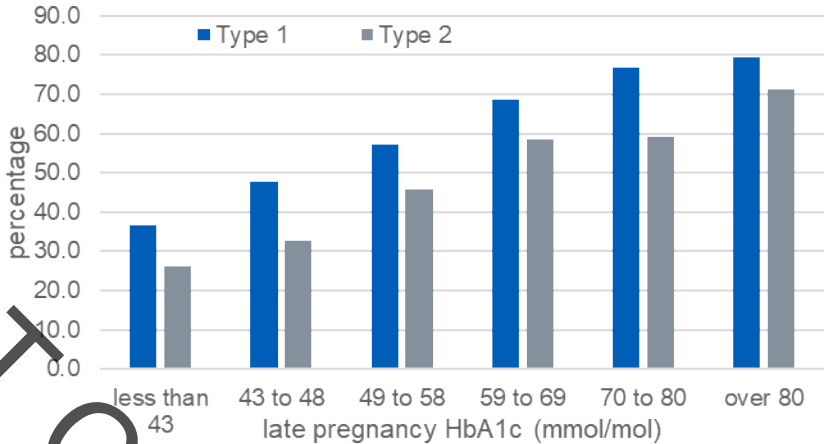


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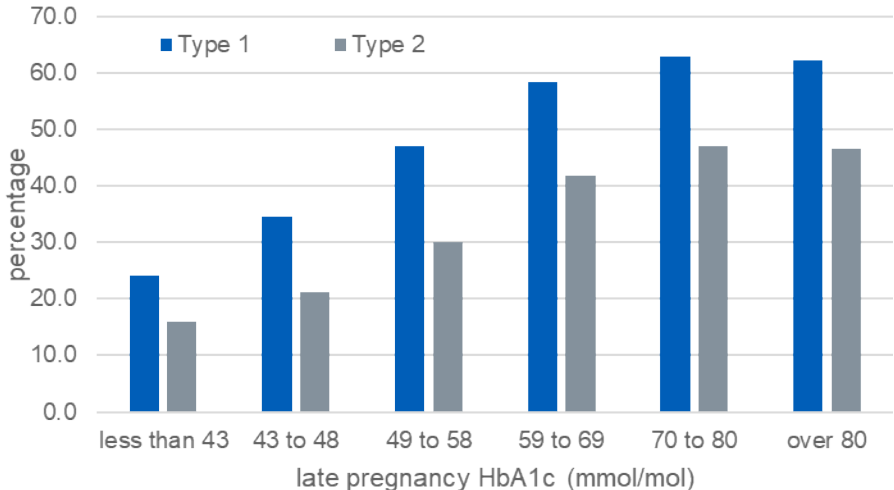
Pregnancy complications and maternal HbA1c during pregnancy?

- Preterm births, LGA and neonatal care admissions were lowest in pregnancies with late HbA1c <43mmol/mol

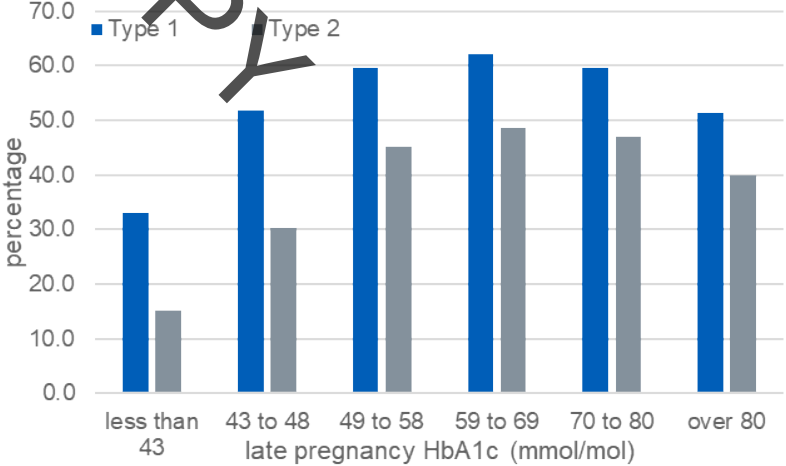
NICU admissions



Preterm births < 37 weeks



Large for gestational age (LGA) babies





95% of women with type 1 diabetes wore continuous glucose monitors in 2022



95%

Real-world CGM use – N=2055



Wearing continuous **glucose monitors** improved:



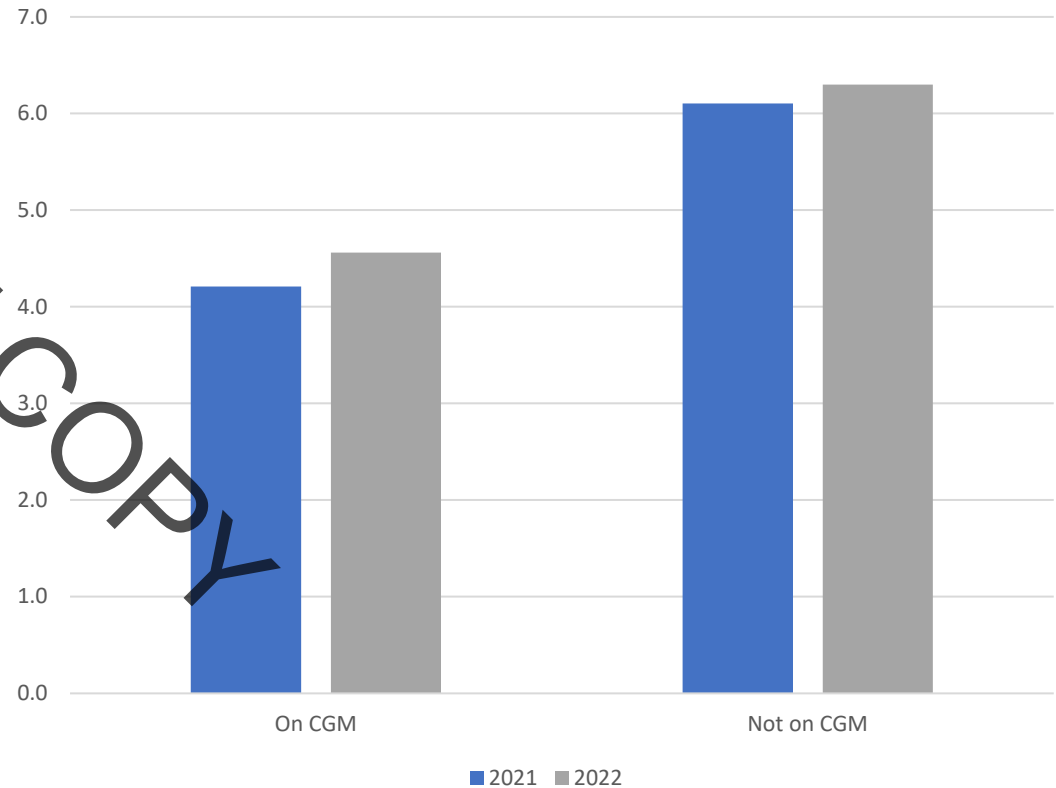
glucose levels for mothers

outcomes for women and babies

Improved pregnancy glucose levels with:

- ✓ Fewer LGA babies
- ✓ Fewer preterm births
- ✓ Fewer neonatal care admissions

Serious adverse pregnancy outcomes (Birth defects, stillbirth, baby death)



Can HCL further improve maternal glucose?

In CONCEPTT, only ~30% CGM users achieved pregnancy glucose targets of 70% time in range

Still some way to go.....



THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Closed-Loop Insulin Delivery during Pregnancy in Women with Type 1 Diabetes

Zoe A. Stewart, M.D., Malgorzata E. Wilinska, Ph.D., Sara Hartnell, B.Sc., Rosemary C. Temple, M.D., Gerry Rayman, M.D., Katharine P. Stanley, M.D., David Simmons, M.D., Graham R. Law, Ph.D., Eleanor M. Scott, M.D., Roman Hovorka, Ph.D., and Helen R. Murphy, M.D.

ABSTRACT

BACKGROUND

From the Wellcome Trust—Medical Research Council Institute of Metabolic Science, University of Cambridge (Z.A.S., M.E.W., R.H., H.R.M.), and Wolfson Diabetes and Endocrine Clinic, Cambridge University Hospitals' NHS Foundation Trust (S.H., D.S., H.R.M.), Cambridge, the Elsie Bertram Diabetes Centre (R.C.T., H.R.M.) and the Department of Obstetrics and Gynaecology (K.P.S.), Norfolk and Norwich University Hospitals' NHS Foundation Trust, and the Norwich Medical School, University of East Anglia (H.R.M.), Norwich, the Ipswich Diabetes Centre, Ipswich Hospital NHS Trust, Ipswich (G.R.), and the Division of Epidemiology and Biostatistics, Leeds Institute of Cardiovascular and Metabolic Medicine, University of Leeds, Leeds (G.R.L., E.M.S.) — all in the United Kingdom. Address reprint requests to Dr. Murphy at Norwich Medical School, University of East Anglia, Fl 2, Bob Champion Research and Education Bldg., Norwich NR4 7UQ, United Kingdom, or at hm386@medschl.cam.ac.uk.

N Engl J Med 2016;375:644–54.
DOI: 10.1056/NEJMoa1602494
Copyright © 2016 Massachusetts Medical Society.

In patients with type 1 diabetes who are not pregnant, closed-loop (automated) insulin delivery can provide better glycemic control than sensor-augmented pump therapy, but data are lacking on the efficacy, safety, and feasibility of closed-loop therapy during pregnancy.

METHODS

We performed an open-label, randomized, crossover study comparing overnight closed-loop therapy with sensor-augmented pump therapy, followed by a continuation phase in which the closed-loop system was used day and night. Sixteen pregnant women with type 1 diabetes completed 4 weeks of closed-loop pump therapy (intervention) and sensor-augmented pump therapy (control) in random order. During the continuation phase, 14 of the participants used the closed-loop system day and night until delivery. The primary outcome was the percentage of time that overnight glucose levels were within the target range (63 to 140 mg per deciliter [3.5 to 7.8 mmol per liter]).

RESULTS

The percentage of time that overnight glucose levels were in the target range was higher during closed-loop therapy than during control therapy (74.7% vs. 59.5%; absolute difference, 15.2 percentage points; 95% confidence interval, 6.1 to 24.2; $P=0.002$). The overnight mean glucose level was lower during closed-loop therapy than during control therapy (119 vs. 133 mg per deciliter [6.6 vs. 7.4 mmol per liter], $P=0.009$). There were no significant differences between closed-loop and control therapy in the percentage of time in which glucose levels were below the target range (1.3% and 1.9%, respectively; $P=0.28$), in insulin doses, or in adverse-event rates. During the continuation phase (up to 14.6 additional weeks, including antenatal hospitalizations, labor, and delivery), glucose levels were in the target range 68.7% of the time; the mean glycemia level was 126 mg per deciliter (7.0 mmol per liter). No episodes of severe hypoglycemia requiring third-party assistance occurred during either phase.

CONCLUSIONS

Overnight closed-loop therapy resulted in better glucose control than sensor-augmented pump therapy in pregnant women with type 1 diabetes. Women receiving day-and-night closed-loop therapy maintained glycemic control during a high proportion of the time in a period that encompassed antenatal hospital admission, labor, and delivery. (Funded by the National Institute for Health Research and others; Current Controlled Trials number, ISRCTN71510001.)



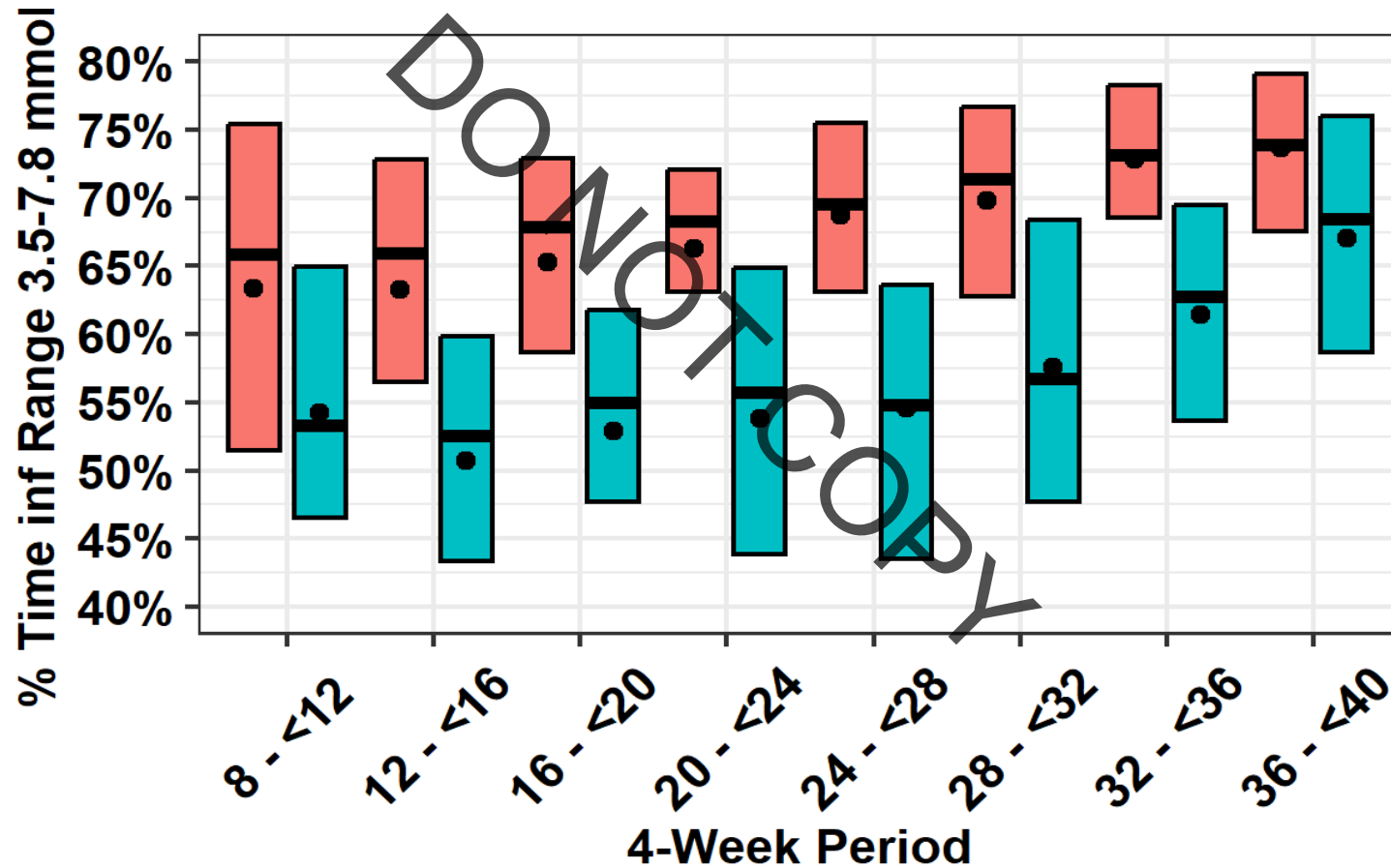
ORIGINAL ARTICLE

Automated Insulin Delivery in Women with Pregnancy Complicated by Type 1 Diabetes

Tara T.M. Lee, M.B., B.S., Corinne Colletti, B.Sc., Simon Bergford, M.S., Sara Hartnell, B.Sc., Eleanor M. Scott, M.D., Robert S. Lindsay, Ph.D., Katharine F. Hunt, M.D., David R. McCance, M.D., Katharine Barnard-Kelly, Ph.D., David Rankin, Ph.D., Julia Lawton, Ph.D., Rebecca M. Reynolds, Ph.D., Emma Flanagan, Ph.D., Matthew Hammond, M.Sc., Lee Shepstone, Ph.D., Malgorzata E. Wilinska, Ph.D., Judy Sibayan, M.P.H., Craig Kollman, Ph.D., Roy Beck, Ph.D., Roman Hovorka, Ph.D., and Helen K. Murphy, M.D., for the AiDAPT Collaborative Group*



CamAPS FX HCL improved maternal glucose from early pregnancy



Additional Benefits.....

- ✓ 3.7kg less gestational weight gain
- ✓ Less gestational hypertension
- ✓ Low rates of LGA/NICU
- ✓ Less worry, less work, more enjoyable pregnancy

Listening to women: experiences of using closed-loop in type 1 diabetes pregnancy

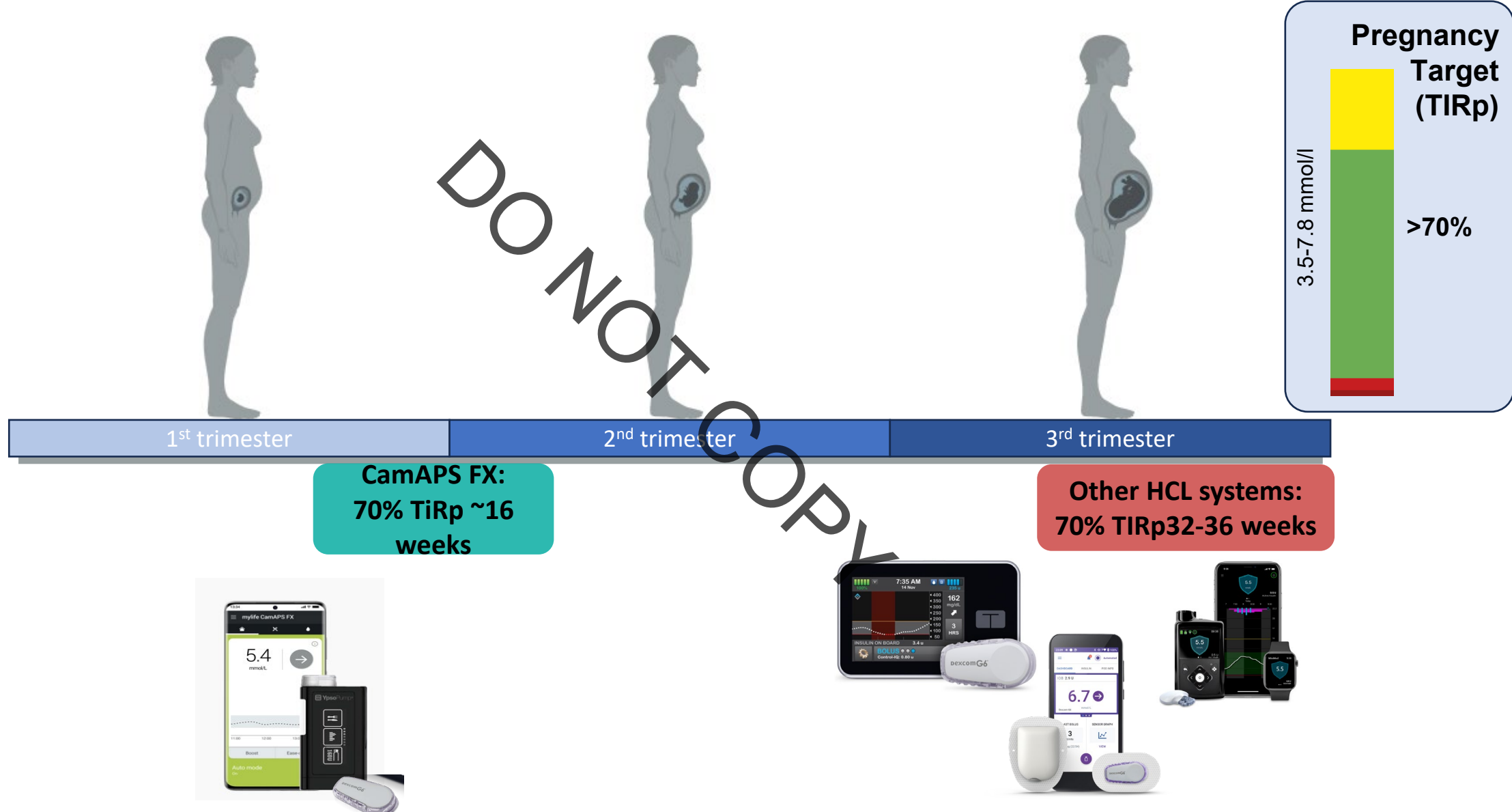
Lawton J et al Diabetes Technology & Therapeutics 2023 25:12, 845-855



HCL in T1D pregnancy decision tool

	Cam APS FX (Ypsomed or Dana)	Medtronic 780G	Tandem IQ	Diabeloop	Omnipod 5	Current standard care CGM (with MDI or Pump)
Licensed for use in pregnancy	✓	✗	✗	✗	✗	✓
Achieves glucose target of ≤5.0 mmol/l	✓ 4.4	✗ 5.5	✗ 6.25	✗ 5.6	✗ 6.1	✗
Evidence for clinically relevant improvement in maternal glucose outcomes (>5% improvement in TIRp 3.5-7.8) irrespective of age, BMI, booking HbA1c	✓ NEJM 2023	✗ Lancet D&E 2024; DTT 2024	✗ DTT 2024	✗ DTT 2024	✗	✓ Lancet 2017
Achieves time in pregnancy glucose range (3.5-7.8) TIRp >70% from first trimester	✓ Achieved in 1 in 2	✗ Achieved 1 in 20 in women with early pregnancy HbA1c >6.5%	✗	✗	✗	✗
Chance of having a big baby (Large for Gestational Age)	1 in 3 LGA rates 39%	2 in 3 LGA rates 60-70%	2 in 3 LGA rates 60-70%	2 in 3 LGA rates 60-70%	Unknown	1 in 2 LGA rates 50%
Maternal weight change in pregnancy	3.7 kg less weight gain	5.4 kg more weight gain in women with early pregnancy HbA1c >6.5%, and 3.3kg more if HbA1c <6.5%	3.3- 5.4 kg more weight gain	3.3- 5.4 Kg more weight gain	Unknown	Neutral
Development of any hypertensive disorder in pregnancy	20%		Unknown	Unknown	Unknown	42%

Too little too late with other HCL systems



“Important to refine the algorithm to better align with pregnancy requirements”

Pregnancy HCL benefits are system specific

CamAPS FX

Other HCL systems

39% LGA

69% LGA

3.7kg less weight gain

5.4kg more weight gain

Lee T et al AiDAPT N Engl J Med 2023

Women with HbA1c>6.5%*
Quiros C et al Diabetes Technol Ther. 2024



SWAP to CamAPS FX HCL during pregnancy

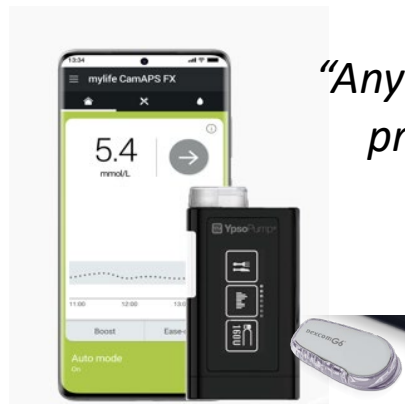


**SWAP to
CamAPS FX**

**Carefully consider
Montgomery ruling...**

**MONTGOMERY
COPY**

*“Any intervention must be based on a shared decision-making process, ensuring the patient is aware of **all options** and supported to make an **informed choice**”*





Rates of **serious outcomes** for women with **type 2 diabetes** and their babies increased in 2022





Pregnancy Outcomes in Young Women With Youth-Onset Type 2 Diabetes Followed in the TODAY Study

*TODAY Study Group**

Diabetes Care 2022;45:1038–1045 | <https://doi.org/10.2337/dc21-1071>

Report on 260 pregnancies in 141 women in the TODAY (Treatment Options for Type 2 Diabetes in Adolescents and Youth) Study

260 pregnancies in 141 WOMEN & GIRLS



42% were non-Hispanic Black

35% were Hispanic

AGE
20.5 years



7.3 years



35.4 kg/m²

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Early-onset T2D predominantly affects WOMEN & GIRLS

- 9,805 people < 25 years with T2D; 8,245 (84%) were aged 19-25 years
- 1,144 in paediatric services; i.e. 8 per paediatric unit
- 66% aged 19-25 in primary care; i.e. < 1 per GP practice
- **54% of all pregnancies in women with T2D**
- **33-50% have had a previous pregnancy with GDM**

Age group	Number of people
Under 12 years	105
12-15 years	545
16-18 years	910
19-25 years	8,245
All 0-25	9805

Number of young people with Type 2 diabetes in England
(Young People with Type 2 Diabetes, 2019-20; NDA & NPDA)

Women's experiences with HCPs

Stigma and judgement; perceived and self....

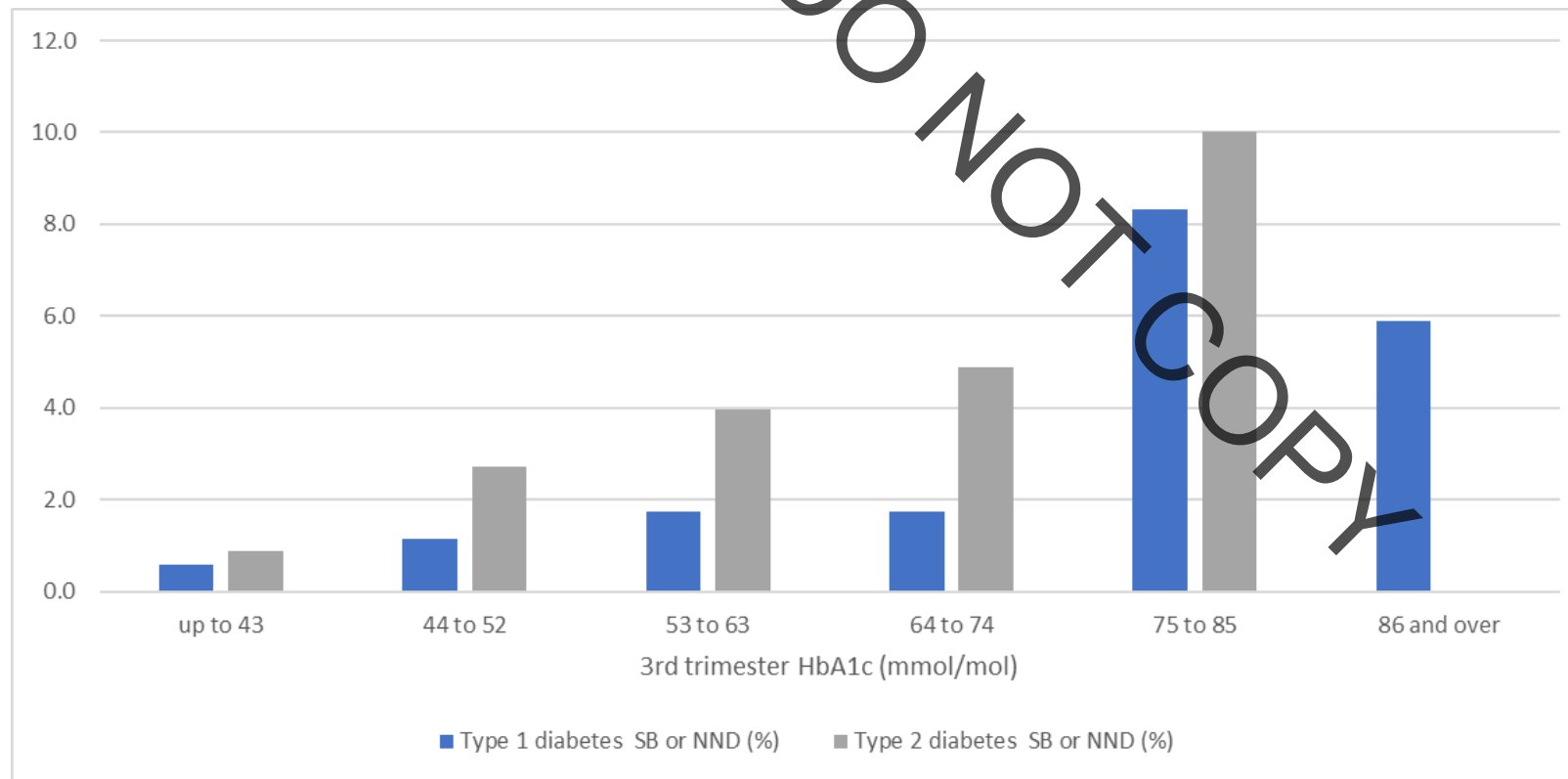
'I felt frightened and not listened to.....'

'more focus on the positivity of managing glucose levels and the results for my pregnancy/birth, for example being able to deliver naturally – proper support to manage diabetes without compromising my mental health and unborn baby'

Perinatal deaths - Saving Babies Lives Care Bundle

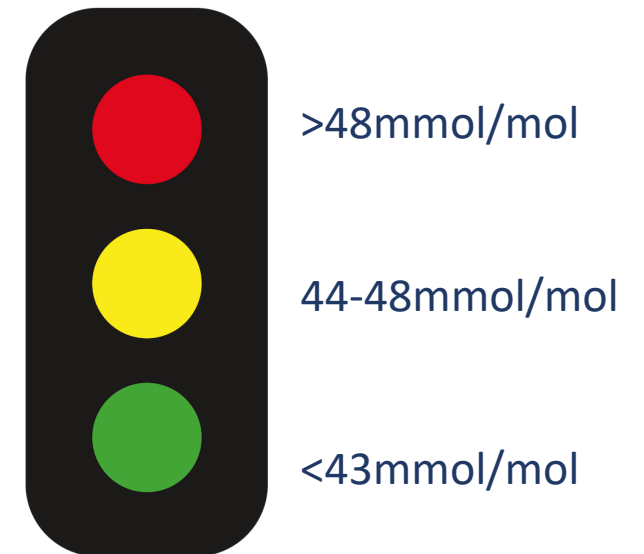
Type 2: 200 deaths (110 stillbirths, 90 neonatal deaths)

Type 1: 145 (85 stillbirths, 60 neonatal deaths)



Risk Factors

- HbA1c >43mmol/mol: OR 3.0
- Deprivation: OR 2.3
- Type 2 vs T1D : OR 1.65



HbA1c >43mmol/mol after 24/40 key modifiable risk factor for perinatal death in T2D

How can we improve outcomes for women with T2D?

- Support to achieve BMI & glucose targets (e.g GLP-1, CGM)
- Focus attention on those women who are not achieving the HbA1c targets (<48 mmol/mol) & not using contraception
- Get serious about preventing and/or reversing T2D
- Why is that your problem?
- Because you see them earlier in the journey with GDM

Role of Gestational Diabetes ?

- Gestational diabetes now seen in 10-20% of all pregnancies
- Up to 70% risk of progression to T2DM in 5-10 years
- Among pregnant women with T2DM – >33% had previous GDM
- Women with higher BMI or higher gestational weight gain are most at risk
- Every 1kg increase from pre-pregnancy weight - 40% increase T2D

NICE NG3 updated guidance December 2020

Women diagnosed with gestational diabetes

1.6.11 For women who were diagnosed with gestational diabetes and whose blood glucose levels returned to normal after the birth:

- offer lifestyle advice (including weight control, diet and exercise)
- offer a fasting plasma glucose test 6 to 13 weeks after the birth to exclude diabetes (for practical reasons this might take place at the 6-week postnatal check)
- after 13 weeks offer a fasting plasma glucose test if this has not been done earlier, or an HbA1c test if a fasting plasma glucose test is not possible
- do not routinely offer a 75-g 2-hour OGTT
- offer a referral into the NHS Diabetes Prevention Programme if eligible based on the results of the fasting plasma glucose test or HbA1c test. [2015, amended 2020]

All women with previous GDM are now eligible

Including those with normoglycaemia (FPG < 5.5mmol/l or HbA1c < 42 mmol/mol)

There is no time limit on when the GDM pregnancy occurred

Nationwide implementation of postnatal HbA1c at 3-6 months in conjunction with infant vaccinations, rather than an impractical fasting plasma glucose at 6-12weeks, may further improve postnatal GDM care

Take home messages to support women with diabetes on their pregnancy journey

Pre-pregnancy

- ✓ Contraceptive support is essential to improve pregnancy outcomes
- ✓ Use HCL technology in T1D (CamAPS FX before/after pregnancy)
- ✓ Pharmacotherapy (GLP-1) vs technology in T2D

During pregnancy

- ✓ 5mg folic acid, stop potentially harmful meds, refer for specialist care

Before, during and after pregnancy

- ✓ Get serious about GDM follow-up and T2D prevention



Take home messages

- ✓ Fantastic success T1D pregnancy from CGM and HCL
- ✓ EOT2D need targeted care and support including better access to safe effective contraception/ pre-pregnancy care (T2Day)
- ✓ Maternal glucose key modifiable risk factor – role of CGM?
- ✓ T2D prevention <40yrs = National Priority
 - ✓ National GDM audit
 - ✓ Post-natal glucose/annual HbA1c
 - ✓ Diabetes Prevention & Remission





Q&A

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